Rethinking restructuring in Mandarin Chinese: Empirical properties, theoretical insights, and LFG/XLE computational implementation

Chit Fung Lam
University of Manchester

Proceedings of the LFG'22 Conference

Miriam Butt, Jamie Y. Findlay and Ida Toivonen (Editors)

2022

CSLI Publications

http://csli-publications.stanford.edu/

Abstract

This paper centres on two phenomena – Aspect under Control (also known as "Aspectual Lowering") and Inner Topicalisation, which have been analysed as "restructuring" phenomena in Minimalist studies (Grano, 2015; N. Huang, 2018). The paper first focuses on the empirical properties revealed by linguistic diagnostics. The empirical observations suggest that, for Aspect under Control, there is clausal restructuring at the phrase-structure level but no restructuring at the functional level. That means, an Aspect-under-Control construction is mono-clausal in the phrase structure but bi-clausal in the functional structure. These observations are best explained in a theoretical framework where clausehood embodies a multi-level construct. Empirical observations suggest inner-topic constructions are bi-clausal at both phrase-structure and functional levels. Therefore, Inner Topicalisation should not be analysed as a restructuring phenomenon. LFG analyses are provided and computationally instantiated on XLE to capture the complex interaction between control, complementation, Aspect under Control, and Inner Topicalisation.

1. Introduction[1]

Research in the transformational/derivational tradition (Principles & Parameters/Minimalism) typically characterises a control construction as a biclausal configuration (e.g., Chomsky, 1981; Landau, 2000; among others), where the control predicate selects for a complement clause that projects up to the CP (or at least TP) layer. Cross-linguistically, a subset of control predicates is said to select for a size-reduced embedded structure, such as a non-clausal complement vP, which lacks a full functional-clausal spine. As a result, the construction is said to be associated with behaviour typically found in a mono-clausal configuration. This phenomenon is known as "restructuring" (or "clause union") (Aissen & Perlmutter, 1976; Rizzi, 1978; see also Wurmbrand, 2003, 2015). Restructuring is, in essence, a clause-size-reduction phenomenon. Cross-linguistically, a range of language patterns has been taken as signalling restructuring, where the control predicate enables an otherwise clause-bound dependency relation to "cross" the predicate. They include clitic climbing in Italian, scrambling in German, long passivisation in German, etc. (see e.g., Wurmbrand, 2003, 2015).

Regarding research on Mandarin Chinese, a few phenomena have been claimed in recent years to be derived from clausal restructuring, two of them

[1] This work was developed as part of my PhD project. I am very grateful to my supervisors, Kersti Börjars and Eva Schultze-Berndt. Many thanks to the audience of LFG22, especially people who kindly commented on my presentation: Miriam Butt, Ash Asudeh, Mark-Mathias Zymla, Jamie Findlay, Helge Lødrup, Lori Levin, and Xiulin Yang. I greatly appreciate the feedback from the anonymous reviewers and Miriam on this paper. Many thanks to Mary Dalrymple, John Lowe, and Joey Lovestrand for their feedback at SE-LFG31, where an earlier version of this work was presented. Thanks to Ziling Bai for her additional acceptability judgment on the data. Any error is mine.

being "Aspect under Control" (also known as "Aspectual Lowering) and "Inner Topicalisation" (Grano, 2015; N. Huang, 2018). In this paper, I will examine these two phenomena and address the following questions:

(i) What are the claims made in past studies about Aspect under Control and Inner Topicalisation? Are the claims substantiated by independent empirical evidence revealable via linguistic diagnostics?
(ii) Does independent empirical evidence suggest that Aspect under Control and Inner Topicalisation are related to clausal restructuring?
(iii) How can the properties of Aspect under Control and Inner Topicalisation be better captured within LFG's parallel constraint-based architecture using a non-movement approach?

In the following discussion, I will centre on the behaviour of three classes of verbs in Aspect under Control and Inner Topicalisation: exhaustive-control (**EC**) verb (*shefa*/*changshi* 'try'), partial-control (**PC**) verb (*dasuan* 'intend'), and non-control verb (*renwei* 'think'). A collective-word diagnostic can empirically distinguish between EC and PC verbs (Haug, 2013: 279; Landau, 2000): a PC verb can select for a semantically singular matrix subject (the controller) with its embedded clause taking on a semantically plural subject (the controllee); in contrast, an EC verb does not allow such semantic discrepancy between the matrix subject and (unexpressed) embedded subject.[2] As for non-control constructions, note that Chinese allows discourse pro-drop (C.-T. J. Huang, 1989), where subjects and objects can be unexpressed.

2. Aspect under Control (or Aspectual Lowering): Empirical properties & theoretical insights

(1) contains the control verb *shefa* 'try'. Its embedded complement is headed by a predicate affixed by the perfective marker *-le* or experiential marker *-guo*.[3]

(1) xiaoming shefa [xiuli-**le**/**-guo** jiu diannao]
Xiaoming try repair-PFV/EXP old computer
'Xiaoming tried to repair the old computer.'

(1) is a typical example of an "Aspect-under-Control" (or "Aspectual Lowering") construction, which has been discussed in Generative Chinese linguistics since the 80s. Two claims have been made about it. First, it has been claimed that the aspectual marker is semantically associated with the matrix predicate despite its surface affixation to the embedded predicate (e.g., T.-H.

[2] A reviewer pointed out that there are also significant differences between EC and PC regarding their ability to license "semantic tense", although this issue goes beyond the scope of this paper.
[3] For the semantic differences between *-le* and *-guo*, see Li & Thompson (1989: 184-236).

A. Li, 1990; Grano, 2015; N. Huang, 2018; among others).[4] Second, it has been claimed by Grano (2015) and N. Huang (2018) that the aforementioned semantic association is the consequence of restructuring in the embedded complement such that the overall construction adopts a mono-clausal configuration. In contrast, no such claims have been made for non-control constructions, which are analysed as bi-clausal. (2) illustrates N. Huang's (2018: 360) Minimalist analysis of Aspect under Control (involving the experiential marker *-guo*), which embodies the above two claims: (i) the Agree operation between an unpronounced aspectual morpheme Asp and the *-guo* suffixed to the embedded predicate models the claim about the matrix semantic construal of the experiential marker; (ii) the embedded complement only projects up to the non-clausal vP layer (instead of clausal TP/CP), thus rendering the overall construction mono-clausal.

(2) Syntactic analysis of Aspect under Control by N. Huang (2018: 360)[5]

... Asp [$_{vP}$ v+Control verb ... [$_{vP}$ v+V-*guo* VP...

|_____|

Agree

To test the empirical basis of the above claims, I resort to a few linguistic diagnostics. (3) is an interpretational diagnostic tailored to test the claim that an aspectual affix of the embedded predicate is semantically construed at the matrix level despite its surface appearance in the complement structure.

