A constraint-based approach to anaphoric and logophoric binding in Mandarin Chinese and Cantonese

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Abstract

This paper proposes an LFG constraint-based approach to binding in Mandarin Chinese and Cantonese. We illustrate the power of LFG's f-structure in developing a formal model which is, in essence, a unifying proposal integrating syntactic anaphoric binding with pragmatically-rooted but grammaticised logophoric binding. The anaphoric-binding component of our model resolves the local binding of complex reflexives and that of simplex reflexives, whereas the logophoric-binding component handles the long-distance binding of simplex reflexives. Our view that Chinese binding is best explained by a dual system encompassing syntactic (anaphoric) and pragmatic (logophoric) aspects is in line with Huang and Liu (2001). While it is not easy for a syntactic theory to accommodate logophoric binding, the LFG formalism has a high degree of flexibility, allowing it to model both types of binding while maintaining its formal, mathematical rigour. Our constraint-based proposal offers an alternative binding theory in response to recent Minimalist proposals on Chinese binding (e.g., Giblin, 2016; Reuland, Wong & Everaert, 2020), opening up a cross-theoretical dialogue. We establish the notion of grammaticised logophoricity in Chinese binding in connection with crosslinguistic studies. Empirically, we examine a range of data to clarify properties of Chinese reflexives and settle past debates, in particular, the animacy debate in relation to typological research on adnominal possession. The comparison between Mandarin Chinese and Cantonese contributes to the comparative study of binding phenomena in Sinitic languages.

1 Introduction[1]

Chinese anaphora has continued to fascinate linguists despite decades of research (e.g., Tang, 1989; Huang & Tang, 1991; Xue, Pollard & Sag, 1994; Cole & Wang, 1996; Huang & Liu, 2001; Pan & Hu, 2003; Giblin, 2016; Charnavel, Huang, Cole, & Hermon, 2017; Charnavel & Y.-J. Huang, 2018; Sperlich, 2019; Reuland, Wong, & Everaert, 2020). One of the most intriguing aspects is the reflexive *ziji*, whose long-distance (LD) binding seems to be elusive to the locality requirement of anaphoric binding (Chomsky, 1981).

Past research on the LD binding of *ziji* can be broadly divided into two perspectives: (derivational) syntax-based approaches (e.g., feature-agreement systems by Tang, 1989; Huang & Tang, 1991; Giblin, 2016; Reuland et al., 2020) vs discourse-functional approaches (e.g., self-ascription theory by Pan, 1997; neo-Gricean pragmatic theory by Y. Huang, 2016). Each of these studies seems to explain a part of the overall picture. There is also a predominant focus on Mandarin Chinese, leaving other Chinese varieties seldom discussed. To resolve issues of Chinese anaphora, what we need, perhaps, is a unifying proposal that: i) considers insights from both syntactic and functional perspectives; ii) provides a formal, explicit system that explains the binding of different pronouns (not just *ziji*); and iii) considers more Chinese varieties.

This paper focuses on the binding properties of four 3rd person singular Mandarin Chinese (MC) and Cantonese (CC) reflexives. Like other pronouns in MC and CC, their spoken forms do not express distinction in gender.

	Complex reflexive	Simplex reflexive
Mandarin Chinese (MC)	*taziji*	*ziji*
Cantonese (CC)	*keuhjihgei*	*jihgei*

We argue that LFG's f-structure provides the formal environment for a unifying proposal integrating syntactic anaphoric binding as well as pragmatically-rooted but grammaticised logophoric binding. For anaphoric binding, we demonstrate that MC and CC do not uphold the widely assumed f-commanding relation between the antecedent and anaphor (Dalrymple, 1993, 2015); nor are the binding patterns captured by the four binding domains (Co-argument Domain, Minimal Complete Nucleus, Minimal Finite Domain, Root Domain) LFG posits for typologically diverse languages (Dalrymple, 1993, 2015). For logophoric binding, we expand on Dalrymple's (2015) proposal as we develop constraints to differentiate the various types of logophoric binding in regard to Sells's (1987) logophoric taxonomy, which has been shown to be valuable to binding in Sinitic languages (see Cole et al., 2001).

2 Properties of MC & CC reflexives

2.1 Grammatical functions and basic patterns (local vs LD binding)
The complex reflexives *taziji* (MC) and *keujihgei* (CC) are locally bound: in (1a), *taziji* is bound by *Lisi* rather than *Zhangsan*; likewise, in (1b), *keujihgei* is bound by *Gafai* instead of *Amihng*.

(1) a. zhangsan$_i$ shuo [lisi$_j$ changchang biaoyang **taziji**$_{*i/j}$]
Zhangsan say Lisi always praise C.SELF[2]
'Zhangsan says that Lisi always praises himself.' (MC)
b. amihng$_i$ wah [gafai$_j$ sihngyaht jaan **keuihjihgei**$_{*i/j}$]
Amihng say Gafai always praise C.SELF
'Amihng says that Gafai always praises himself.' (CC)

We will discuss the formal constraint capturing the local-binding relation in section 5. In comparison, the simplex reflexives *ziji* (MC) and *jihgei* (CC) are subject to both local and LD binding: in (2a), *ziji* is bound by *Lisi* or *Zhangsan*, depending on the context; a similar situation applies to *jihgei* in (2b).

(2) a. zhangsan$_i$ shuo [lisi$_j$ changchang biaoyang **ziji**$_{i/j}$]
Zhangsan say Lisi always praise SELF
'Zhangsan says that Lisi always praises him(self).' (MC)
b. amihng$_i$ wah [gafai$_j$ sihngyaht jaan **jihgei**$_{i/j}$]
Amihng say Gafai always praise SELF
'Amihng says that Gafai always praises him(self).' (CC)

All four reflexives can be assigned the grammatical functions (GFs) of OBJ, OBJ$_\theta$, OBL$_\theta$, (embedded) SUBJ or POSS.[3] When functioning as (embedded) SUBJ

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[2] In this paper, we gloss simplex reflexives as SELF and complex reflexives as C.SELF.
[3] The simplex reflexives, *ziji* and *jihgei*, can also be used as adverbials with the meaning of "by oneself". Our analysis will not cover this usage.

or POSS, the reflexive is bound by potential antecedent(s) in higher clause(s), meanwhile observing its local or LD binding properties:

(3) a. zhangsan$_i$ shuo lisi$_j$ renwei [**ziji**$_{i/j}$/**taziji**$_{*i/j}$-de pengyou hen qinfen]
    Zhangsan say Lisi think   SELF-POSS   friend   very be.diligent
    'Zhangsan says Lisi thinks his friend is very diligent.'   (MC)

  b. amihng$_i$ wah gafai$_j$ yihngwaih [**jihgei**$_{i/j}$/**keuihjihgei**$_{*i/j}$-ge pahngyauh
    Amihng say Gafai think   SELF/C.SELF-POSS   friend
    hou kahnlihk]
    very diligent
    'Amihng says that Gafai thinks his friend is very diligent.'   (CC)

2.2 Animate-antecedent controversy

Past studies debate whether the antecedent of MC *ziji* and *taziji* must be animate: see Tang (1989), Huang & Liu (2001) and Huang et al. (2009) for affirmative views; Pan (1997) and Charnavel & Y.-J Huang (2018) for negative views. We have observed the following tendencies.

