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ON MANDARIN ARGUMENT REVERSAL

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Contents

List of Figures

List of Tables

Abstract

On Mandarin Argument Reversal

Taijing Xiao

This paper discusses new constraints on argument structure in Mandarin which provides evidence for the constructivist approach. Mandarin has enriched non-canonical arguments. In generic sentences, it even tolerates argument reversal. Lin (2001) proposes the free combination of light verbs to explain this liberality. This paper shows that argument reversal is restricted to an environment of genericity and is incompatible with viewpoint aspects. Such a requirement suggests that the restriction of argument structure is not limited to the lexical properties of verbs and light verbs but also involves wider and more structural domains like genericity and aspects.

We propose a causal approach to the operator that licenses the proper subject semantically. Even for a low thematic role like THEME, if in generics it owns high enough typicality or causal power to typically 'cause' the property of the following predicate, it can be recon-

sidered as a CAUSER and therefore take the subject position. This analysis can also explain the argument reversal in causative-resultatives and may shed light on the research of more non-canonical arguments cross-linguistically.

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Chapter 1

Introduction

From a lexical perspective, the argument structure is part of a verb's lexical entry (Larson, 1988; Dowty, 1991). It includes (i) the subcategorization frame which shows how many syntactic arguments a verb needs (i.e., its transitivity) and what syntactic categories those arguments are (i.e., c-selection); (ii) predicate structure which defines what relations the semantic arguments stand to verbs (thematic roles); (iii) what syntactic positions are taken by those arguments. In other words, how syntactic arguments are associated with semantic arguments. This part is usually called linking theory.

Cross-linguistic research has revealed both uniformity and diversity in argument structure phenomena. Regarding uniformity, one widely used method to assign thematic roles is called Thematic Hierarchy (TH). It is a ranking, believed by many to

be language-independent, that determines the relative syntactic positions of thematic roles (cf. Fillmore 1968; Larson 1988; Grimshaw 1990). Fillmore (1968) describes TH as in (1).

(1) If there is an A [=Agent], it becomes the subject; otherwise, if there is an I [=Instrument], it becomes the subject; otherwise, the subject is the O [=Objective, i.e., Theme/Patient].

(Fillmore, 1968)

Throughout various tests, different TH were proposed. Three examples are given below. Although slightly different opinions towards the specific order exist, we can still observe a generally universal ranking such as Agent is always the highest and Theme is relatively low usually.

(2) a. AGENT > GOAL/SOURCE/LOCATION > THEME (Jackendoff, 1972)

b. AGENT > THEME > GOAL > OBLIQUES(manners, location, time)

(Larson, 1988)

c. AGENT > EXPERIENCER > GOAL/SOURCE/LOCATION > THEME

(Grimshaw, 1990)

(3) shows an example of a TH application. The order of arguments for 'open' should obey certain TH, otherwise, it will cause infelicitous reading.

(3) a. John opened the door. Agent > Theme

b. The chisel opened the door. Instrument > Theme

c. #The door opened John. #Theme > Agent

Against this uniform background, considerable diversity has been discovered. Languages that seem to violate TH also exist. A well-documented one is the non-canonical argument structure in Mandarin Chinese. Mandarin is claimed to have Thematic Liberality which means both the subject and object can often be non-canonical and get occupied by different thematic roles like Instrument, Location, Time, etc (Lin, 2001; Li, 2014; Zhang, 2018). See some examples in (4).

(4) a. ta kai-guo zhe-sou muotuoting.
he drive-ASP this-CL motorboat
'He drove this motorboat before' Agent > Theme

b. ta kai-guo weixian shuiyu.
he drive-ASP dangerous waters
'He drove in dangerous waters.' Agent > Location

c. ta xihuan kai shangwu.
he like drive morning
'He likes to drive in the mornings.' Agent > Time

d. zhe-tiao he buneng kai muotuoting.
this-CL river cannot drive motorboat

'A motorboat can't be driven on this river.' Location > Theme

(Lin, 2001)

(4) shows us that in Mandarin, not only canonical thematic roles like Agent and Theme can hold the subject/object position, but non-canonical ones like Location, Time, or Instrument can also become arguments. Literature including Li (2011, 2014) has shown that a non-canonical object behaves just like a canonical object, rather than an adjunct with a preposition deletion. The evidence comes from findings like (i) non-canonical objects are in complementary distribution with canonical objects; (ii) non-canonical objects are interpreted differently than preverbal adjuncts; (iii) non-canonical objects can be definite, indefinite, or quantification, just like canonical objects.

A classical syntactic approach proposed by Lin (2001) and followed by Huang (2006) is that, apart from English, Mandarin internal argument is licensed in the structure via the merger of a light verb (Lv) (e.g., BECOME, EXIST, DO, CAUSE) in Syntax. More importantly, it tolerates having no light verb in V (See (5)). Thus it creates much more possibilities for interacting with different light verbs. Therefore, the combination of lexical roots (✓) and light verbs in Mandarin, as Lin (2001) assumes, can be very liberal.

(5) V ∈ { (✓), [Lv1 ✓], [Lv2 ✓], [Lv2 [Lv1 ✓]]}, where the option of V = ✓ is

available only in Chinese.