(3) ***Interpretational diagnostic for detecting semantic association***

a. xiaoming shefa [xiuli-**le** jiu diannao] (#xianzai diannao
Xiaoming try repair-PFV old computer now computer
shi huaide) Aspect-under-Control
be broken
'Xiaoming tried to repair the old computer; (with the computer repaired,) #but now the computer is still broken now.'

b. xiaoming changshi-**le** [(yao) xiuli jiu diannao] (xianzai
Xiaoming try-PFV will repair old computer now
diannao shi huaide) Not Aspect-under-Control
computer be broken
'Xiaoming tried to repair the old computer, but now the computer is still broken.'

[4] This claim was first made to sustain a theoretical viewpoint that a Chinese control verb selects for a non-finite complement clause, although Chinese does not have overt finiteness markers. In C.-T. J. Huang (1989), the non-finite complement clause of a control verb is posited to lack an AUX projection. However, *-le* and *-guo* normally entail an AUX projection. To ensure that Aspect-under-Control constructions do not become exceptions, it is posited that their *-le* or *-guo* be construed at the matrix level; thus, their complement clause can still lack an AUX projection.

[5] "v+Control verb" and "v+V-guo" indicate that the lexical verbs (head of VPs) move to v positions, as is generally assumed in Minimalist analyses.

(3a) and (3b) each contain a follow-up sentence: *but now the computer is still broken*. In (3a), the perfective marker -*le* is affixed to the embedded predicate, licensing Aspect under Control. In (3b), -*le* is affixed to the matrix predicate. If the embedded -*le* in an Aspect-under-Control construction were semantically associated with the matrix predicate – as what has been claimed in past studies – there should not be any interpretational differences between affixing -*le* to the embedded predicate (as in (3a)) vs affixing it to the matrix predicate (as in (3b)). Nevertheless, there is a contrast between (3a) and (3b) observable in their compatibility with the follow-up sentence. In (3a), the control construction is incompatible with the follow-up sentence, suggesting that -*le* is semantically associated with the embedded predicate *xiuli* 'repair' to convey the meaning that the old computer has already been repaired. If -*le* in (3a) were construed at the matrix level, such incompatibility should not arise and we would not expect any interpretational differences between (3a) and (3b). The empirical evidence in (3) suggests that in an Aspect-under-Control construction, the aspectual marker is both structurally affixed to and semantically associated with the embedded predicate rather than the matrix predicate, contrary to what has been claimed in the literature (see also Xu, 1985; Hu et al., 2001 for similar counter arguments).[6]

To test the claim of clausal restructuring, I first adopt the *ye* 'also' diagnostic, which is a language-specific test for detecting Chinese clausehood in the phrase structure. This diagnostic is used in N. Huang (2018: 352-353). The diagnostic is grounded on the fact that *ye* 'also' is confined to a structural position after the subject but preceding any functional heads (e.g., modal auxiliary). The phrase-structural restrictions of *ye* 'also' are illustrated in (4).

(4) *Context: Xiaoming will work hard.*
(***ye**) zhangsan (**ye**) yao (***ye**) nuli gongzuo
also Zhangsan also will also hard work
'Zhangsan will also work hard.'

Assuming that the entire sentence (4) is a projection of IP (or TP) and the future auxiliary *yao* takes the category I (or T) in the phrase structure, *ye* 'also' is thus associated with the inflectional domain of a clause and its licit appearance can be taken as signalling the existence of IP (or TP) – the essence of the forthcoming diagnostic (see e.g., Huang et al, 2009 for more information on Chinese phrase structures). Before applying the diagnostic, it is important to point out that *ye* 'also' *per se* has no compatibility issue when preceding a predicate affixed with the experiential marker -*guo*, as is shown in (5).

[6] The oft-cited example from Xu (1985: 349) involves the use of a *qing* 'invite'-construction with the aspectual marker -*guo* affixed to the embedded predicate.

(5) *Context: Xiaoming has worked hard before.*
zhangsan **ye** nuli gongzuo-**guo**
Zhangsan also hard work-EXP
'Zhangsan has also worked hard before.'

(6a) is an Aspect-under-Control construction with the experiential marker *-guo* affixed to the embedded predicate. The construction becomes ungrammatical when *ye* 'also' is introduced to the embedded complement. On the other hand, for a non-Aspect-under-Control construction, as in (6b), introducing *ye* 'also' to the embedded complement does not cause ungrammaticality.

(6) ***Ye* 'also' diagnostic to detect inflectional domain in phrase structure**
Context: Zhangsan once tried to repair an old computer.
a. xiaoming cenjing shefa [(***ye**) quxiuli-**guo** jiu diannao],
Xiaoming once try also go.repair-EXP old computer
keshi bu changgong Aspect-under-Control
but not succeed
'Xiaoming once tried to (*also) repair the old computer, but he didn't succeed.'
b. xiaoming cenjing shefa [(**ye**) quxiuli jiu diannao],
Xiaoming once try also go.repair old computer
keshi bu changgong Not Aspect-under-Control
but not succeed
'Xiaoming once tried to (also) repair the old computer, but he did not succeed.'

As discussed previously, the special phrase-structural restrictions of *ye* 'also' accord to this adverb diagnostic properties of the IP layer. Therefore, the contrast between (6a) and (6b) can be explained by clausal differences in their embedded complements: while the embedded complement of (6b) is an IP projection, the embedded complement of (6a) does not project up to the IP domain; with the absence of the IP domain, the embedded complement of (6a) can be said to be a non-clausal structure, for example, VP (if one assumes the projection hierarchy of CP > IP > VP). The results of the diagnostic are in line with the restructuring claim that an Aspect-under-Control construction selects for a non-clausal complement, thus adopting a mono-clausal configuration.

The joint results of the two diagnostics – interpretational diagnostic in (3) and *ye* 'also' diagnostic (6) – have revealed an important insight: semantic association should not be conflated with clausal restructuring. Before claiming for any cause-and-effect relationships, semantic association and clausal reduction each require independent empirical testing. Unfortunately, such independent testing is often missing in past studies (e.g., Grano, 2015; N. Huang, 2018). That being said, the conflation of syntactic clausehood and semantic association can be attributed to the wider theoretical framework

adopted by the researcher.[7] LFG adheres to the principle of modularity (Dalrymple et al., 2019: 265-266), ensuring that syntactic clausehood not be conflated with semantic association. Here, this modular view is backed up by the empirical evidence revealed by the two diagnostics which, on the one hand, support clausal reduction of the embedded structure, thus diminishing the clausal boundary between the matrix potion and embedded complement in the phrase structure; on the other hand, reject a matrix-semantic construal of the embedded aspectual marker despite the diminished clausal boundary.

Another insight that LFG brings to the issue at hand is about the nature of "clausehood" as a multi-level construct. As LFG assumes two syntactic structures – phrase structure (or c-structure for encoding constituency, dominance and linear order) and functional structure (or f-structure for encoding grammatical relations and features), it follows that clausal embedding in one syntactic structure does not entail clausal embedding in another. Butt (2014: 166) has made this point lucid:

"...within Lexical-Functional Grammar..., in which different types of embeddings are represented at different levels of representation. Constituents are embedded within one another at c(onstituent)-structure. Dependency relations such as embedded complements are represented at f(unctional)-structure. C-structure and f-structure are not isomorphic and embedding at c-structure need not correspond to embedding at f-structure and vice versa."