First, when the reflexive bears a non-POSS function, such as OBJ in (1a), it needs to be bound by an animate antecedent. While the reason for this animacy requirement is not entirely transparent, we conjecture that it is related to the common observation that the syntax of particular constructions correlates with certain semantic meanings; in this case, an object-*(ta)ziji* 'self' construction in general denotes an agent-patient relation with a shared identity between the agent and patient such that the agent performs a certain action on themselves. The notion of "agenthood" often correlates with the concept of "volition", with the prototypical agent being an entity with a high level of volition (see e.g., Jackendoff, 1990 on thematic roles); thus, the prototypical agent is an animate entity. The shared identity between the agent and patient enforced by an object-*(ta)ziji* 'self' construction would in turn entail that the patient is an animate entity. We believe this syntax-semantics correlate has misled some studies to posit that *(ta)ziji* is inherently animate (e.g., Tang, 1989). We will see that this is not an accurate postulation. Before that, we shall point out that our analysis does not aim to account for cases of personification, such as (4), where *(ta)ziji* refers to an entity which is construed to be animate only in metaphorical usage:

(4) yueliang$_i$ na   wuyun   lai   zhegai **(ta)ziji**$_i$
    moon   take dark.cloud come cover (C.)SELF
'The moon covered herself with dark clouds.' (MC; adapting Tang, 1989: 96)

On the other hand, when the reflexive bears a POSS function, it can encode a range of relationships commonly attested in the typology of adnominal possession (e.g., Koptjevskaja-Tamm, 2002; Haspelmath, 2017). They include ownership, body-part, kinship, part-whole relations, etc. We have observed that while most types of POSS reflexives require animate antecedents – in particular those encoding ownership, body-part, and kinship relations – POSS reflexives expressing part-whole relations (e.g., possessed quality)[4] can be bound by an inanimate antecedent, such as (5):

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[4] The type of part-whole relations we focus on is the possessed quality type. Although in the typological literature, body-part relations (e.g., *my hand*) are sometimes classified as a subtype of part-whole relations, we make a distinction between them in this paper.

(5) a. [[zhangsan$_i$ zhizuo de] mei-zhang shuqian]$_j$ dou you
       Zhangsan make   DE every-CL   bookmark all   have
       (ta)ziji$_{*i/j}$-(de)   dute   de xingzhuang
       (C.)SELF-(POSS)   unique DE shape
     'Every bookmark that Zhangsan made has its unique shape.'   (MC)
   b. gongqiao   zai shuimianshang touxia **(ta)ziji**-de   daoying
      arch.bridge on water.surface cast   (C.)SELF-POSS shadow
      'The arch bridge casts its shadow on the water surface'

                                        (MC; adapted from Pan, 1997: 12)

In (5a), *(ta)ziji* relates *xingzhuang* 'shape' (part) to its inanimate antecedent *shuqian* 'bookmark' (whole). In (5b), we assume that *gongqiao* 'arch bridge' and its own shadow form a part-whole relation in a broader sense. The use of *(ta)ziji* in part-whole adnominal possession constitutes an important counterexample to the postulation that *(ta)ziji* is inherently animate.

The above generalisations are extended to the CC reflexives *jihgei* and *keuhjihgei*. We skip the data here. In section 5, we assume that the different semantic notions expressed by constructions of POSS (part-whole), POSS (non-part-whole) and non-POSS reflexives are grammaticalised such that POSS (part-whole) reflexives obey different syntactic constraints from the other reflexives.

2.3 Subject orientation
We concur with most past studies that MC reflexives *taziji* and *ziji* need to be bound by SUBJ antecedents (e.g., see Huang et al., 2009):[5]

(6) a. zhangsan$_i$ song (gei) lisi$_j$ yi-zhang **(ta)ziji**$_{i/*j}$-de   xiangpian
       Zhangsan give to Lisi one-CL (C.)SELF-POSS picture
       'Zhangsan gives Lisi a picture of himself.'
                                        (MC; Charnavel et al., 2017: 2341)
   b. zhangsan$_i$ [cong lisi$_j$ chu]   tingshuo wangwu$_k$ bu xihuan **ziji**$_{i/*j/k}$
      Zhangsan [from Lisi place] hear   Wangwu not like   SELF
      'Zhangsan heard from Lisi that Wangwu did not like him/himself.'
                                        (MC; Pollard & Xue, 1998: 296)
   c. zhangsan$_i$ gaosu lisi$_j$ **taziji**$_{i/*j}$-de   shenshi
      Zhangsan tell   Lisi C.SELF-POSS life.story
    'Zhangsan told Lisi the story of his life.' (MC; Huang & Tang, 1991: 282)

On the other hand, it has been found that the Cantonese complex reflexive *keuhjihgei* is not subject-oriented, even though subject-orientation holds for the simplex reflexive *jihgei* (see Matthews & Yip, 2013; Yip & Tang, 1998):

(7) amihng$_i$ bei-jo   gafai$_j$ yat-jeung {**keuhjihgei**$_{i/j}$/**jihgei**$_{i/*j}$}-ge   seung
    Amihng give-PFV Gafai one-CL   C.SELF/SELF-POSS   photo
    'Amihng has given Gafai a photo of himself.'   (CC)

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[5] Some studies explore the possibility of interpreting subject orientation as c-command orientation; in other words, a configurational rather than grammatical-relation concept. They often use BA constructions to discuss the possibility (e.g., Charnavel et al., 2017). However, this treatment would not explain why in double-object constructions, e.g., (6a) and (6c), where both subject and object c-command the reflexive, the antecedent is the subject but not the object. We maintain the view that subject orientation should be interpreted as a grammatical-relation concept and the idiosyncrasy of BA constructions awaits further investigation.

2.4   LD binding and blocking effects

It is well-known that the LD binding of *ziji* is susceptible to a range of blocking effects, which prevent it from being bound by a potentially available antecedent. This section summarises a few blocking effects in the literature.

First, it has been observed that an intervening 1st or 2nd person pronoun blocks a 3rd-person NP from being LD bound by *ziji* (see e.g., Tang, 1989). In (8), *Zhangsan* is blocked by *wo/ni* 'I/you' from being an LD antecedent of *ziji*:

(8) zhangsan$_i$ juede wo/ni$_j$ dui **ziji**$_{*i/j}$ mei xinxin
    Zhangsan feel   I/you to SELF no confidence
    'Zhangsan feels that I/you have no confidence in myself/yourself.'

$\hspace{6cm}$ (MC; Tang, 1989: 108)

As shown below, the 1st or 2nd person pronoun does not need to be a SUBJ to cause the blocking (see e.g., Xue et al., 1994; Huang & Tang, 1991):

(9) zhangsan$_i$ gaosu wo$_j$ [lisi$_k$ dui **ziji**$_{*i/*j/k}$ mei xinxin]
    Zhangsan tell   me Lisi to SELF   no confidence
    'Zhangsan told me that Lisi has no confidence in himself.' $\hspace{1cm}$ (MC)

On the other hand, a 3rd person NP does not block the LD binding of a 1st or 2nd person NP (see e.g., Xu, 1993). This contrast is known as "person asymmetry" of blocking effects.

(10) wo$_i$ juede zhangsan$_j$ hui taoyan **ziji**$_{i/j}$
      I   feel Zhangsan will hate   SELF
      'I feel that Zhangsan will hate me/himself.' $\hspace{2.5cm}$ (MC)

When more than one instance of *ziji* is in the sentence, a potential LD antecedent of *ziji* blocks another potential LD antecedent further away (see e.g., Pan, 2001):

(11) John$_i$ renwei Bill$_j$ zhidao Mark$_k$ ba **ziji**1-de   shu   jiegei-le
     John think Bill know Mark BA SELF-POSS book lend-PFV
     ziji2-de   pengyou
     SELF-POSS friend
     'John thinks Bill knows Mark lends self's book to self's friends.'