According to these studies, the availability of light verbs is the crucial reason why non-canonical arguments and **non-canonical linking** arise in the first place. Basically, the liberal combination of verbs and light verbs results in non-canonical arguments and TH violation.

In this paper, I argue that while non-canonical arguments may be licensed by light verbs in syntax. However, they are actually subject to **canonical linking**. In other words, there is no non-canonical linking in Mandarin. What looks like non-canonical linking involves a causative subject and that causative component in TH is ranked higher than other thematic roles. Similar analyses have been defended for English psychological predicate pairs involving argument reversals (Dowty, 1979, 1991). See examples in (6), where Dowty (1991) points out that the stimulus subject (e.g., AI in (6-b)) causes some emotional reaction or cognitive judgment in the Experiencer (John).

(6) a. John fears AI.

b. AI scares John.

Furthermore, we show that genericity patterns with causative-resultatives in licensing apparent non-canonical linking (argument reversal). This also indicates

the shared property of both generic sentences and causative-resultatives: a general CAUSER.

The argument reversal we present in this paper provides further evidence that argument structure is compositionally determined, not just a lexical property. It might be affected by genericity and other semantic component (e.g., resultative). In other words, thematic hierarchy is relevant at the phrasal/clausal level, not only related to verbs.

This paper is organized as follows: Chapter 2 introduces Mandarin non-canonical argument and one of its special kind argument reversal. In chapter 3, specifically, section 3.2, we present the incompatibility of argument reversal and aspects, leading to the claim that genericity licenses argument reversal. Chapter 4 proposes a Mandarin generic operator that licenses argument reversal. Chapter 5 extends the proposal. I first apply the proposal to the analysis of the generics-aspects interactions and discuss the possible explanations (5.1 and 5.2). Then I bring the question to a broader and crosslinguistic picture (5.3 and 5.4). Chapter 6 concludes.

Chapter 2

Empirical background

In this chapter, we will first introduce the well-known phenomenon of Mandarin non-canonical argument. Current analysis and its insufficiency will be discussed. Argument reversal, as one special kind of non-canonical argument, which usually appears in Mandarin generic sentences, is elaborated later.

2.1 Non-canonical argument

It has been widely reported that in Mandarin Chinese, action verbs can freely take non-canonical arguments in subject positions and object positions, which is also called *the unselectiveness of subject and object* in Mandarin Chinese by Lin (2001). Some examples of non-canonical arguments in object positions are firstly illustrated below:

(1) a. chi niurou mian
eat beef noodle
'eat beef noodle' *(Theme)*

b. chi da-wan
eat big bowl
'use a big bowl to eat' *(Instrument)*

c. chi guanzi
eat restaurant
'dine at a restaurant' *(Location)*

d. chi xiawu
eat afternoon
'eat beef noodle' *(Time)*

(Lin, 2001)

(1) shows that not only a Theme but also arguments like Instrument, Location, and Time can be at the object position of a verb like 'eat'. (2) further shows that, similarly, a verb like 'drive' can take not only an Agent but also arguments like Location, Causer and others in the subject position.

(2) a. Laowang kai-le yi-liang BMW
Laowang drive-ASP one-CL BMW
'Laowang drove a BMW.' *(Agent)*

b. Gaosu-gonglu-shang kai-zhe yi-liang BMW
Express-way-on drive-Dur one BMW
'There is a BMW (running) on the expressway.' *(Location)*

c. Zhe-liang BMW kai-de wo quan-shen mao-han.
this-CL BMW drive-EXT I whole-body sweat
'Driving this BMW makes me sweat all over my body.' *(Causer)*

Whether those non-canonical arguments are really taking an object or subject position just like canonical ones has been discussed in much previous research, and the answer tends to be positive.

To show that syntactically, non-canonical objects also behave like canonical objects, Li (2010, 2011); Barrie and Li (2012) and Li (2014) present the following argument and tests:

Firstly, a non-canonical object can be definite, indefinite, or quantificational, just like what a canonical object can be.

(3) a. ta hua-le ji-zhang zhi?
he draw-CL how.many-CL paper
'How many pieces of paper did he draw on?'

Quantificational and aspect marker 'le'

b. ta hua-guo na-mian qiang.
he draw-ASP that-CL wall
'He has drawn on that wall.'

Definite and aspect marker 'guo'

c. jiao bang-tiao hong shengzi.
foot tie-CL red string
'The foot was tied with a red string.'

Indefinite with classifier attached to V

Secondly, non-canonical objects are in complementary distribution with canonical

objects, which indicates that they appear in the same position.

(4) a. wo chi wancan /zhe-jia fandian
I eat dinner /this-CL restaurant
'I eat dinner/ at this restaurant.'

b. *wo chi wancan zhe-jia fandian /zhe-jia fandian wancan
I eat dinner this-CL restaurant this-CL restaurant dinner
Intended: 'I eat dinner at this restaurant.'

Thirdly, like a canonical object, a non-canonical object can also occur with a duration/frequency phrase.

(5) a. wo shang xingqi chi-le san-ci/tian mian/fandian
I last week eat-ASP three-times/day miantiao/restaurant
'I ate noodles/at restaurants three times/days last week.'

b. wo chi mian / haohua fandian chi-le henduo ci/tian.
I eat noodle / fancy restaurant eat-ASP many times/day
'I ate noodles/at fancy restaurants many times/days.'