Applying the same logic to clausal restructuring means that restructuring in the phrase structure does not entail restructuring in the functional structure and vice versa. The results of the *ye* 'also' diagnostic are only indicative of clausal restructuring at the phrase-structural level. It is important to apply an appropriate diagnostic to test whether there is any clausal restructuring at the functional level. To this end, I adopt a binding diagnostic using the complex reflexive *taziji*. In LFG research, it has been accepted that binding constraints should be stated in functional terms rather than phrase-structural terms (see Dalrymple, 1993, 2015). Therefore, binding diagnostics reveal insights pertinent to the functional structure. (7) states part of the binding condition of *taziji* (see Lam, 2021 for a comprehensive version defined in formal language and the empirical data for deriving the binding condition):

[7] The use of vP (or more recently VoiceP) in a Minimalist tree to encode agentivity is a case in point. In general, Minimalist trees with a proliferation of functional heads tend to encode certain semantic notions with the functional heads. In contrast, LFG is more parsimonious in positing functional categories. In general, LFG posits functional categories only when there are syntactic distributional factors motivating particular structural positions to be associated with the categories. Semantic notions, such as agentivity, are dealt with in independent structures (e.g., argument structure), which are related to the syntactic structures via mapping mechanisms.

(7) (Part of) the binding condition of complex reflexive *taziji*:
When the complex reflexive *taziji* bears a non-subject grammatical function, *taziji* must be locally bound by the subject of the same predicate which selects for *taziji*.

(8a) is an Aspect-under-Control construction. Following the word-order requirements in Chinese, the temporal adverbial *zai zuihou guantou* 'at the last moment' modifies the embedded verb *jiu* 'save' rather than the control verb *shefa* 'try'.[8] The fact that the adverbial selectively modifies the embedded verb instead of the control verb suggests that the two verbs do not form one co-predicational domain in the sense of Butt (2014).[9] In other words, *jiu* 'save' and *shefa* 'try' are construed as separate verbs in (8a). Using *taziji* as the object of the embedded predicate, its binding condition requires *taziji* to be locally bound by the subject of the same predicate which selects for it. In this case, *taziji* needs to be locally bound by the subject of *jiu* 'save'. The fact that (8a) is a well-formed construction suggests the binding condition of *taziji* is satisfied. This entails that, in the functional structure, there must be an unexpressed subject for the embedded predicate *jiu* 'save', serving as the antecedent of *taziji*. The existence of an embedded subject function is an indicator of clausal embedding in the function structure. Thus, the embedded complement of the Aspect-under-Control construction (8a) bears a clausal function. That means, there is no clausal restructuring at the functional level. (8a) can be compared with (8b), which is a non-Aspect-under-Control construction. Both (8a) and (8b) are shown by the diagnostic to take on a bi-clausal structure at the functional level.

(8) ***Binding diagnostic to detect embedded subject at functional level***
a. xiaoming shefa [(zai zuihou guantou) jiu-**le** **taziji**]
Xiaoming try at last moment save-PFV C.SELF
'Xiaoming tried to, at the last moment, save himself (and he did save himself in the end).' Aspect-under-Control
b. xiaoming shefa [(zai zuihou guantou) jiu **tazji**]
Xiaoming try at last moment save C.SELF
'Xiaoming tried to, at the last moment, save himself.'
Not Aspect-under-Control

The concept of clausehood as a multi-level construct is in line with the independent empirical evidence revealed by the above linguistic diagnostics.

[8] In (8a), while the rescue was done at the last moment, Xiaoming could have been planning over a period of time for his last-minute rescue – as part of his "trying" efforts. This adds to the evidence that the temporal adverbial selectively modifies the embedded predicate *jiu* 'save'.
[9] According to Butt (2014: 173), if two verbs (e.g., *let*, *cut* in Urdu) form a co-predicational domain, in the functional structure, the two verbs are "fused" as one predicate (e.g., 'let-cut'). In this setting, it is not possible for an adverbial to selectively modify only one of the verbs.

In a theoretical framework where clausehood is conceptualised as a single-dimensional construct, the *ye* diagnostic in (6) and binding diagnostic in (8) generate perplexing results because the former points to a mono-clausal structure while the latter suggests a bi-clausal structure. Such a predicament is non-existent in LFG where clausehood is a multi-level construct with the understanding that the two diagnostics are revealing clausal properties at different (but interrelated) linguistic levels.

The properties of Aspect under Control are summarised below:

(i) The aspectual marker affixed to the embedded predicate is semantically associated with the embedded predicate but not the matrix predicate.

(ii) An Aspect-under-Control construction is mono-clausal in the phrase structure but bi-clausal in the functional structure: there is clausal restructuring at the phrase-structural level but not the functional level.

The wider implication is that semantic association should not be conflated with clausal restructuring. Any impression of "semantic closeness" between the embedded aspectual marker and matrix predicate in an Aspect-under-Control construction is likely to be an illusion caused by the restructuring effects.

3. Inner Topicalisation: Empirical properties & theoretical insights

In Chinese, Inner Topicalisation (also known as "object preposing") is a phenomenon where an embedded object is displaced to a phrasal position after the matrix or embedded subject and before the matrix or embedded predicate (see e.g., Paul, 2002). (9) exemplifies Inner Topicalisation in *shefa* 'try' (EC verb) and *dasuan* 'intend' (PC verb) constructions. (10) exemplifies the Inner Topicalisation of *renwei* 'think' (non-control verb). For clarity, the preposed object (inner topic) is underlined and the "gap" corresponding to the position where the object would appear in a non-topicalised scenario is marked as "__".

(9) xiaoming <u>zhe-xiang gongzuo</u> **shefa**/**dasuan** mingtian wancheng ___
Xiaoming this task try/intend tomorrow finish
'Xiaoming tries/intends to finish this task tomorrow.'

(10) a. *xiaoming <u>zhe-xiang gongzuo</u> **renwei** (ta) hui mingtian
Xiaoming this task think 3SG will tomorrow
wancheng ___
finish
'Xiaoming thinks that (he) will finish this task tomorrow.'

b. xiaoming **renwei** (ta) <u>zhe-xiang gongzuo</u> hui mingtian
Xiaoming think 3SG this task will tomorrow
wanchang ___
finish
'Xiaoming thinks that (he) will finish this task tomorrow.'