$\hspace{6cm}$ (MC; Pan, 2001: 303-304)

The available readings include (a) to (g), whereas (h) and (i) are unavailable:
(a) ziji1 = ziji2 = John; (b) ziji1 = ziji2 = Bill; (c) ziji1 = ziji2 = Mark
(d) ziji1 = Mark; ziji2 = Bill; (e) ziji1 = Mark; ziji2 = John;
(f) ziji1 = John; ziji2 = Mark (g) ziji1 = Bill; ziji2 = Mark;
*(h) ziji1 = John; ziji2 = Bill; *(i) ziji1 = Bill; ziji2 = John

It has been reported that the deictical use of a 3rd person NP causes blocking (see e.g., Huang & Liu, 2001):

(12) zhangsan$_i$ shuo ta$_j$[deictical use] qipian-le   **ziji**$_{*i/j}$
     Zhangsan say he   deceive-PFV SELF
  'Zhangsan says that he has deceived himself.' (MC; Huang & Liu, 2001: 147)

We have observed that the LD binding of CC *jihgei* is also susceptible to the above blocking effects. On the contrary, no blocking effects have been

observed for locally-bound *ziji* and *jihgei*. For instance, (13) shows that the 1st/2nd person NP blocking effect does not appear for locally-bound *ziji* and *jihgei* (see also Huang & Liu 2001):[6]

(13) a. zhangsan$_i$ gaosu wo **ziji**$_i$-de mimi
     Zhangsan tell I SELF-POSS secret
     'Zhangsan told me about his secret.' (MC)
  b. amihng$_i$ tuhng ngoh gong **jihgei**$_i$-ge beimaht
     Amihng to I tell SELF-POSS secret
     'Amihng told me about his secret.' (CC)

The contrast between LD- and locally-bound simplex reflexives in terms of the availability of blocking effects seems to suggest they involve different binding mechanisms. We will argue that this hypothesis is on the right track.

3 Past proposals on LD binding

Past studies centre on the binding behaviour of *ziji*. Early studies include syntactic proposals leveraging movement-based feature-agreement mechanisms: e.g., Tang (1989), Cole and Wang (1996), Huang and Tang (1991). According to these proposals, LD binding involves successive-cyclic steps of movement in LF, each forming a local binding, satisfying Principle A. The blocking effects are explained by feature agreement: during movement, traces left by *ziji* must agree with their local subject; thereby, all subjects, local and non-local, agree with *ziji* in person and number. However, the LF-movement account suffers empirical problems since there are observations which cannot be explained by feature agreement alone, such as person asymmetry, deictical blocking, and blocking by another LD antecedent.

The shortcomings of the feature-agreement proposals called for alternative accounts from a discourse-functional perspective. Huang and Liu (2001) proposed a dual system which views locally-bound *ziji* as a syntactic anaphor, conforming to Principle A, and analyses LD-bound *ziji* as a logophor to "designate the individual [...] whose speech, thoughts, feelings, or general state of consciousness are reported" (Clements, 1975: 141). The antecedent of an LD-bound *ziji* is considered the "speaker" or "virtual speaker" (e.g., thinker, feeler, knower, experiencer) of the complement clause where the reflexive is found. The blocking effects are explained functionally as effects of a perceptual strategy to avoid perspective conflicts. For details on how all the blocking effects can be explained by this perceptual strategy, please refer to Huang and Liu (2001: 161–165). As a summary, the blocking effect of a 1st/2nd person pronoun, e.g., (8), is induced because the 1st/2nd person pronoun anchors the perspective to the external speaker/addressee, while *ziji* as a logophor designates the perspective of the internal speaker (i.e., matrix subject). Consequently, there is a perspective conflict, blocking LD binding. In comparison, when the matrix subject is a 1st/2nd person pronoun, as in (10), it anchors the perspective to that of the external speaker, but in this case *ziji* as a

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[6] If the blocking effects were in place, we would expect the interpretations of *ziji*$_i$ (MC) and *jihgei*$_i$ (CC) to be unavailable (see (9)); in other words, the speaker would have to use non-reflexive *ta* (MC) or *keuih* (CC) to refer to the matrix subject. The fact that *ziji*$_i$ and *jihgei*$_i$ are available readings entails that there is no blocking effect.

logophor also refers to this external speaker; in other words, there is no perspective conflict. The deictical blocking in (12) is similarly explained by how the deictical NP is anchored to the perspective of the external speaker; thus, the LD binding of *ziji* by the internal speaker *Zhangsan* is ruled out. The blocking by another LD antecedent in (11) is likewise accounted for as an effort to avoid conflicting perspectives caused by different logophoric *ziji* which anchors the utterance to varying perspectives.

Huang and Liu (2001: 156) provide a logophoric theory incorporating Sells's (1987) taxonomy which classifies the antecedents of logophors into three primitive roles: SOURCE (the intentional agent of the communication), SELF (the one whose mental state or attitude the proposition describes), and PIVOT (the one with respect to whose time-space location the content of the proposition is evaluated). They explore the possibility that these roles can be reduced to the notion of *de se* in the sense of Chierchia (1989) with the assumption that SOURCE and SELF satisfy a stronger *de se* requirement than PIVOT since it is observed that PIVOT can be licensed once the external speaker takes the perspective or empathises with the internal protagonist (see also Cole et al., 2001; Pan, 2001). Sells's classification has a useful application in capturing variations among Sinitic languages, as we will see in section 5 that LD binding in CC must be licensed by SOURCE or SELF, but not PIVOT.

Huang and Liu's proposal seems to provide a more satisfactory account for LD binding compared to earlier studies. They hypothesise that logophoricity can be integrated into syntax by postulating SourceP, SelfP, and PivotP as CP-type functional phrases in LF representations. However, from a theory-internal perspective, as admitted by Huang and Liu (2001: 178), their formalism of LF syntax does not in itself capture the blocking effects. From the present perspective, as remarked by Sperlich (2019: 23), Huang and Liu's machinery is not supported by current Minimalist theory.

Recent Minimalist studies on Chinese anaphora have regained interest in agreement-based proposals, amid crosslinguistic proposals (e.g., Reuland, 2011) which posit Agree to be the main machinery in binding relations while abandoning Principle A. One of these proposals is Giblin's (2016) Agree-based account of LD *ziji*. Giblin analyses *ziji* to be ϕ-feature deficient and syntactically bound using the mechanism of Contiguous Agree. This system can explain blocking caused by unmatched person values, e.g., (8). Reuland et al. (2020) also incorporate Giblin's agreement system in their proposal. However, like the earlier proposals leveraging movement-based agreement, Giblin's agreement-based account is not sufficient in explaining the wide range of blocking effects, especially those unrelated to issues of feature agreement.

After reviewing the above proposals, we conclude that agreement-based accounts for LD binding suffer empirical problems, and despite the inadequacies of Huang and Liu (2001), a logophoric account is preferred based on empirical considerations. Although one may argue that it is possible to produce a nonuniform proposal for LD binding embracing both agreement and logophoric accounts, as Giblin (2016) suggests, we question, by Occam's razor, why it is necessary to introduce an additional agreement system if a logophoric account is already sufficient. We will devise an LFG proposal where LD binding is explained logophorically. We will discuss how the

(grammaticised) notions of SOURCE, SELF, and PIVOT are formally introduced into our syntactic structure (f-structure) in a mathematically well-defined manner as well as how our system can potentially capture blocking effects by suspension of logophoric constraints, which cannot be modelled in Huang and Liu's (2001) LF syntax.

4   Grammaticised logophoricity

In the following sections, we will present our LFG binding system, where we preserve the insight of Huang and Liu (2001) that LD binding in MC is logophoric binding.[7] We shall extend their insight to explore how a logophoric reflexive is formally bound in its logophoric domain[8] which is created by a logocentric predicate.[9] Before that, we shall address one more issue: do MC and CC demonstrate "pure" logophoricity or "grammaticised" logophoricity?