Fourthly, both canonical and non-canonical objects can combine with a verb to take an affected outer object.

(6) a. wo chi-le ta san-ge pingguo.
I eat-ASP him three-CL apple
'I ate three apples = he was affected by my eating (his) three apples.'

b. wo chi-le ta san-tian fanguan.
I eat-ASP him three-day restaurant
'I ate at restaurants for three days on him.'

Finally, both types can occur in the relativization construction [$_{DP/NP}$... *de* ∅].

(7) a. ta chi de (dongxi) dou shi hao dongxi.
he eat DE thing all be good thing
'All (things) he eats are good things.'

b. ta chi de (canting) dou shi haohua canting.
he eat DE restaurant all be fancy restaurant
'(The restaurants where) he eats were fancy restaurants.'

The syntactic position of preverbal non-canonical argument has also been discussed. To prove that in a sentence with a non-canonical argument preverbally, the argument is indeed occupying the subject position, Her (2009) and Huang et al. (2009) use the test of an intentional adverb like *guyi* 'intentionally'. See (8).

(8) a. ✓wo guyi kao rou lai anwei ta.
I intentionally roast meat come comfort him
'✓ I intentionally roasted meat to comfort him.'

b. *zhege kaoxiang wo guyi kao rou lai anwei ta.
this oven I intentionally roast meat come comfort him
' This oven was intentionally used (by me) to roast meat to comfort him.'

(Lin, 2001)

The unacceptability of (8-a) shows that there is no empty canonical subject (*pro*) taking the subject position and therefore the subject position should be taken by the

non-canonical argument 'the oven'.

In order to explain the liberal use of thematic argument in Mandarin, Lin (2001) compares English, Japanese, and Mandarin and proposes that English licenses both its external and internal argument via the realization of an argument role from the argument structure in the Lexicon; For Japanese, only the internal argument is licensed in Lexicon. Its external agentive argument is licensed in the structure via the merger of a light verb in Syntax. As for Mandarin, both its external and internal arguments are licensed via the merger of a light verb in Syntax. Table 2.1 below shows their difference.

	English	Japanese	Mandarin Chinese
External argument	Lexicon	Syntax	Syntax
Internal argument	Lexicon	Lexicon	Syntax

Table 2.1: The locus where arguments are licensed in a structure (Lin, 2001)

In Lin (2001)'s analysis, no argument is obligatory for Mandarin verbs. Lexicon (or L-Syntax) trivially applies to the verb. Thus verbs will be sent to S-Syntax without any argument. In S-Syntax, syntactic mergers apply and merge the light verbs like BECOME and CAUSE to the structure, along with arguments like Location and Instrument. Therefore, the non-canonical arguments introduced in this section are due to the different light verbs that merge with the verb. However, such analysis

will become inadequate as shown in the next chapter. We will prove that explaining the non-canonical argument only counting on the combination of light verbs will cause overgeneration. Clearly, there are more structural restrictions when forming a sentence with non-canonical arguments.

2.2 Argument reversals

Mandarin has more than Thematic Liberality (Lin 2001; Zhang 2018), sometimes it even allows sentences that seem to violate Thematic Hierarchy and thus show an Argument Reversal. Li (2014) calls the same phenomenon as free ordering. (9) below shows an example of Argument Reversal.

(9) a. xiaobei he lvcha.
small.cup drink green.tea
'(In general,) the small cup(s) is/are used to drink green tea.'

Instrument > Theme

b. lvcha he xiaobei.
green.tea drink small.cup
'(In general,) the green tea is used to drink with a small cup.'

Theme > Instrument

(9) presents two generic sentences. In (9-a), the transitive verb 'drink' can follow an Instrument subject 'small cup' and precede a Theme object 'green tea'. In addition,

we can reverse the subject and object in (9-a) and get (9-b). It shows a Theme over an Instrument thus a violation of traditional TH.

More examples of argument reversal are given below. We test different situation types of verbs, including activity verbs, accomplishment verbs, stative/state verbs, and achievement verbs. As a result, other than achievement verbs, all other types of verbs allow argument reversal. One requirement remains: these all need to be generic sentences.

(10) Activity Verbs

a. niurou dun shaguo.
beef stew casserole
'Stew beef in casseroles.' Theme > Instrument

b. zixingche qi houshan.
bicycle ride back.hill
'Ride the bicycle in the back hill.' Theme > Location

(11) Accomplishment Verbs

a. tushuguan gai cheng zhongxin.
library build city center
'Build the library in the center of the city.' Theme > Location

b. huaju yan baitian.
opera play daytime
'Play the operas in daytime.' Theme > Time

(12) Static Verbs

a. larou kun hongsheng.
bacon tie red.rope
'Use the red rope to tie the bacon.' Theme > Instrument

b. chunlian tie damen.
couplets stick main.gate
'Stick the couplets on the main gate.' Theme > Location

(13) Achievement Verbs: (more: *dong* 'understand', *shu* 'lose', *daoda* 'reach', faxian 'discover', kai 'open')

a. ?renminbi ying baitian.
RMB win daytime
'Win RMB in the daytime.' Theme > Time

b. ?chuanghuzhi po nanqiang.
window.paper break south.wall
'Break window papers on the south wall.' Theme > Location

c. ?baojian tun baitian. (bishou tun wanshang)
sword swallow daytime dagger swallow night
'(In general,) swallow the sword during the daytime. Swallow the dagger at night.'