Several claims have been made in the derivational literature regarding Inner Topicalisation. First, it has been claimed that whether an inner topic can "cross" the matrix predicate is contingent on the size of the embedded complement. Assuming movement, only a reduced-size embedded complement enables the inner topic to move out of the embedded complement and "cross" the matrix predicate, whereas a full-size embedded clause blocks the movement (Grano, 2015; N. Huang, 2018). Based on these assumptions, it is claimed that a control predicate restructures its embedded complement into a non-clausal structure (Grano, 2015) or a reduced clausal structure (N. Huang, 2018) such that the inner topic moves across the boundary between the matrix clause and embedded complement (Paul, 2002), forming the pattern in (9). On the contrary, a non-control predicate e.g., *renwei* 'think' forms a biclausal configuration with its embedded complement projecting to a clausal domain, blocking any further movement of an inner topic; thus, Inner Topicalisation via movement is only possible within the embedded clause (Grano, 2015; N. Huang, 2018), explaining the contrast in (10).

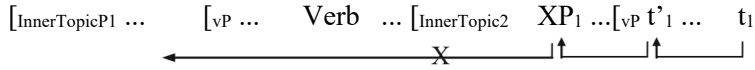
The above claims are instantiated in the formal analyses of (11), which is the analysis of N. Huang (2018). In his formal system, InnerTopP is a projection in the "operator" domain (comparable to the CP domain in the general derivational literature), signalling a full-sized clausal structure. After arriving at the InnerTopP position, an inner topic "freezes" due to some feature-checking mechanism. (11a) models Inner Topicalisation in a control (e.g., *shefa* 'try') construction. The embedded complement is restructured as a non-clausal vP; with the lack of the CP domain (thus absence of the InnerTopP position) in the embedded complement, the inner topic has to undergo a series of movements, crossing the control verb and eventually arriving at a post-matrix-subject position, where there is the CP domain of the entire sentence, in order to satisfy the theory-internal feature-checking mechanism. (11b) models the movement of an inner topic in a non-control (e.g., *renwei* 'think') construction. Since a non-control construction does not have clausal restructuring, such an InnerTopP position is found in the embedded complement, which projects up to the "operator" (or CP) domain and stops the inner topic from moving any further upward.[10]

(11) a. Inner Topicalisation of an embedded-object phrase XP in a control construction (N. Huang, 2018: 361)

$[_{InnerTopicP}\ XP_1 \ldots [_{vP}\ t''_1 \ldots$ Control verb $\ldots [_{vP}\ t'_1 \ldots \quad t_1 \ldots$

[10] It is worth mentioning that, in N. Huang's (2018) system, if the embedded clause is reduced but remains clausal in size – comparable to TP ("inflectional" domain), it still does not contain the required InnerTopP position for freezing the inner topic. In other words, the inner topic can still move out of the embedded clause into the matrix clause.

b. Inner Topicalisation of an embedded-object phrase XP in a non-control construction (N. Huang, 2018: 361)



Past studies associate the ability of the preposed object to be extracted from the embedded complement with the size of the embedded complement; thus, a way to empirically test the validity of the analysis is to diagnose the size of the embedded complement to see whether, for example, a control verb selects for a size-reduced complement structure, which is a critical factor for the movement proposal. To this end, I first use the complementizer-*shuo* diagnostic to diagnose the CP domain. This diagnostic is also used in N. Huang (2018). Contrary to his analysis which assumes *shuo* to be a functional head of the inflection domain, [11] I side with Chappell (2008) that *shuo* is a complementizer diachronically derived from the homophonous verb *shuo* 'say', in line with the cross-linguistic observation that SAY verbs (*verba dicendi*) grammaticalise into complementizers.[12] The *shuo* complementizer is attested in informal speech, but is rare in the written language.

(12) ***Complementizer-shuo diagnostic to detect CP domain***

a. xiaoming zhe-xiang gongzuo shefa/dasuan **shuo**
Xiaoming this work try/intend COMP
mingtian wancheng ___ Control construction
tomorrow finish
'Xiaoming tries/intends to finish this task tomorrow.'

b. xiaoming renwei **shuo** (ta) zhe-xiang gongzuo
Xiaoming think COMP 3SG this task
hui mingtian wancheng ___ Non-control construction
will tomorrow finish
'Xiaoming thinks that (he) will finish this task tomorrow.'

The results of the diagnostic in (12) suggest that, in the context of inner topicalisation, the embedded complement of both control and non-control constructions still projects up to the CP domain, which is evidenced by the

[11] As noted by N. Huang (2018: 370) himself, treating *shuo* as a non-complementizer in the inflectional domain has a few unresolved issues. Besides having to leave the exact functional category of *shuo* undetermined in his analysis, he also needs to go against the cross-linguistic observation that SAY verbs grammaticalise into complementizers as well as to address a few distributional issues related to the possibility of fronting a constituent before *shuo*. Furthermore, depriving *shuo* of the diagnostic properties as a complementizer would leave the CP domain of Chinese empirically undiagnosable.

[12] Chappell (2008) mentioned a range of cross-linguistic references regarding the grammaticalization of SAY verbs documented in African, South and Southeast Asian regions.

presence of the complementizer *shuo*. In other words, there is no clausal restructuring in the phrase structure.

Taking clausehood as a multi-level construct, I adopt the above-mentioned *taziji* binding diagnostic to detect any restructuring effects at the functional level. The fact that (13a) and (13b) are grammatical indicates that there is an (unexpressed) subject function in the embedded complement to satisfy the binding requirement of *taziji*, as stated in (7). The existence of an embedded subject function signals clausal embedding at the functional level. Thus, in the context of inner topicalisation, both control and non-control constructions are biclausal at the functional level. In other words, there is no clausal restructuring at the functional level either.

(13) ***Binding diagnostic to detect embedded subject at functional level***

a. xiaoming na-fen liwu shefa [(zai zuihou guantou)
Xiaoming that-CL gift try at last moment
song ___ gei **taziji**] Control construction
give to C.SELF
'Xiaoming tries to, at the last moment, give the gift to himself.'

b. xiaoming renwei [(ta) na-fen liwu hui (zai zuihou guantou)
Xiaoming think 3SG that-CL gift will at last moment
song ___ gei **taziji**] Non-control construction
give to C.SELF
'Xiaoming thinks that (he) will, at the last moment, give the gift to himself.'

After adducing independent evidence for the bi-clausal nature of the inner-topic constructions, it is important to note that EC and PC verbs behave differently in Inner Topicalisation. As illustrated in (14) and (15), the inner topic of an EC (e.g., *shefa* 'try') construction must appear in the matrix clause, while the inner topic of a PC (e.g., *dasuan* 'intend') construction may either appear after matrix-subject position or remain inside the embedded clause:

(14) a. xiaoming zhe-xiang gongzuo shefa mingtian wancheng ___
Xiaoming this-CL task try tomorrow finish
'Xiaoming tries to finish this task tomorrow.' EC construction

b. *xiaoming shefa zhe-xiang gongzuo mingtian wancheng
Xiaoming try this-CL task tomorrow finish
Xiaoming tries to finish this task tomorrow.' EC construction

(15) a. xiaoming zhe-xiang gongzuo dasuan mingtian
Xiaoming this-CL task intend tomorrow
yiqi wancheng ___ PC construction
together finish
'Xiaoming intends to finish this task together tomorrow.'

b. xiaoming dasuan zhe-xiang gongzuo mingtian
Xiaoming intend this-CL task tomorrow
yiqi wancheng ___ PC construction
together finsih
'Xiaoming intends to finish this task together tomorrow.'