Logophoricity is in itself a pragmatic concept. Cross-linguistically, languages exhibit varying degrees of logophoricity. According to Culy (1994), pure logophoric languages are those containing special morphological and/or syntactic forms employed only in logophoric domains. For example, the logophoric pronouns in Babungo are to be used only in logophoric domains but not in other contexts. They are considered "true" logophoric pronouns and Babungo is regarded as a pure logophoric language. On the other hand, as discussed by Huang and Liu (2001), the local binding of *ziji* is unrelated to logophoricity. From this perspective, the logophoric use of *ziji* in LD binding is an extended use of the reflexive. Neither are *ziji* and *jihgei* "true" logophoric pronouns on a par with Babungo's logophoric pronouns, nor are MC and CC pure logophoric languages. In fact, Culy (1994) observes that while many languages show degrees of logophoricity, pure logophoric languages are only found in Africa.

We argue MC and CC exhibit grammaticised logophoricity. To elaborate, we build on Dalrymple's (2015) argumentation in her study of Yag Dii where she holds that Yag Dii exhibits grammaticised logophoricity. She argues, citing Clements (1975: 141), that the antecedent of a "true" logophoric pronoun is the individual "whose speech, thoughts, feelings, or general state of consciousness are reported" (see also Sells, 1987); in other words, the antecedent is identified by semantic/pragmatic means, not syntactically. Therefore, if one finds that the identification of a logophoric antecedent has syntactic requirements, one can conclude that the language displays grammaticised logophoricity in contrast to pure logophoricity. One of the important pieces of evidence Dalrymple provides for Yag Dii is that the antecedent of a BI (logophoric) pronoun must be a syntactic SUBJ. Therefore, Yag Dii demonstrates grammaticised logophoricity. As mentioned earlier, the antecedent of *ziji* (MC) and *jihgei* (CC) also has a SUBJ requirement, as shown

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[7] We will extend this mechanism to the LD binding in CC.

[8] Following Y. Huang (2000: 183), the concept of "logophoric domain" can be defined pragmatically or syntactically. Pragmatically, a logophoric domain is a stretch of discourse where the perspective of the internal protagonist is being represented. Syntactically, a logophoric domain begins in a clause subordinate to the one where the logophoric antecedent is identified.

[9] Y. Huang (2000: 184) explains that there are two common forms of "logocentric licensers": (i) logocentric predicates (ii) logocentric complementizers. We discuss in section 5 the types of logocentric predicates assumed in MC and CC, but logocentric complementizers are not found in these languages.

in (6) and (7). Based on this evidence, we conclude that MC and CC show grammaticised logophoricity. In fact, as remarked by Dalrymple, this kind of SUBJ requirement is commonly found among (partially) grammaticised logophoric systems, including Icelandic (Bresnan, 2016; Sells, 1987):

(14) *Eg heyrði fra   Joni$_i$ að   Maria hefði   boðið   **ser**$_i$
      I   heard from John that Maria had-SBJN invited him
      'I heard from John that Maria had invited him (John).'(Maling, 1984: 233)

Bresnan (2016: 266) attributes the ungrammaticality of (14) to the violation of the SUBJ requirement that applies to the logophor *ser*. We can contrast the grammaticised logophoric systems of MC/CC, Yag Dii, and Icelandic with the pure logophoric system of Ewe where there is no SUBJ requirement:

(15) Kɔmi   xɔ agbale tso Kofi$_i$ gabɔ be wo-a-va   me kpe na **ye**$_i$
      Kwami get letter from Kofi side that PRO-T-come cast block for LOG
      'Kwami got a letter from Kofi$_i$ saying that he should come cast blocks for
      him$_i$.'   (Clements, 1975: 160)

  The observation that logophoric binding in MC and CC is a grammaticised one has important implications on how we formalise the binding. Since the antecedent cannot be defined in purely pragmatic terms, at least some of the logophoric constraints need to be stated for the syntactic structure (f-structure).

5   Our LFG constraint-based binding system

We analyse LD-bound *ziji* and *jihgei* as grammaticised logophors. Both are subject to the same blocking effects. Conversely, we have not observed blocking effects for locally-bound *ziji* and *jihgei*, and neither do they need to comply with any *de se* requirements. We agree with Huang and Liu (2001) that the local binding of *ziji* (and *jihgei*) should be modelled differently from LD binding. Our constraint-based binding system contains two key components:

Component 1: Anaphoric Binding
- Local binding of complex reflexives – *taziji* (MC) and *keuhjihgei* (CC)
- Local binding of simplex reflexives – *ziji* (MC) and *jihgei* (CC)
Component 2: Logophoric Binding
- LD binding of simplex reflexives – *ziji* (MC) and *jihgei* (CC)

As a preview, in (16), we provide a schematic overview of the lexical entries of the reflexives. It illustrates how we organise the constraints for anaphoric binding and different types logophoric binding, namely SOURCE-binding, SELF-binding, PIVOT-binding, and binding by the discourse speaker. *Ziji* and *jihgei* contain constraints for both anaphoric and logophoric binding organised in a disjunctive manner, whereas *taziji* and *keuhjihgei* are only capable of anaphoric binding. We use 'REFL-PRO' as the semantic form of an anaphoric reflexive, and 'LOG-PRO' as that of a logophoric reflexive. Later, our anaphoric binding constraints will use the FN attribute (Dalrymple et al., 2019: 154) to refer to this semantic form as we delimit the binding domain.[10]

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[10] A common LFG notation for reflexives is to use 'PRO' as the PRED value together with the attribute-value pair <PRONTYPE, REFL> (see e.g., Dalrymple et al., 2019).

(16) Schematic overview of the lexical entries of the reflexives:

Lexical entry of *taziji* (MC):	**Lexical entry of *ziji* (MC):**	**Lexical entry of *jihgei* (CC):**
($\uparrow$PRED) = 'REFL-PRO' *Constraints for anaphoric binding*	{ ($\uparrow$PRED) = 'REFL-PRO' *Constraints for anaphoric binding (local-binding)* | ($\uparrow$PRED) = 'LOG-PRO'	{ ($\uparrow$PRED) = 'REFL-PRO' *Constraints for anaphoric binding (local-binding)* | ($\uparrow$PRED) = 'LOG-PRO'
Lexical entry of *keuhjihgei* (CC): ($\uparrow$PRED) = 'REFL-PRO' *Constraints for anaphoric binding*	{*Constraints for SOURCE-/SELF-binding* | *Constraints for PIVOT-binding* | *Constraints for reference to discourse speaker* }}	{*Constraints for SOURCE-/SELF-binding* | *Constraints for reference to discourse speaker* }}

5.1 Anaphoric-binding component: local binding

LFG assumes that binding relations are stated in f-structural terms, and posits that binding requirements should be specified lexically instead of on a language-by-language or universal basis. (17) is the general equation of anaphoric-binding, adapted from Dalrymple (1993, 2015), to be included in the lexical entries of the reflexives.

(17) $\qquad$ ($\uparrow_\sigma$ ANT) = ((GF* GF$_{pro}$ $\uparrow$) ANTE)$_\sigma$
$\qquad\qquad\qquad\qquad$ OFFPATH

$\uparrow$ is the f-structure of the reflexive, $\uparrow_\sigma$ is the semantic structure corresponding to $\uparrow$, and ($\uparrow_\sigma$ ANT) refers to the antecedent. (GF* GF$_{pro}$ $\uparrow$) is an inside-out path reaching the binding domain within which the antecedent is found. LFG assumes that the antecedent f-commands the reflexive (Dalrymple, 1993). We will see that this does not hold for MC and CC. ANTE is an outside-in path from the binding domain encoded by (GF* GF$_{pro}$ $\uparrow$) to the antecedent. The binding domain is delimited by the off-path constraint OFFPATH acting on the path GF* to limit the reflexive's search for an antecedent. Cross-linguistically, there are four common binding domains (Dalrymple, 1993): Co-argument Domain, Minimal Complete Nucleus, Minimal Finite Domain, and Root Domain. We will see that they do not capture binding in MC and CC. Given the equation (17), our task is to derive ANTE and OFFPATH for the reflexives in MC and CC. We have identified four characteristics that are important for deriving ANTE and OFFPATH:

i. Does the antecedent need to be a SUBJ? (Section 2.3)
ii. Can the antecedent be further embedded within an f-commanding GF?
iii. Is there any animacy restriction on the antecedent? (Section 2.2)
iv. If the answer to (iii) is "yes", does the animacy restriction of the antecedent have any implications on the binding domain?