'Achievement verbs take the form of a simple verb in Chinese, of which the focus is the ending point of an event, and which must co-occur with the inchoative aspect marker 'le' '

Mandarin generics are not unique to allow Themes to occupy the subject position. English middles as shown in (14) also exhibit similar cases. A middle verb presents the structure of active voice, with the subject (usually Theme) coming be-

fore it. The difference is Mandarin allows a higher-hierarchy thematic role to take an object position while English doesn't. (See (15).)

(14) a. The car drives nicely.

b. Greek translates easily. (Keyser and Roeper, 1984)

(15) a. *The car drives (during) daytime.

b. *Greek translates (in) libraries.

Similar to generics, Fagan (1992) finds the restriction on middle formation in English and German: Only (transitive) activities and accomplishments undergo middle formation.

Chapter 3

Constraints on argument reversals

3.1 Distinct truth conditions

If according to Lin (2001), the non-canonical arguments and the argument reversal are caused only by a liberal combination of light verbs and verbs, no interpretive differences from the default word order would be expected in sentences like (9) in chapter 2.

However, argument reversal sentences have distinct truth conditions from their original counterparts. In (9-a), the subject is Instrument 'small cups' and the object is Theme 'green tea.' It forms a generic sentence meaning that 'for drinking events with small cups, people usually use them drinking green tea instead of other stuff.' the In (9-b), on the other hand, is also acceptable when Theme 'green tea'

holds a subject position. It means that 'for drinking-green-tea events, people usually use small cups instead of other drinking utensils.' As we can see, having a Theme preceding an Instrument violates the Thematic Hierarchy, but the sentence is still grammatical.

There is actually an interpretational difference between (9-a) and (9-b). The subject always acts as a precondition of the predicate. Scenario 1 is shown below where among 7 drinking events, 3 events are about drinking green tea with big cups, 2 events are about drinking green tea with small cups and 1 drinking black tea with small cups, and one final event is about drinking black tea with a bottle. In such a scenario, (1-a) is much preferred than (1-b) as shown in (1)

Figure 3.1: Scenario 1

(1) a. xiaobei he lvcha.
small.cup drink green.tea
'(In general,) the small cup(s) is/are used to drink green tea.'

b. ?lvcha he xiaobei.
green.tea drink small.cup
Intended: '(In general,) the green tea is used to drink with a small cup.'

In another scenario below, (2-b) is preferred over (2-a). (See (2).)

Figure 3.2: Scenario 2

(2) a. ?xiaobei he lvcha.
small.cup drink green.tea
Intended: '(In general,) small cup are used to drink green tea.'

b. lvcha he xiaobei.
green.tea drink small.cup
'(In general,) green tea is drunk with a small cup.'

In general, we find that Mandarin generic subjects have a special semantic contribution. In other words, argument reversal has an interpretive effect. This semantic difference is consistent with theories of genericity. After all, most theories of genericity (e.g., Carlson (1977a), Chierchia et al. (1995)) predict that reversing the restric-

tion (the subject NP) and the scope (the VP) should yield interpretive differences.

What is more is, at this moment, it seems not unreasonable to see the two subjects in (9) as some sort of a causer. For instance, (9-a) means that being a small cup will 'cause' it to be more possible to be used to drink green tea than other drinks. We will discuss this possibility more in section 4.1.

3.2 Interactions with viewpoint aspect—the need for genericity

Another similarity between Mandarin argument reversal cases and English middles is that those cases only exist in generics. Both English middles and thematic hierarchy violations in Mandarin become unacceptable in simple episodic sentences with aspects. See (3) to (5).

(3) a. ?Yesterday, the mayor bribed easily, according to the newspaper.

b. ?At yesterday's house party, the kitchen wall painted easily.

(Keyser and Roeper, 1984)

(4) a. lvcha he xiaobei.
green.tea drink small.cup
'Green tea is drunk with small cups.' Theme > Instrument

b. #lvcha he-le xiaobei.
green.tea drink-PERF small.cup

Intended: ‘Green tea has been drunk with small cups.’

Literal: ‘The green tea has drunk small cups.’ #Theme > Instrument

(5) a. niurou qie dadao.
beef cut big.knife
‘The big knife is used to cut beef.’ Theme > Instrument

b. #niurou qie-guo dadao.
beef cut-EXP big.knife
Intended: ‘The big knife has been used to cut beef.’

Literal: ‘The beef has cut a big knife.’ #Theme > Instrument

We can observe from (4) to (5) that whenever an aspect marker (e.g., perfective ‘le’ and experiential ‘guo’) is inserted into argument reversal generics, the sentence would only get an infelicitous episodic reading.

Insertion into non-reversed generics like (6-b), however, where thematic hierarchy is not violated, will be much more compatible with the aspect.

(6) a. xiaobei he lvcha.
small.cup drink green.tea
‘The small cup(s) is/are used to drink green tea.’ Instrument > Theme

b. xiaobei he-le lvcha.
small.cup drink-PERF green.tea
‘The small cup(s) has/have been used to drink green tea.’

Instrument > Theme

What these suggest is that genericity is one requirement to affect argument structure

and further license argument reversal. Normal episodic sentences should strictly obey the Thematic Hierarchy.