Although several past studies (e.g., N. Huang, 2018: 364; Hu et al, 2001: 1142; Zhang, 2016: 291) have noticed the pattern of (15b), where the inner topic of a *dasuan* 'intend' construction remains inside the embedded clause, this pattern tends to be treated as a "non-standard" variant of inner topicalisation arising from some inter-speaker variation (see e.g., N. Huang, 2018). Nevertheless, the recurrence of such a pattern in different studies leads one to doubt the legitimacy of treating it as a peripheral observation in the theoretical machinery of Inner Topicalisation. In my analysis, the difference between (14) and (15) is an important one that correlates with the verb's control behaviour rather than being an issue of inter-speaker variation. To the best of my knowledge, there has not been any previous study pointing to the distinction between EC and PC verbs in order to understand the empirical contrast between (14) and (15).

Before moving on to my formal analysis, the properties of Inner Topicalisation are summarised below:

(i) An inner-topic construction formed by a control or non-control verb is bi-clausal at both phrase-structure and functional levels. In the phrase structure, the embedded complement can project up to the clausal CP domain. At the functional level, the embedded complement bears a clausal function.

(ii) Because there is no clausal restructuring at either linguistic level, the ability of the inner topic to be displaced outside the embedded complement should not be analysed as contingent on the clause size of the embedded complement.

(iii) There is a distinction between EC vs PC vs non-control verbs in Inner-Topicalisation: for an EC construction, the inner topic must appear in the matrix clause; for a PC construction, the inner topic can appear in either the matrix clause or embedded clause; for a non-control construction, the inner topic must remain inside the embedded clause.

Pre-theoretically, the differences between EC and PC verbs in Inner Topicalisation appear to reflect the varying degrees of syntactic and semantic "tightness" in that EC implies a close relationship between the matrix and embedded clauses (as well as between the controller and controllee), making the embedded-object extraction into the matrix clause obligatory. However, this "tightness" should not be modelled by a clause-restructuring analysis since there is independent syntactic evidence suggesting bi-clausality. In contrast, PC implies a less close relationship between the matrix and embedded clauses

(as well as between the controller and controllee). Therefore, the embedded-object extraction into the matrix clause is not obligatory for PC.

4. LFG/XLE computational implementation of theoretical analysis

This section presents a formal LFG analysis (Bresnan et al., 2015; Dalrymple et al., 2019). The analysis is computationally implemented via the grammar-engineering tool Xerox Linguistic Environment (XLE; Crouch et al., 2011). The implementation safeguards the formal accuracy of the constraints and helps to oversee their complex interaction; particularly, the interaction between the constraints responsible for control, complementation, Aspect under Control, and Inner Topicalisation. The advantages of computationally implementing formal analyses are discussed by e.g., Bender (2008), Forst & King (to appear).

My forthcoming analysis aims at capturing the important linguistic properties of Aspect under Control and Inner Topicalisation as discussed in the above sections. It features the two syntactic structures in LFG: c-structure (phrase structure) and f-structure (functional structure). In dealing with Aspect under Control, the analysis captures the discrepancy between c- and f-structures in embodying clausehood as a multi-level concept with restructuring happening only at the c-structural level. The modelling of Inner Topicalisation features a non-movement approach and recasts Inner Topicalisation as a phenomenon of long-distance dependency (Kaplan & Zaenen, 1989), instead of a restructuring phenomenon. In line with LFG's assumption of an elaborated lexicon containing linguistic constraints of various sorts, the analysis emphasises the role of the lexicon – in particular constraints in the lexical entries of the matrix verbs – in regulating Inner Topicalisation. As such, the formal machinery of Inner Topicalisation does not rely on any stipulated clause-size differences of the complement clause. The lexicalist approach effectively captures the distinction between EC vs PC vs non-control verbs. The formal analysis borrows insights from Dalrymple et al. (2019) on modelling English bridge verbs. The presence of a "bridging" feature in the f-structure licenses extraction from the embedded clause, while its absence makes the embedded clause an unextractable "island".

4.1. Important constraints in the XLE grammar

The XLE grammar fragment contains the constraints responsible for control, complementation, Aspect under Control, and Inner Topicalisation.

4.1.1. Phrase-structural rules:

```
I' --> {DP: ! $ (^DIS)                                  Inner Topicalisation rule
          (^{XCOMP: (-> INTOP); | COMP: (-> INTOP);}* OBJ)=!;
        I': ^=!
       |(I)
        VP: ^=! }.
```

Assuming a Chinese sentence to be a projection of IP, an inner-topic DP is analysed as occupying the I'-adjoining position – following a subject phrase at the Spec-IP position but preceding an I category (e.g., *hui* 'will'). Annotated to the inner-topic DP category are two lines of f-description. The first line maps the DP onto a member of the displacement-function DIS set (Dalrymple et al., 2019: 653). The second is a long-distance dependency equation embodying functional uncertainty (Kaplan & Zaenen, 1989). The off-path constraint (-> INTOP) requires each XCOMP and/or COMP to contain the attribute INTOP, which (as we will see) is a "bridging" feature lexically specified by a matrix verb to license out-of-complement-clause extraction. This formal setup captures the linguistic insight that the lexicon plays an important role in regulating Inner Topicalisation, which does not rely on clause-size differences.

Complex category $IP_{[-INTOP]}$ rule

```
IP[-INTOP] --> I'[-INTOP]: ^=!.
I'[-INTOP] --> (I)
               VP: ^=!.
```

Unlike the I'-rule, the daughters of the complex-category $I'_{[-INTOP]}$-rule do not contain an inner topic (see Dalrymple et al., 2019: 143 for complex categories). As will be discussed, an EC verb is forced to select for $IP_{[-INTOP]}$ as the category of its embedded clause, depriving its ability to host an inner-topic DP. As such, the only place for an inner topic is in the matrix clause. This setup is a reflection of the linguistic insight that EC implies a close relationship between the matrix and embedded clauses, making extraction into the matrix clause obligatory.