Our discussion below will focus on *taziji*. We will discuss how the constraints of *taziji* can be adapted for *keuhjihgei* and the local binding of *ziji* and *jihgei*.

5.1.1 Constraints for reflexives taking non-POSS functions

As discussed in section 2.2, when the reflexive bears a non-POSS function, it has to be bound by an animate antecedent. In other words, there is animacy restriction on the antecedent. Moreover, the antecedent can be further embedded within a f-commanding GF. (18) contains examples of *(ta)ziji*

adapted from Tang (1989: 100). As discussed in section 2.3, *(ta)ziji* is SUBJ-oriented. The antecedent of *(ta)ziji* can be further embedded within SUBJ:

(18) a. [[zhangsan$_i$-de   baba$_j$-de] aoman]$_k$ hai-le   **(ta)ziji**$_{*i/j/*k}$
     Zhangsan-POSS dad-POSS arrogance   harm-PFV (C.)SELF
     'The arrogance of Zhangsan's dad has harmed himself.'   (MC)
   b. [zhangsan$_i$ nayan   zuo]$_j$ dui **(ta)ziji**$_{i/*j}$ bu   li
     Zhangsan that.way do   to (C.)SELF   not advantageous
     'That Zhangsan behaved in such a manner did him no good.'   (MC)
   c. [zhangsan$_i$ zuoshi   xiaoxin de taidu]$_j$ jiu-le   **(ta)ziji**$_{i/*j}$
     Zhangsan do.thing careful DE attitude   save-PFV (C.)SELF
     'Zhangsan's cautious attitude saved him.'   (MC)

The ANTE path for (18a) is [SUBJ POSS], for (18b) is [SUBJ SUBJ], and for (18c) [SUBJ ADJ ∈ SUBJ]. We generalise the ANTE path for *(ta)ziji* to be (19), where we have added animacy restrictions on the GF along the ANTE path:

(19) ANTE_(TA)ZIJI ≡
{   SUBJ | SUBJ   POSS | SUBJ   SUBJ | SUBJ   ADJ∈   SUBJ   }
(→ANIMATE) =c +   (→ANIMATE) =c − (→ANIMATE) = c +   (→ANIMATE) = c + (→ANIMATE) = c −   (→ANIMATE) = c +

Because the antecedent can be embedded within SUBJ, it does not need to f-command the reflexive. In CC, these patterns are also observed for *keuhjihgei* and locally-bound *jihgei*. Nevertheless, *keuhjihgei* is not SUBJ-oriented. Therefore, while the ANTE path for the locally-bound *jihgei* is the same as MC *(ta)ziji*, we have removed the SUBJ requirement for *keuhjihgei*:

(20) a. **ANTE_(TA)ZIJI_JIHGEI** ≡
{   SUBJ | SUBJ   POSS | SUBJ   SUBJ | SUBJ   ADJ∈   SUBJ   }
(→ANIMATE) =c +   (→ANIMATE) =c − (→ANIMATE) = c +   (→ANIMATE) = c + (→ANIMATE) = c −   (→ANIMATE) = c +
    b. **ANTE_KEUHJIHGEI** ≡
{   GF | GF   POSS | GF   SUBJ | GF   ADJ∈   SUBJ   }
(→ANIMATE) =c +   (→ANIMATE) =c − (→ANIMATE) = c +   (→ANIMATE) = c + (→ANIMATE) = c −   (→ANIMATE) = c +

We now derive the off-path constraint OFFPATH for *taziji*. First, non-POSS *taziji* must be bound by the "closest" animate antecedent (see section 2):

(21) a. zhangsan$_i$ shuo [lisi$_j$ renwei [wangwu$_k$ zeguai **taziji**$_{*i/*j/k}$]]
     Zhangsan say   Lisi think   Wangwu blame   C.SELF
     'Zhangsan says Lisi thinks Wangwu blames himself.'   (MC)
   b. zhangsan$_i$ shuo [lisi$_j$ renwei [**taziji**$_{*i/j}$ hen   qinfen]]
     Zhangsan say   Lisi think   C.SELF   very   be.diligent
     'Zhangsan says Lisi thinks he is very diligent.'   (MC)

The binding domain for (21a) is the f-structure (OBJ↑) and that for (21b) is (COMP SUBJ↑). With *taziji* being an embedded SUBJ, the Minimal Complete Nucleus cannot be the correct binding domain. Otherwise, the domain for (21b) would be the f-structure (SUBJ↑), wherein there is no valid antecedent. We may formulate the off-path constraint as ¬[(→SUBJ PRED FN) ≠ REFL-PRO]. The constraint states that none of the attributes corresponding to the path GF* of (17) may contain a non-reflexive SUBJ. Thus, in (21b), while (COMP SUBJ↑) is valid with COMP having the SUBJ *taziji*, (COMP COMP OBJ↑) is invalid as the outermost COMP contains the non-reflexive SUBJ *Lisi*. Thus, *taziji* is bound by *Lisi* but not *Zhangsan*.

Additional evidence suggests that the animacy requirement of non-POSS *taziji* has implications on the binding domain such that the constraint ¬[(→SUBJ PRED FN) ≠ REFL-PRO] needs to be further revised:

(22) John$_i$ shuo [na-ben shu$_j$ hai-le   **taziji**$_{i/*j}$]
     John say   that-CL book harm-PFV   C.SELF
     'John says that book has harmed him.'   (MC; Pan & Hu, 2003: 153)

The binding domain for (22) is the f-structure at the end of (COMP OBJ↑) such that with *shu* 'book' being an inanimate entity, instead of resulting in ungrammaticality, *taziji* will continue to search for its antecedent outside the embedded clause.[11] We revise the off-path constraint as (23):

(23) ¬[(→ SUBJ PRED FN) ≠ REFL-PRO & (→ SUBJ ANIMATE) = +]

The revised constraint ensures that when the path GF* of (17) contains an inanimate SUBJ, the reflexive's search for its antecedent will continue to an outer f-structure. In (22), (COMP OBJ↑) is the valid binding domain: although COMP does not fulfil the first part of the disjunctive rule,[12] it satisfies the second part by not containing an animate SUBJ.

    The same off-path constraint is applied to non-POSS locally-bound *ziji*, non-POSS *keuhjihgei* and non-POSS locally-bound *jihgei*.

5.1.2   Constraints for reflexives taking POSS functions

As discussed in section 2.2, we have observed that most types of POSS reflexives (except part-whole type) require animate antecedents. These types of *taziji*, locally-bound *ziji*, *keuhjihgei* and locally-bound *jihgei* share the same ANTE as their non-POSS counterparts. (24) is an example of kinship POSS:

(24) zhangsan$_i$ shuo [na-fan hua$_j$ shanghai-le [**taziji**$_{i/*j}$-de   mama]]
     Zhangsan say   that-CL words hurt-PFV   C.SELF-POSS mum
     'Zhangsan says that those words have hurt his mum.'   (MC)

The reflexive is a POSS embedded within another GF (e.g., OBJ). We add this observation to the off-path constraint (23) and revise it as (25). (25) is applicable to all locally-bound reflexives in MC and CC bearing non-POSS GF or POSS GF (except the part-whole type).