3.3 Inserting overt subjects breaks the aspectual interaction

Although genericity plays an important role, thematic roles are still relevant in argument reversal: not every thematic role can be reversed in generics. For example, agent roles do not participate in a reversal. In (7) we show that although Mandarin allows a higher thematic role (e.g., Instrument, Location, Time) in object positions, Agent roles can never occur in object positions.

(7) a. #xiaobei he Zhangsan.
small.cup drink Zhangsan
Intended: 'Zhangsan drinks with small cups.' Instrument > Agent

b. #lvcha he Zhangsan.
green.tea drink Zhangsan
Intended: 'Zhangsan drinks green tea.' Theme > Agent

This suggests that the ability of genericity to license argument reversal is constrained by the kind of thematic role associated with an object. In other words, genericity and thematic roles interact, pointing to the direction that genericity has an impact on AS/thematic alignment.

3.4 Causative Resultatives

Genericity is not the only way to license argument reversal. Although the episodic sentences with aspect markers like (4-b) are ungrammatical. The sentences become much better with resultative morphemes like *zang* 'dirty'. See (8).

(8) a. lvcha he zang le xiaobei.
green.tea drink dirty PERF small.cup
'Green tea caused the small cup to become dirty due to the drinking.'

Theme > Instrument

b. hongjiu he zui le Zhangsan.
wine drink drunk PERF Zhangsan
'The wine caused Zhangsan to be drunk.' Theme > Agent

In (10-a), with a resultative morpheme *zang* (dirty), the argument reversal is achievable in an episodic sentence with aspect. With a similar resultative structure in (8-b), even an Agent (*Zhangsan*) can hold the object position.

It appears that the resultative alone can also affect argument structure. We will address the effect of the resultative in argument reversal later in this paper.

3.5 Interim summary

First, as chapter 2, 3.1, and 3.4 show, generic sentences, like causative-resultative constructions, license argument reversal in Mandarin, indicating that both construc-

tions can influence argument structure. Second, 3.2 shows that genericity interacts with thematic roles when licensing argument reversals. That says, the thematic roles seem to function differently in generic sentences from their corresponding episodic sentences. Third, 3.3 reveals that there are still constraints regarding the thematic hierarchy. The argument structure in generics is not completely liberal. A certain thematic hierarchy should be followed no matter what.

Summary of what licenses Argument Reversal
Genericity
Causative-resultative
General thematic hierarchy (e.g., AGENT always ranks highest.)

Table 3.1: Summary of what licenses Argument Reversal

Based on these findings, I argue in the next section that generic sentences and causative-resultatives share similar argument structure properties—the presence of a CAUSER.

Chapter 4

Analysis

In this part, we argue that (i). the generic sentences can be seen as a subtype of causative constructions (4.1); (ii). the causation in generics comes from a complex functional head combining a generic operator and a Voice head (4.2). (iii). A new semantics of generic sentences is proposed (4.3).

4.1 Causal meaning of GEN

Much previous research (e.g., Lawler 1972; Carlson 1977b; Cohen 1999) assumes that in generic sentences, there is a null generic operator GEN to function the same way as an adverb of frequency *usually*, which transfers an ordinary verbal predicate to a characterizing predicate.

The definition of the conditional probability of e given k is given by the ratio of

unconditional probabilities as follows:

(1)

$$P(\phi|\psi) = \frac{P(\phi \cap \psi)}{P(\psi)}$$

Some examples of the probability given by different adverbs are shown in (2).

(2) a. $Q(\phi|\psi)$ is true iff:

$P(\phi|\psi) = 1$ if Q = always

$P(\phi|\psi) = 0$ if Q = never

$P(\phi|\psi) > 0$ if Q = sometimes

$P(\phi|\psi) > 0.5$ if Q = usually

...

$P(\phi|\psi) > 0.5$ if Q = GEN (Cohen, 1999, p. 229)

Cohen (1999) formalizes GEN in the same way with the logical interpretation of conditional probability of *usually*:

(3) Dogs (ψ) bark (ϕ).

$P(bark|dog) > 0.5$

This means the conditional probability $\mathbb{P}$ of having feature ϕ given that one is a

member of a group or kind ψ is higher than 0.5. They consider both ϕ and ψ to be properties.

In (3), more specifically, the conditional probability of barking as a dog is higher than 0.5. As the number of dogs (ψ) approaches infinity, the mathematical limit of the frequency of a barking dog will get closer and closer to a precise frequency higher than 0.5. This is similar to the procedure of testing the probability of getting a head from tossing a coin. Figure 4.1 shows the result of two random experiments. We see that although the probability of getting heads varies at the beginning, it always approaches 0.5 given enough attempts.