V'-rule & complex category $VP_{[+RESTR]}$

```
V' --> {AdvP: ! $ (^ADJUNCT);
        V': ^=!
       |V: ^=!;
        (DP: (^OBJ)=!)
        ({IP: (^{XCOMP: ~(-> RESTR); |COMP: ~(-> RESTR);})=!
          |IP[-INTOP]: (^XCOMP: ~(-> RESTR))=!
          |VP[+RESTR]:(^{XCOMP:(->RESTR);|COMP:(->RESTR);})=!
          }) }.
```

The V'-rule branches into two disjunctive options. The second disjunctive option contains three possible categories for the embedded complement: IP, $IP_{[-INTOP]}$, and $VP_{[+RESTR]}$. Each category corresponds to a grammatical function, whose f-structure is constrained by an off-path equation requiring the presence/absence of the attribute RESTR, [13] which is mnemonic for "restructuring". As will be discussed, RESTR is introduced by some constraints responsible for Aspect under Control. This feature interacts with the c-structural rule for selecting an appropriate category for the embedded complement. $VP_{[+RESTR]}$ is a complex category mnemonic for "restructured (or

[13] ~(-> RESTR) is a negative off-path constraint with the negation symbol "~".

non-clausal) VP", capturing the linguistic insight that Aspect under Control involves clausal restructuring at the c-structure level.

```
VP[+RESTR] --> V'[+RESTR]: ^=!.
V'[+RESTR] --> { AdvP: ! $ (^ADJUNCT);
                 V'[+RESTR]: ^=!
               | V: ^=!;
                (DP: (^OBJ)=!)}.
```

The (grand)daughters of the $VP_{[+RESTR]}$ node lack a projection for an inner topic.

4.1.2. Templates for f-descriptions:

```
EC-SUBJ(P) = (^PRED) = 'P<(^SUBJ)(^XCOMP)>'
             (^SUBJ) = (^XCOMP SUBJ).
PC-SUBJ(P) = (^PRED) = 'P<(^SUBJ)(^COMP)>'
             (^COMP SUBJ PRED) = 'PRO'.
EC-INTOP = (^XCOMP INTOP) = +
           @(CAT (^XCOMP) {IP[-INTOP] VP[+RESTR]}).
PC-INTOP = (^COMP INTOP) = +.
ASPECT-C-PERF = { (^{XCOMP|COMP} ASPECT) =c perfective
                  (^{XCOMP|COMP} RESTR)= +
                | (^{XCOMP|COMP} ASPECT) ~= perfective }.
ASPECT-C-EXP = { (^{XCOMP|COMP} ASPECT) =c experiential
                 (^{XCOMP|COMP} RESTR) = +
               | (^{XCOMP|COMP} ASPECT) ~= experiential}.
```

The use of templates captures correlational relations in a formal grammar. EC-SUBJ(P) is a template containing the constraints for modelling an EC verb as involving functional control (Bresnan, 1982), and PC-SUBJ(P) contain the constraints for representing PC as anaphoric control.[14] This formal setup captures the distinction between EC and PC verbs as functional vs anaphoric control. Both EC-INTOP and PC-INTOP assign the "bridging" feature <INTOP, +> to the clausal function of a matrix verb. The INTOP attribute is used in the off-path constraints for licensing Inner Topicalisation (see section 4.1.1). EC-InTop uses the CAT predicate[15] (Crouch et al., 2011) for enforcing categorical selection – one of the c-structural nodes corresponding to the XCOMP function must have the category $IP_{[-INTOP]}$ or $VP_{[+RESTR]}$. The (grand)daughters of $IP_{[-INTOP]}$ and $VP_{[+RESTR]}$ do not contain a projection for hosting an inner-topic DP. As such, the embedded complement of an EC verb cannot host an inner-topic DP. ASPECT-C-PERF and ASPECT-C-EXP contain constraints for Aspect under Control. The effects of the disjunctive options are implicational in nature

[14] Subscribing to Haug's (2013) view, partial control is modelled as quasi-obligatory anaphoric control, where the coreferential constraint is stated at the semantic level. Syntactically, a partial-control construction simply contains an embedded pronominal subject in the f-structure without any coreferential marking.

[15] @(CAT d categories) iff there is some n in phi-1(d) such that category(n) $ categories (Crouch et al., 2011).

{~P|Q}.[16] For instance, if a clausal function contains <ASPECT, experiential>, a restructuring feature RESTR is passed to the f-structure of the clausal function. This feature interacts with the V'-rule in section 4.1.1 for selecting the correct category of the embedded complement, which is $VP_{[+RESTR]}$.

4.1.3. Lexical entries:

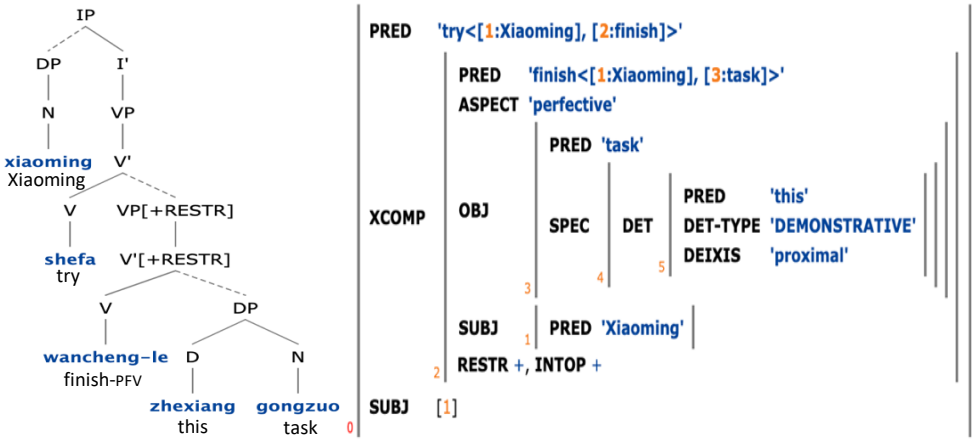
```
shefa V * @(EC-SUBJ try)      dasuan V *@(PC-SUBJ intend)
          @(EC-INTOP)                    @(PC-INTOP)
          @(ASPECT-C-PERF)               @(ASPECT-C-PERF)
          @(ASPECT-C-EXP).               @(ASPECT-C-EXP).

renwei V * @(VCOMP think).
```

These are the lexical entries of the EC verb *shefa* 'try', PC verb *dasuan* 'intend', and non-control verb *renwei* 'think'. Various templates are activated.[17]

4.2. Formal analysis of Aspect under Control

(16) was parsed using the formal grammar developed with the above constraints, giving c- and f-structures. The formal grammar was loaded by the XLE-web interface developed at the University of Konstanz.[18] For clarity, I have added the glosses under the terminal c-structural nodes.

(16) xiaoming shefa wancheng-**le** zhexiang gongzuo
Xiaoming try finish-PFV this task
'Xiaoming tried to finish this task.'