(25) **OFFPATH** ≡ ¬[(→{SUBJ|POSS}PRED FN) ≠ REFL-PRO & (→SUBJ ANIMATE)= +]

    As discussed in section 2.2, POSS reflexives expressing a part-whole relation (POSS$_{part-whole}$) can be bound by an inanimate antecedent:

(26) zhangsan$_i$ shuo [na-ben shu$_j$ you   [**taziji**$_{*i/j}$-de   tese]]
     Zhangsan say   that-CL book have   C.SELF-POSS feature
     'Zhangsan says that book has its own features.'   (MC)

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[11] We can compare with the situation in English where the animacy requirement of a reflexive does not have implications on its binding domain. *Himself* in (i) results in ungrammaticality:
(i) Peter$_i$ said the book has harmed {*himself$_i$ / him$_i$}.
[12] By De Morgan's Law ¬[P & Q] ⇔ ¬P V ¬Q, the constraint is equivalent to the following disjunctive rule: ¬[(→SUBJ PRED FN) ≠ REFL-PRO] V ¬[(→SUBJ ANIMATE) = +].

The binding domain for (26) is (OBJ POSS↑). OFFPATH does not predict the correct result since $\neg[(\rightarrow$ SUBJ ANIMATE$) = +]$ would result in the wrong admission of COMP in the binding domain, predicting *Zhangsan* to be the binder. What it requires is OFFPATH_POSS$_{\text{part-whole}}$ as stated in (27), which has removed the disjunctive option of OFFPATH designed for the animacy requirement:

(27) **OFFPATH_POSS$_{\text{part-whole}}$** $\equiv \neg[(\rightarrow\{$SUBJ$|$POSS$\}$ PRED FN$) \neq$ REFL-PRO$]$

(26) shows that when a POSS$_{\text{part-whole}}$ reflexive is bound by an f-commanding GF, there is no animacy requirement on the binder GF. However, we have observed that when the binder GF becomes non-f-commanding because it is further embedded within an f-commanding GF, the embedded binder GF is restricted to be animate, as shown in (28):

(28) a. [xiaoming$_i$-de   hua]$_j$ zhanxianchu **taziji**$_{i/*j}$-de   xingge
         Xiaoming-POSS word show   C.SELF-POSS personality
         'Xiaoming's words have shown his personality.'   (MC)
     b. [zhuozishang$_i$-de diaochua]$_j$ you   **taziji**$_{*i/j}$-de   dute   fengge
          table-POSS   carving   have   C.SELF-POSS unique   style
          'The carvings of the table have their unique style.'   (MC)

In (28b), POSS$_{\text{part-whole}}$ *taziji* cannot be bound by a non-f-commanding inanimate GF, although binding by a non-f-commanding animate GF is licensed in (28a). Thus, we posit the ANTE path for POSS$_{\text{part-whole}}$ of different reflexives to be (29), which is modified from (20):

(29) a. **ANTE_(TA)ZIJI_JIHGEI_POSS$_{\text{part-whole}}$** $\equiv$
$\{$ SUBJ | SUBJ POSS | SUBJ SUBJ | SUBJ ADJ$\in$ SUBJ $\}$
$_{(\rightarrow\text{ANIMATE}) =c\,-}$ $_{(\rightarrow\text{ANIMATE}) = c\,+}$ $_{(\rightarrow\text{ANIMATE}) = c\,+}$ $_{(\rightarrow\text{ANIMATE}) = c\,-}$ $_{(\rightarrow\text{ANIMATE}) = c\,+}$

   b. **ANTE_KEUHJIHGEI_ POSS$_{\text{part-whole}}$** $\equiv$
$\{$ GF | GF POSS | GF SUBJ | GF ADJ$\in$ SUBJ $\}$
$_{(\rightarrow\text{ANIMATE}) =c\,-}$ $_{(\rightarrow\text{ANIMATE}) = c\,+}$ $_{(\rightarrow\text{ANIMATE}) = c\,+}$ $_{(\rightarrow\text{ANIMATE}) = c\,-}$ $_{(\rightarrow\text{ANIMATE}) = c\,+}$

5.1.3   Summarising anaphoric-binding constraints

Our analysis assumes a different GF for possessive reflexives that encode part-whole relations, which we term as "POSS$_{\text{part-whole}}$". Empirically, these reflexives illustrate different binding patterns; therefore, they embody a different set of binding constraints than reflexives taking non-POSS functions and those bearing POSS functions indicating other types of possessive relations. In this paper, we use POSS to represent any type of possessor, including part-whole ones. We leave for future research the theoretical status of POSS$_{\text{part-whole}}$ in LFG corresponding to a wealth of typological research on adnominal possession, as well as the question of whether we should sub-classify other types of POSS as different grammatical functions (e.g., POSS$_{\text{kinship}}$, POSS$_{\text{ownership}}$) in MC and CC. (30) summarises our anaphoric-binding constraints for each reflexive. The constraints are written as a disjunctive rule. The first disjunctive option targets at the situation where the reflexive takes a non-POSS$_{\text{part-whole}}$ function, whereas the second disjunctive option is for the situation when the reflexive bears the POSS$_{\text{part-whole}}$ function.

(30) a. Anaphoric-binding constraints for *taziji*, locally-bound *ziji*, and *jihgei*:

$\{ \neg(POSS_{part\text{-}whole}\uparrow) \Rightarrow$

$(\uparrow_\sigma ANT) = ((\ GF^*\ \ \ \ \ GF_{pro}\uparrow)\ \ \textbf{ANTE\_ (TA)ZIJI\_JIHGEI})_\sigma$
$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \textbf{OFFPATH}$

$| \ (POSS_{part\text{-}whole}\uparrow) \Rightarrow$

$(\uparrow_\sigma ANT) = ((\ GF^*\ \ \ \ \ GF_{pro}\uparrow)\ \ \textbf{ANTE\_ (TA)ZIJI\_JIHGEI\_POSS}_{\textbf{part-whole}})_\sigma \}$
$\ \ \textbf{OFFPATH\_POSS}_{\textbf{part-whole}}$

  b. Anaphoric-binding constraints for *keuhjihgei*:

$\{ \neg(POSS_{part\text{-}whole}\uparrow) \Rightarrow$

$(\uparrow_\sigma ANT) = ((\ GF^*\ \ \ \ \ GF_{pro}\uparrow)\ \ \textbf{ANTE\_ KEUHJIHGEI})_\sigma$
$\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \textbf{OFFPATH}$

$| \ (POSS_{part\text{-}whole}\uparrow) \Rightarrow$

$(\uparrow_\sigma ANT) = ((\ GF^*\ \ \ \ \ GF_{pro}\uparrow)\ \ \textbf{ANTE\_ KEUHJIHGEI\_POSS}_{\textbf{part-whole}})_\sigma \ \}$
$\ \ \textbf{OFFPATH\_POSS}_{\textbf{part-whole}}$

5.2 Logophoric-binding component: long-distance binding

This section develops constraints for logophoric binding. (31) is our general binding equation modified from Dalrymple (2015: 1116):

$$(31) \ \ \ \ \ \ \ \ \ \ \ \ (\uparrow_\sigma ANT) = ((\ \ \ GF_{log} \ \ \ \ GF_{pro}^*\ \uparrow)\ PATH\ )_\sigma$$
$$\ (\rightarrow LOG) \ \ \ \neg(\rightarrow LOG)$$

In line with Dalrymple (2015), we posit a LOG feature in the f-structure to mark the logophoric domain where the logophoric reflexive, *ziji* or *jihgei*, must appear. LOG is not the antecedent. We will see how this feature is introduced by a logocentric predicate.[13] We define GF_{log} as (32), which is essentially a clausal function:

(32) $GF_{log} \equiv \{COMP \mid XCOMP\}$

PATH is the outside-in path from the f-structure immediately containing GF_{log} to the antecedent. In most circumstances, as we shall see, PATH is a single SUBJ. We will expand on Dalrymple's (2015) proposal by integrating insights from Huang and Liu (2001) as we develop constraints to differentiate the different types of logophoric binding with reference to Sells's (1987) logophoric taxonomy: SOURCE, SELF, and PIVOT binding.