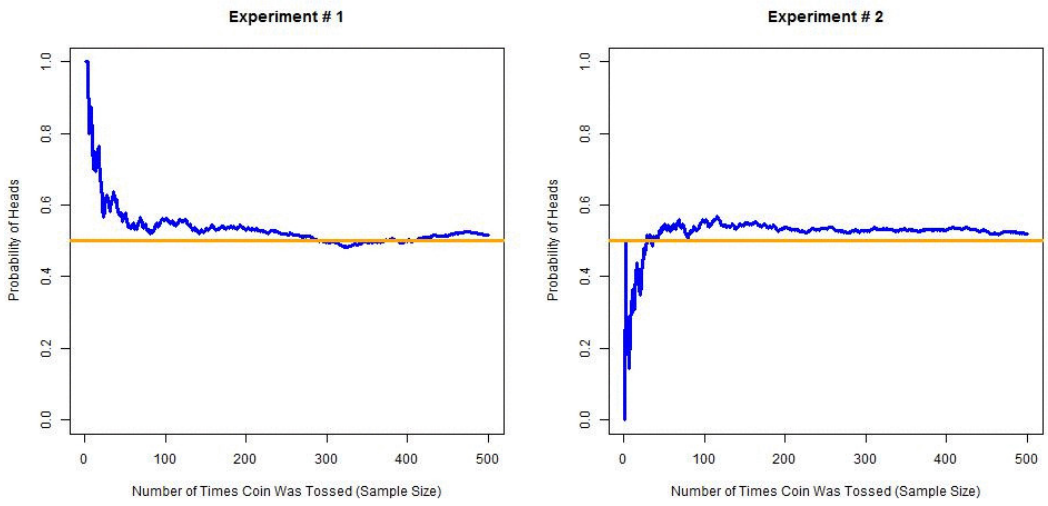


Figure 4.1: A coin-tossing simulation

(From Roopam Upadhyay, https://ucanalytics.com/)

Beyond events that already happened, Cohen (1999) considers the fact that for

some generic sentences like (4), we calculate not only actually observed events but also events that might happen in the future.

(4) Mary handles the mail from Antarctica. (Cohen, 1999, p. 233)

(4) doesn't require Mary to actually handle any mail before but as long as in a sufficiently long time when mail does arrive, Mary will handle most of it. Such time could extend to the future.

Given that, Cohen (1999) treats time as not linear but branching with more than one possible future. They give a more detailed restriction of GEN in (5-a). A history h is a collection of time segments that share the same initial time segment; $h' \sqsubset h$ means that h continues h' (in other words, h' forms an initial segment of h.); The probability function $\mathbb{P}$ here assigns values between 0 and 1, inclusive. To make sure that every admissible history h under discussion is in the topic time, we restrict h within the topic time t as shown in (5-b).

(5) $\mathbb{P}(\phi|\psi)^t = l$ iff

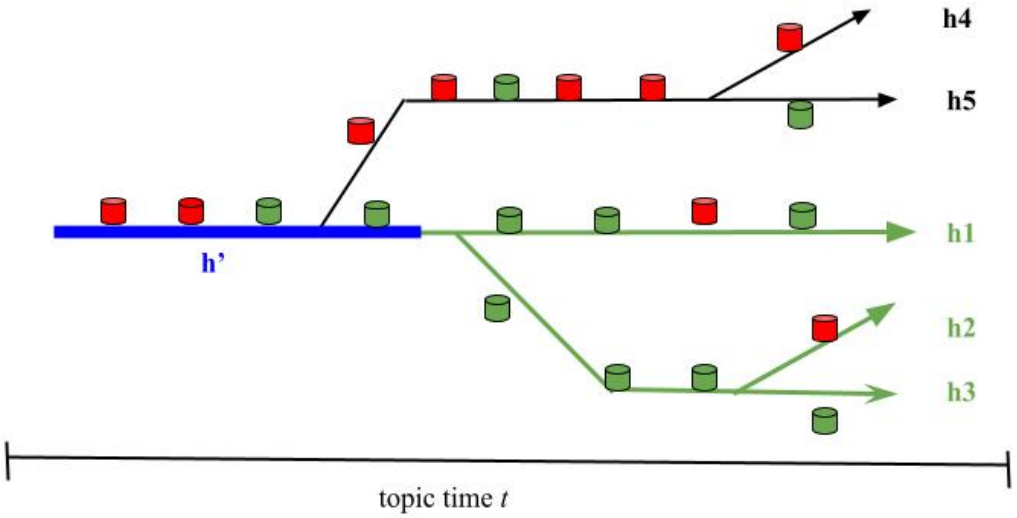
a. for every admissible history h and every $\varepsilon > 0$, there is a history $h' \sqsubset h$ s.t. for (e)very history h'', $h' \sqsubset h'' \sqsubset h$, the limiting relative frequency of ϕs among ψ will be within ε of l (Cohen, 1999, p. 232)

b. $h \subseteq t$

The restriction 'for every $\varepsilon > 0$,..., the limiting relative frequency of ϕs among ψ will be within ε of l' is from the formal definition of limits. It basically means that there is an ideal limiting frequency l which we may never be able to match that precise number given restricted observation. However, we can make sure that no matter how close you want our result to be to l (i.e., how small the positive ε is), we can always find a range of input (e.g., the number of observations) which makes the result fall into $[l-\varepsilon, l+\varepsilon]$. Therefore, in other words for (5), within all sufficiently long history h in certain topic time t, there is a beginning history h' such that after that h', the probability of certain property is convergent and infinitely close to l. That l should be larger than 0.5 and not larger than 1, depending on the context.

Let's assume some scenarios for (9-a) (repeated below) to be true. Within a topic time t, there is a history h containing multiple events of drinking tea with small cups. Some of them are green tea-drinking events and the others are black tea-drinking events. That topic time t requires that every admissible history h in it satisfies that after a certain history h', all the longer histories h'' make the conditional probability convergent and infinitely approach a probability higher than 50%. With infinite events, that probability should in the end hypothetically be able to approach 100 %.