Functional control is involved with f-structural sharing between the matrix SUBJ and embedded SUBJ. In the f-structure, <ASPECT, perfective> is found

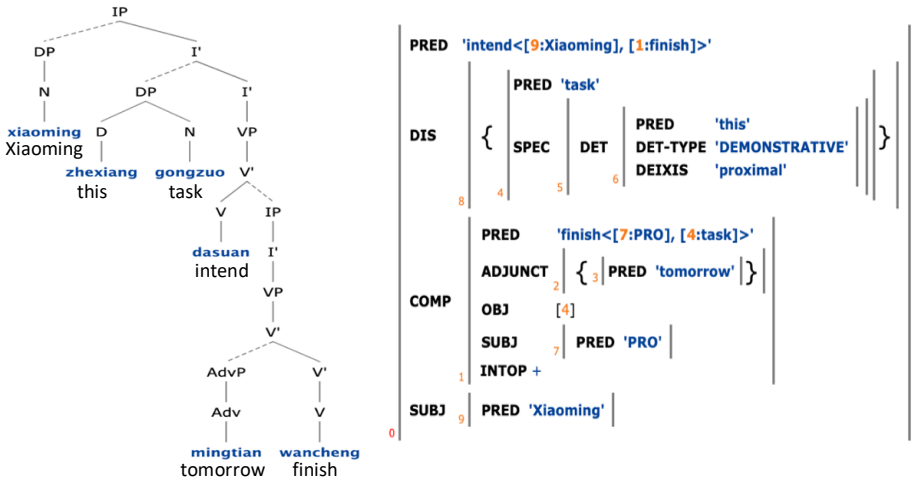
[16] See also Crouch et al. (2011) regarding how one may define implicational constraints on XLE.
[17] The temple VCOMP contains the subcategorisation constraint for a verb that selects for SUBJ and COMP functions.
[18] The XLE web interface from Konstanz is based on the XLE Web interface from INESS, which was programmed by Paul Meurer (see https://clarino.uib.no/iness/page?page-id=XLE-Web_Documentation).

inside XCOMP. This corresponds to my linguistic analysis that the perfective marker is associated with the embedded predicate rather than matrix predicate. There is a discrepancy between the c- and f-structures. In the c-structure, the embedded complement takes on the non-clausal complex category $VP_{[+RESTR]}$, indicative of restructuring; thus, mono-clausality. In the f-structure, the embedded complement bears the clausal function XCOMP; thus, bi-clausality.[19] This formal setup captures my linguistic analysis that Aspect under Control involves restructuring at one linguistic level but not another, corresponding to the bigger picture that clausehood is a multi-level notion.

4.3. Formal analysis of Inner Topicalisation

PC verbs allow the inner topic to appear either in the matrix or embedded clause, as displayed in (17) and (18). Non-control verbs disallow out-of-complement-clause extraction, implying – in a pre-theoretical sense – a rather "distant" relationship between matrix and embedded clauses. (19) shows – in line with my predictions – an error output from XLE when the inner topic is located in the matrix clause of a non-control construction. Formally, this is due to the lack of the "bridging" feature INTOP to license out-of-complement-clause extraction; as such, the complement clause is an unextractable "island".

(17) xiaoming <u>zhexiang gongzuo</u> dasuan mingtian wancheng ___
Xiaoming this task intend tomorrow finish
'Xiaoming intends to finish this task tomorrow.'

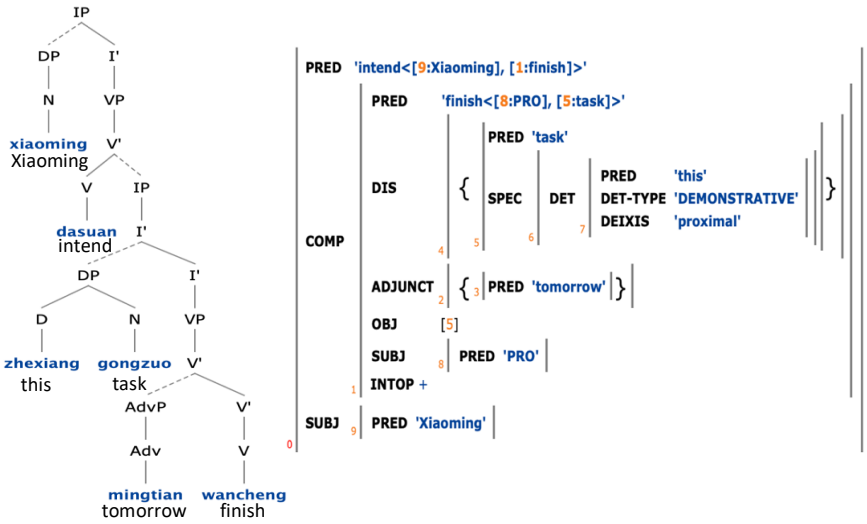


The f-structure in (17) shows a long-distance dependency relation between a member of the DIS set at the matrix-clause level and the embedded OBJ.

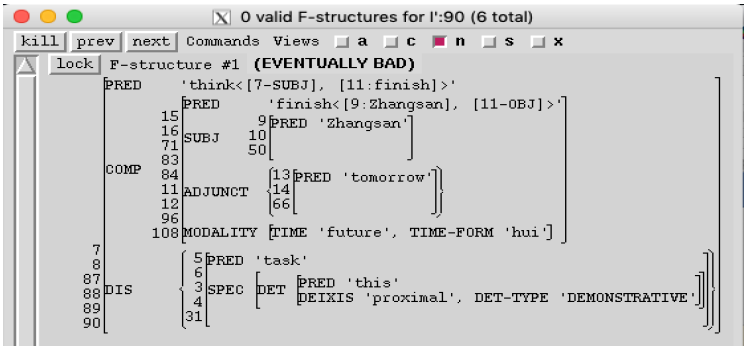
[19] As discussed above, <RESTR, +> inside the f-structure of XCOMP interacts with the functional annotation in the V'-rule (section 4.1.1) such that embedded complement must take on the non-clausal $VP_{[+RESTR]}$ category in the c-structure.

(18) xiaoming dasuan zhexiang gongzuo mingtian wancheng ___
Xiaoming intend this task tomorrow finish
'Xiaoming intends to finish this task tomorrow.'

The f-structure in (18) shows a long-distance dependency relation between a member of the DIS set at the embedded-clause level and the embedded OBJ.



(19) *xiaoming zhexiang gongzuo renwei zhangsan hui mingtian wancheng _
Xiaoming this task think Zhangsan will tomorrow finish
'Xiaoming thinks that Zhangsan will finish this task tomorrow.'

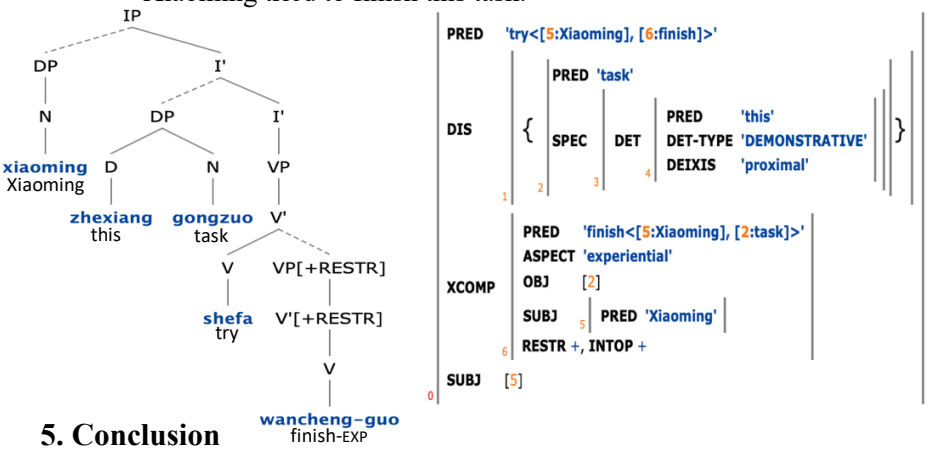


4.4. Interaction between Aspect under Control and Inner Topicalisation

Using an EC construction, (20) exemplifies both Aspect under Control and Inner Topicalisation.[20] Being able to parse (20) correctly means that the formal grammar is able to handle the complex interaction among constraints posited for control, complementation, Aspect under Control and Inner Topicalisation.