5.2.1 SOURCE as antecedent

We adopt the definition of Huang and Liu (2001: 156) that a SOURCE-type antecedent is "the intentional agent of communication." We assume the logophoric domain for SOURCE-binding is marked by a verb of speech functioning as the logocentric predicate. In (33), our coreferential indexation only concerns the logophoric interpretation (i.e., LD binding).

(33) a. [$_{SOURCE}$ xiaoming]$_i$ shuo xiaomei hen touyan **ziji**$_i$
        Xiaoming say Xiaomei very hate SELF
        'Xiaoming says Xiaomei hates him very much.' (MC)
    b. [$_{SOURCE}$ amihng]$_i$ wah ameih hou jang **jihgei**$_i$
        Amihng say Ameih very hate SELF
        'Amihng says Ameih hates him very much.' (CC)

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[13] See footnote 9 and Y. Huang (2000) for more information on logocentric predicates.

The following is the lexical entry of the logocentric predicate *say*:

(34) *shuo/wah* V   (↑PRED) = 'SAY < SUBJ, COMP >'
               ((↑COMP LOG) = +
                  (↑SUBJ LOG-ANT) = SOURCE)

(↑COMP LOG) = + marks the logophoric domain as LOG +. The logophoric domain is the complement clause of *say*. LOG-ANT is a feature added to the f-structure of SUBJ to mark it as a SOURCE-type antecedent. The inclusion of logophoric information in the syntactic f-structure corresponds to our analysis that MC and CC illustrate grammaticised logophoricity (see section 4).

The two logophoric constraints are marked as optional. Their optionality is governed by discourse-logophoric conditions (e.g., perspectivity, *de se* attitudes) that we discussed previously with reference to Huang and Liu's (2001) explanation of the blocking effects. A blocking effect occurs when there is illicit reference to a potential LD antecedent. As such, in our formal system, blocking is understood as the suspension of the two logophoric constraints, thereby causing the absence of the essential logophoric domain needed for LD binding. To formally model the suspension mechanism, we need to relate the two f-structural constraints to a formal representation of discourse where we state the various discourse conditions (e.g., conditions to avoid perspective conflicts). This goes beyond the scope of our paper. However, we now see how blocking effects can potentially be resolved in our constraint-based model, which is an advantage over Huang and Liu's (2001) derivational approach which, as admitted by Huang and Liu (2001: 178), cannot in itself capture blocking effects. Before discussing the binding constraints in the lexical entries of *ziji* and *jihgei*, we will first examine SELF-binding.

5.2.2   SELF as antecedent
We subscribe to Huang and Liu's (2001: 156) definition of SELF-type antecedent that refers to "the one whose mental state/attitude the proposition describes". Like SOURCE-binding, we assume that a logocentric predicate (e.g., verb of feeling/thinking) marks the logophoric domain.

(35) a. [SELF xiaoming]$_i$ hen gaoxing   xiaomei   xihuan **ziji**$_i$
        Xiaoming   very be.happy Xiaomei   like   SELF
        'Xiaoming is very happy that Xiaomei likes him.' (MC)
    b. [SELF amihng]$_i$ hou   hoisam   ameih   jungyi **jihgei**$_i$
        Amihng   very   be.happy Ameih   like   SELF
        'Amihng is very happy that Ameih likes him.' (CC)

(36) *gaoxing/hoisam*   V   (↑PRED) = 'BE.HAPPY < SUBJ, COMP >'
                      ((↑COMP LOG) = +
                         (↑SUBJ LOG-ANT) = SELF)

LOG-ANT is a feature added to the f-structure of SUBJ to mark it as a SELF-type antecedent. In most circumstances, a logophoric antecedent is SUBJ, but there are logocentric predicates that optionally allow POSS embedded within SUBJ to be the antecedent, e.g., *biaoshi* 'indicate'. By default, the antecedent of a logophor is an animate entity. We have observed that when both SUBJ and embedded POSS are animate, the logophoric antecedent is SUBJ.

(37) a. [[_{SELF} zhangsan]$_i$-de   baogao]$_j$ biaoshi   tamen dui **ziji**$_{i/*j}$ mei xinxin
            Zhangsan-POSS report   indicate they   to SELF no confidence
            'Zhangsan's report indicates that they had no confidence in him.'
                                                    (MC; Huang & Liu, 2001: 187)
    b. [_{SELF} [zhangsan]$_i$-de mama]$_j$ biaoshi   tamen dui **ziji**$_{*i/j}$ mei xinxin
            Zhangsan-POSS mum   indicate they   to SELF no confidence
            'Zhangsan's mum indicates that they had no confidence in her.'

(38) *biaoshi* V (↑PRED) = 'INDICATE < SUBJ, COMP >'
            ((↑COMP LOG) = +
            { (↑SUBJ ANIMATE) = + ⇒ (↑SUBJ LOG-ANT) = SELF
            | [(↑SUBJ ANIMATE) = − & (↑SUBJ POSS ANIMATE) = +] ⇒
            (↑SUBJ POSS LOG-ANT) = SELF })

We now examine the constraints in the lexical entries of *ziji* and *jihgei* which are responsible for SOURCE and SELF binding:

(39)
{(↑$_\sigma$ ANT) = ((GF$_{log}$ GF$_{pro}$* ↑)   SUBJ   )$_\sigma$
            (→LOG) ¬(→LOG)   (→ANIMATE) =$_c$ +
                            (→LOG-ANT) =$_c$ {SOURCE | SELF}

| (↑$_\sigma$ ANT) = ((GF$_{log}$ GF$_{pro}$* ↑)   SUBJ   POSS   )$_\sigma$ }
            (→LOG) ¬(→LOG)   (→ANIMATE) =$_c$ −   (→ANIMATE) =$_c$ +
                                                    (→LOG-ANT) =$_c$ {SOURCE | SELF}

¬((SUBJ (POSS) ↑) LOG)

The disjunctive constraints stipulate that *ziji* is bound by an antecedent, which is SUBJ or embedded POSS, found in the f-structure immediately containing GF$_{log}$, subject to the LOG-ANT feature and animacy requirements. Thus, SOURCE/SELF binding is achieved by the interaction of the lexical constraints of a logocentric predicate with those of a reflexive. ¬((SUBJ (POSS) ↑) LOG) prevents SOURCE or SELF-bound reflexive from appearing as SUBJ (or embedded POSS) in the highest clause within the logophoric domain. So, we consider the local binding of e.g., *Xiaoming$_i$ says [ziji$_i$-POSS friend not go]* as anaphoric binding.[14] As we take blocking effects as independent evidence for logophoric binding, our stance is empirically corroborated by the blocking-effect asymmetry between local and LD binding that local binding is not susceptible to blocking; thus a lack of independent evidence to motivate logophoric binding (section 2.4).[15] The constraint does not affect the LD logophoric binding of reflexives e.g., *Xiaoming$_i$ says [Zhangsan likes ziji$_i$].*

5.2.3 PIVOT as antecedent
We adopt Huang and Liu's (2001: 156) definition of PIVOT antecedent as "the one with respect to whose time-space location the content of the proposition is

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[14] This treatment is in a sense similar to that of Reinhart and Reuland (1993) where anaphoric binding is prioritised over logophoric binding, although we approach binding from a different analytical tradition and our concept of logophoric binding is different from theirs.

[15] In general, we adopt a cautious approach regarding when to propose logophoric binding. We maintain the view that in a language where there are no morphologically distinct forms as logophors, if one wants to argue that an anaphoric form has a dual identity as both anaphor and logophor, one must identify strong empirical evidence to prove its logophoric identity. In MC/CC, the strongest evidence for LD *ziji/jihgei* comes from the blocking effects, which would be difficult to explain without the logophoric account.

evaluated". There are differences between MC and CC in that PIVOT does not license logophoric binding in CC. A similar result was reported for a Teochew variety spoken in Singapore where PIVOT does not license binding (Cole et al., 2001).