(6) xiaobei he lvcha.
small.cup drink green.tea
'(In general,) the small cup(s) is/are used to drink green tea.'



P(h1):	0%	0%	33%	50%	60%	66%	57%	62.5%
P(h2):	0%	0%	33%	50%	60%	66%	71%	62.5%
P(h3):	0%	0%	33%	50%	60%	66%	71%	75%
P(h4):	0%	0%	33%	25%	!20%	33%	28%	25% 22%
P(h5):	0%	0%	33%	25%	!20%	33%	28%	25% 33%

Figure 4.2: A branching history for (6)

In figure 4.2, there is a branching history. Each history contains different 'tea-drinking' events involving black tea and green tea. The blue line represents the history h'. Continuing h', the three green histories $h1$, $h2$, and $h3$ remain the probability of 'drinking green tea with small cups' higher than 50% and keep the probability rising broadly approaching 100%. On the other hand, two histories $h4$ and $h5$

don't have a blue line h' such that after it the probability of 'drinking green tea with small cups' keeps higher than 50% and converges to a fixed number. Thus these two become unqualified scenarios.

Similarly, another branching history of (9-b) (repeated below) is given in figure 4.3. In figure 4.3, along the branching history, multiple 'green-tea-drinking' events happened. Only the green histories $h1$, $h2$ and $h3$ satisfy the requirement which is after a history h', the probability of 'drinking green tea with small cups' stays higher than 50% and has the tendency to keep rising. Histories $h4$ and $h5$ thus again be unqualified for sentence (9-b).

(7) lvcha he xiaobei.
green.tea drink small.cup
'(In general,) the green tea is drunk with small cups.' Theme > Instrument

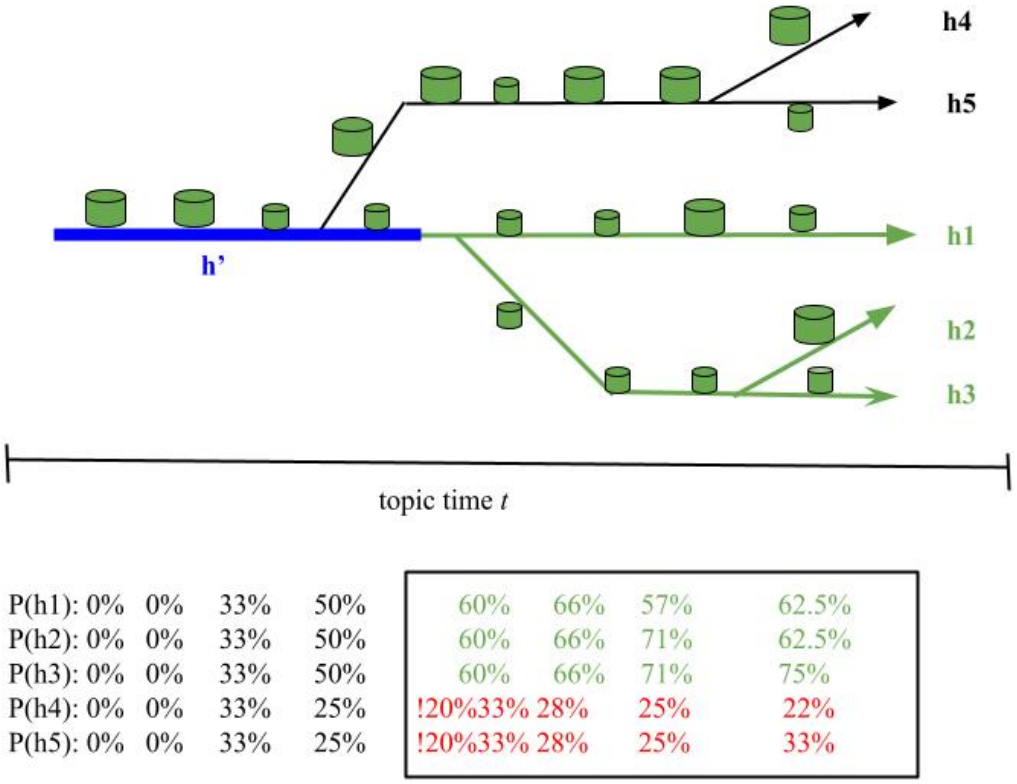


Figure 4.3: A branching history for (7)

According to Cohen (1999, p. 233), admissible history needs to be (i) sufficiently long so there would be enough time for the relative frequency of ϕ among ψ to approach the probability of l; (ii). continue the relevant part of the actual history (referred from the context). Cohen makes such restrictions so sentences like (4) could be explained. It thus requires that in all sufficiently long histories where mail does arrive, Mary will handle most of it.

As we can see, Cohen (1999) treats generics with a probabilistic analysis. What

was put into consideration is the frequency of certain properties showing up. However, van Rooij and Schulz (2019) argues that generic sentences not only include the traditional kind like (8-a) but also some less frequent, sometimes rare-happened examples as in (8-b) and (8-c), which couldn't be explained with Cohen (1999)'s probabilistic solution.