[20] Without Aspect under Control, the EC verb would select for the $IP_{[-INTOP]}$ category (via CAT predicate in section 4.1.2) as its embedded complement, which cannot host an inner topic. Due to the lack of space, I skipped the demonstration of this scenario.

(20) xiaoming zhexiang gongzuo shefa wancheng-guo
Xiaoming this task try finish-EXP
'Xiaoming tried to finish this task.'



5. Conclusion

This paper has examined various claims about Aspect under Control and Inner Topicalisation using linguistic diagnostics. It has been shown that the aspectual maker of an Aspect-under-Control construction is semantically associated with the embedded predicate rather than matrix predicate. The clausehood diagnostics have revealed restructuring effects at the phrase-structure level, but not at the functional level. That means, an Aspect-under-Control construction is mono-clausal at the phrase-structure level, but bi-clausal at the functional level. Regarding Inner Topicalisation, there are differences between EC vs PC vs non-control verbs in licencing the structural position of an inner topic. It has been shown that inner-topic constructions are bi-clausal at both phrase-structure and functional levels. That means, Inner Topicalisation should not be characterised as a restructuring phenomenon, counteracting recent proposals (e.g., Grano, 2015; N. Huang, 2018). Overall, this paper calls for a strong empirical foundation regarding claims of clausal restructuring, particularly the importance of employing independent clausehood diagnostics to verify clausal reduction at different linguistic levels. Without independent tests, the postulation of restructuring can lead to a misinterpretation of linguistic phenomena. This paper has provided LFG analyses for Aspect under Control and Inner Topicalisation. The analyses are computationally instantiated by XLE to safeguard the formal accuracy of the constraints and oversee their complex interaction. The fact that LFG analyses can be computationally implemented evidences the formally explicit nature of this grammatical theory.

References

Aissen, J., & Perlmutter, D. (1976). Clause reduction in Spanish. In H. Thompson (Ed.), *Proceedings of the Second Annual Meeting of the BLS* (pp. 1–30).

Bender, E. (2008). Grammar engineering for linguistic hypothesis testing. In *Proceedings of the Texas Linguistics Society X Conference: Computational Linguistics for Less-Studied Languages* (pp. 16–36). CSLI.
Bresnan, J., Asudeh, A., Toivonen, I., & Wechsler, S. (2015). *Lexical-Functional Syntax*. John Wiley & Sons.
Butt, M. (2014). Control vs. complex predication: Identifying non-finite complements. *Natural Language & Linguistic Theory*, *32*(1), 165–190.
Chappell, H. (2008). Variation in the grammaticalization of complementizers from verba dicendi in Sinitic languages. *Linguistic Typology*, *12*(1).
Chomsky, N. (1981). *Lectures on Government and Binding*. Foris Publications.
Crouch, D., Dalrymple, M., Kaplan, R. M., King, T. H., Maxwell, J., & Newman, P. (2011). *XLE Documentation*. Palo Alto Research Centre.
Dalrymple, M. (1993). *The Syntax of Anaphoric Binding*. CSLI.
Dalrymple, M. (2015). Obligatory nonlocal binding. *Natural Language & Linguistic Theory*, *33*(4), 1089–1120.
Dalrymple, M., Lowe, J. J., & Mycock, L. (2019). *The Oxford Reference Guide to Lexical Functional Grammar*. Oxford University Press.
Forst, M., & King, T. H. (to appear). Computational implementations and applications. In M. Dalrymple (Ed.), *The Handbook of Lexical Functional Grammar*. Language Science Press.
Grano, T. (2015). *Control and Restructuring* (Vol. 56). Oxford University Press.
Haug, D. (2013). Partial control and anaphoric control in LFG. In T. H. King (Ed.), *Proceedings of LFG13* (pp. 274–294). CSLI.
Hu, J., Pan, H., & Xu, L. (2001). Is there a finite vs. Nonfinite distinction in Chinese? *Linguistics*, *39*(6), 1117–1148.
Huang, C.-T. J. (1989). Pro-drop in Chinese: A generalized control theory. In *The null subject parameter* (pp. 185–214). Springer.
Huang, C.-T. J., Li, Y.-H. A., & Li, Y. (2009). *The Syntax of Chinese*. CUP.
Huang, N. (2018). Control complements in Mandarin Chinese: Implications for restructuring and the Chinese finiteness debate. *Journal of East Asian Linguistics*, *27*(4), 347–376.
Kaplan, R. M., & Zaenen, A. (1989). Long-distance dependencies, constituent structure, and functional uncertainty. In M. Baltin & A. Kroch (Eds.), *Alternative Conceptions of Phrase Structure* (pp. 17–42).
Lam, C. F. (2021). A constraint-based approach to anaphoric and logophoric binding in Mandarin Chinese and Cantonese. In M. Butt, J. Findlay, & I. Toivonen (Eds.), *Proceedings of the LFG'21 Conference* (pp. 202–222). CSLI.
Landau, I. (2000). *Elements of Control: Structure and Meaning in Infinitival Constructions*. Kluwer Academic Publishers.
Li, C. N., & Thompson, S. A. (1989). *Mandarin Chinese: A Functional Reference Grammar* (Vol. 3). University of California Press.
Li, Y.-H. A. (1990). *Order and constituency in Mandarin Chinese*. Kluwer Academic.
Paul, W. (2002). Sentence-internal topics in Mandarin Chinese: The case of object preposing. *Language and Linguistics*, *3*(4), 695–714.
Rizzi, L. (1978). A restructuring rule in Italian syntax. In S. Keyser (Ed.), *Recent Transformational Studies in European Languages* (pp. 113–158). MIT Press.
Wurmbrand, S. (2003). *Infinitives: Restructuring and Clause Structure*. DE GRUYTER.
Wurmbrand, S. (2015). Restructuring cross-linguistically. In T. Bui & D. Özyıldız (Eds.), *Proceedings of NELS 45*. University of Massachusetts.
Xu, L. (1985). Towards a lexical-thematic theory of control. *The Linguistic Review*, *5*(4), 345–376.
Zhang, N. N. (2016). Identifying Chinese dependent clauses in the forms of subjects. *Journal of East Asian Linguistics*, *25*(3), 275–311.