(40) a. zhangsan lai   kan **ziji**ᵢ de   shihou, [ₚᵢᵥₒₜ lisiᵢ] zheng zai kan   shu
          Zhangsan come see SELF DE   moment   Lisi   now at read book
          'Lisi was reading when Zhangsan came to visit him.'

<div align="right">(MC, Huang & Liu, 2001, p. 156)</div>

     b. *amihng laih   taam **jihgei**ᵢ ge sihhauh, ameihᵢ haihdouh tai-gan   syu
          Amihng come see SELF GE moment Ameih at   read-DUR book
          Intended: 'Ameih was reading when Amihng came to visit her.'   (CC)

No logocentric predicate is required for PIVOT binding. Formally, we do not posit any LOG feature marking for PIVOT binding. (41) shows the constraints in the lexical entry of *ziji* for PIVOT binding:

(41) ¬((GF* GF↑) GF* LOG)
     ($\uparrow_\sigma$ ANT) ≠((⠀⠀⠀GF*   GF_pro ↑) **ANTE_ (TA)ZIJI_JIHGEI**) $_\sigma$
     ⠀⠀⠀⠀⠀**OFFPATH**
     ($\uparrow_\sigma$ ANT) = ((⠀⠀⠀GF*   GF_pro ↑) SUBJ) $_\sigma$
     (↑ ANT-TYPE) = PIVOT

The first constraint requires there to be no LOG feature in the f-structure of the sentence. In other words, there is no formal marking of logophoric domain by any logocentric predicates as the logocentric predicates in our system are either SOURCE- or SELF-predicates. The second constraint is a negative version of our anaphoric binding constraint, containing the previously seen components (20) and (25). It requires *ziji* not to be bound by any local antecedent, which otherwise constitutes anaphoric binding. See e.g., (40a) where *ziji* is not bound locally but by an entity somewhere else. The third constraint requires *ziji* to be bound by SUBJ, as is required in PIVOT-binding, where the speaker takes the perspective of a sentence-internal protagonist. PIVOT binding is not licensed by a logocentric verb, which otherwise assigns the LOG-ANT feature to the f-structure of the antecedent. The last constraint adds information to the f-structure of *ziji* that its antecedent is a PIVOT.

5.2.4   Discourse speaker as antecedent

The last type of logophoric binding relates to the observation that *ziji* and *jihgei* can refer to an antecedent in the discourse, which can be the external speaker or a discourse speaker a few sentences away (e.g., extended indirect speech). This is regarded as, cross-linguistically, a significant property of logophors in both pure and grammaticised logophoric systems (see e.g., Bresnan et al., 2016: 269; Culy, 1994; Maling, 1984; Sells, 1987). (42) is an extended indirect speech where *ziji* is interpreted as referring to *Xiaoming*:

(42) xiaomingᵢ zai   xiang … (a few sentences) … zhangsan jide
      Xiaoming now think   Zhangsan remember
      xiaomei shuo-guo na-ge   ren   dui **ziji**ᵢ-de chuxian gandao yiwai
      Xiaomei say-PFV that-CL person   to SELF-DE appear feel   surprised
      'Xiaomingᵢ is now thinking... (a few sentences)… Zhangsan remembered
       Xiaomei said the person was surprised about hisᵢ appearing.' (MC)

We posit the following constraints in the lexical entries of *ziji* and *jihgei* for this type of binding:

(43) ¬((GF* GF↑) GF* LOG)
$\quad$ (↑$_\sigma$ ANT) ≠ (($\quad$ GF* $\quad$ GF$_{pro}$ $\quad$ ↑) $\quad$ GF* $\quad$ GF)$_\sigma$
$\quad$ (↑ANT-TYPE) = DISCOURSE-SPEAKER

The first constraint requires there to be no LOG feature in the f-structure of the sentence. The second constraint requires the reflexive not to be bound by any entity within the sentence. The last constraint encodes the information that the reflexive refers to a discourse speaker.

5.3 $\quad$ Illustration of f-structures generated by our binding system

(44) is a CC sentence with three possible binding interpretations. See (16) for how we organise the various anaphoric and logophoric binding constraints in the lexical entry of the reflexive.

(44) amihng$_i$ wah-gwo [ameih$_j$ yanseung $\quad$ [**jihgei**$_{i/j/k}$-ge choihwah]]
$\quad$ Amihng say-PFV Ameih appreciate SELF-POSS talent
$\quad$ 'Amihng$_i$ has said that Ameih$_j$ appreciates his/her$_{i/j/k}$ talent.' $\qquad$ (CC)

With the constraints in our binding system, we generate the following (abbreviated) f-structures, each of which represents a referential possibility of *jihgei*. We use the subscripts – *i*, *j*, *k* – as an informal proxy to specify the coreferential relations. A more formal representation would show the coreferential relations in the form of semantic structures projected from the f-structures. Each type of binding relation is encoded with the appropriate f-structural information. The *i* interpretation in (45) belongs to SOURCE binding where *jihgei* is bound by *Amihng* along the path ((COMP OBJ POSS ↑) SUBJ). The *j* interpretation in (46) displays anaphoric binding with *jihgei* bound by *Ameih* along the path ((OBJ POSS ↑) SUBJ). The *k* interpretation in (47) displays binding by an external discourse speaker, for example, in extended indirect speech.

(45)
$$\begin{bmatrix} \text{PRED} & \text{'SAY <SUBJ, COMP>'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'AMIHNG}_i\text{'} \\ \text{ANIMATE} & + \\ \text{LOG-ANT} & \text{SOURCE} \end{bmatrix} \\ \text{COMP} & \begin{bmatrix} \text{LOG} & + \\ \text{PRED} & \text{'APPRECIATE <SUBJ, OBJ>'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'AMEIH'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'TALENT<POSS>'} \\ \text{POSS} & \begin{bmatrix} \text{PRED} & \text{'LOG-PRO}_i\text{'} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(46)
$$\begin{bmatrix} \text{PRED} & \text{'SAY <SUBJ, COMP>'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'AMIHNG'} \end{bmatrix} \\ \text{COMP} & \begin{bmatrix} \text{PRED} & \text{'APPRECIATE <SUBJ, OBJ>'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'AMEIH}_j\text{'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'TALENT<POSS>'} \\ \text{POSS} & \begin{bmatrix} \text{PRED} & \text{'REFL-PRO}_j\text{'} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(47)
$$\begin{bmatrix} \text{PRED} & \text{'SAY <SUBJ, COMP>'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'AMIHNG'} \end{bmatrix} \\ \text{COMP} & \begin{bmatrix} \text{PRED} & \text{'APPRECIATE <SUBJ, OBJ>'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'AMEIH'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'TALENT<POSS>'} \\ \text{POSS} & \begin{bmatrix} \text{PRED} & \text{'LOG-PRO}_k\text{'} \\ \text{ANT-TYPE} & \text{DISCOURSE-SPEAKER} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

6 Conclusion

This paper illustrates the power of the LFG machinery as it develops a constraint-based system capable of differentiating various types of anaphoric and logophoric binding in MC and CC. The LFG formalism has a high level of flexibility allowing it to model both types of binding, while maintaining its formal, mathematical rigour. Our constraint-based approach offers an alternative binding theory in response to the recent Minimalist proposals on Chinese binding (e.g., Giblin, 2016; Reuland et al., 2020), opening up a cross-theoretical dialogue. We have established the notion of grammaticised logophoricity in MC and CC in connection with crosslinguistic studies. Empirically, we have re-examined data of MC to clarify the properties of MC reflexives and settle the animacy-antecedent debate with reference to the typological literature on adnominal possession. The comparison between MC and CC contributes to the comparative study of binding phenomena in Sinitic languages.

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