(8) a. Tigers are striped. (And they all are)

b. Mosquitoes carry the West Nile virus. (Even though only 1% actually do so)

c. Wolves attack people. (Although very few actually do so.)

To offer a more uniform analysis for (8), van Rooij and Schulz (2019) considers two parameters: **Typicality** and **Impact**. Therefore, there are two readings for sentence in (8-b):

(9) Mosquitoes carry the West Nile virus.

a. it is **typical** for mosquitoes that they carry the West Nile virus, and

b. this is highly relevant information, because of the **impact** of being bitten by a mosquito when it carries the West Nile virus.

In other words, although the mosquitoes that actually carry the West Nile Virus is

not very high (not larger than 50%), the sentence still sounds OK because (i) the impact of carrying the West Nile Virus is striking enough(e.g., spreading deadly diseases) and (ii) other spices ($\neg k$) that carry the West Nile Virus are way lower than mosquitoes (k), making such property (e: carrying WNV) typical enough for mosquitoes. Both readings lead to the high representativeness of mosquitoes carrying the West Nile Virus. The final Representativeness of e given k is controlled by Typicality and Impact together and eventually decides if the generic sentence is true. See (10).

(10) $Representativeness(e,k) = Typicality(e,k) \times Impact(e)$

'ks are e' is true, or acceptable if and only if $Repr(e,k)$ is high.

(van Rooij and Schulz, 2019)

It is quite difficult to provide a quantitative analysis for Impact. But for Typicality, it is relatively easy. For convenience, we temporally set aside the Impact and focus on the Typicality. One method introduced by van Rooij and Schulz (2019) following Sheps (1958) to calculate the Typicality is given in (11).

(11) $Typicality(e,k) =_{df} \frac{\alpha P(e|k)-(1-\alpha)P(e|\neg k)}{\alpha-(1-\alpha)P(e|\neg k)}$ $(\alpha \in [\frac{1}{2},1])$

a. if $\alpha = 1$, $Typicality(e,k) = P(e|k)$: this would be the same with Cohen

(1999)'s probability of e (i.e., striped) given k, (i.e., tigers); synonymous to $\frac{P(e\&k)}{P(k)}$.

b. if $\alpha = \frac{1}{2}, Typicality(e,k) = \frac{P(e|k)-P(e|\neg k}{1-P(e|\neg k)}$: the difference between $P(e|k)$ (i.e., the probability of mosquitoes having WNV) and $P(e|\neg k)$ (i.e., the probability of things other than mosquitoes having WNV) should be large enough.

Under this assumption, with a concrete scenario like (12), we would be able to calculate its two kinds of Typicality.

(12) Scenario: 90% dogs bark (assume 10% of dogs are quiet). Among all the other kinds of animals to be concerned, 10 % of them bark (e.g., fox, or seal).

a. if *barking* is a common feature for *dog*, which in this case, it is (i.e., α = 1):

$Typicality1(bark, dog) = \frac{P(bark\ \&\ dog)}{P(dog))} = 90\%$

b. if *barking* is a uncommon feature for *dog* (i.e., $\alpha = \frac{1}{2}$):

$Typicality2(bark, dog) = \frac{P(bark\ \&\ dog)-P(bark\ \&\neg dog)}{1-P(bark\ \&\neg dog))} = \frac{90\%-10\%}{1-10\%}$

$\approx 88.9\%$ $(\alpha = \frac{1}{2})$

We see that both kinds of Typicality are high enough. Therefore, the sentence 'dogs

bark' sounds very natural to us. With such an assumption in mind, we would explain why some previous-mentioned Mandarin examples make sense or why not. In chapter 3, (1-b) figure 3.1 and (2-a) in figure 3.2 are off since both types of Typicality are not high enough. For (1-a) and (2-b), at least their Typicality 1 is high enough and thus those sentences feel much better.

van Rooij and Schulz (2019) states that causal relation doesn't restrict to sentences like (13-a), which describes the causation between two events. They also give a causal analysis to sentences in a generic fashion like (13-b), which describes a causation between two types of events.

(13) a. John's throwing of a stone caused the bottle to break.

*(a causal relation between **two tokens of events**)*

b. Aspirin causes headaches to diminish.

*(a causal relation between **two types of events**)*

In that spirit, many more generic statements should be given a causal analysis, even for some sentences like (14) which are usually not considered as one.

(14) a. Tigers are striped.

b. Dogs bark.

c. Birds lay eggs.

According to van Rooij and Schulz (2019), for a sentence that has the form of '*k*s are *e*', it could be seen that the objects of type *k* have the power to cause features of type *e*. In other words, the generic subject *k* tends to cause the generic predicate *e*. They follow Harré (1975); Ellis (1999) and name the Representativeness in (10) **Causal Power** in generic sentences. Therefore, in this paper, we assume that **Causal Power** $\approx$ **Representativeness** $\approx$ **Typicality**

4.2 GEN-Voice bundling

According to Parsons (1990); Pylkkänen (2008), the light verb CAUSE is simply a relation between two events and doesn't always introduce extra syntactic arguments (See (15)).

(15) CAUSE: $\lambda \mathrm{f}_{<s,t>}.\ \lambda \mathrm{e}_{s}.\ (\exists e')\ f(e')\ \&\ \mathrm{CAUSE}\ (e, e')$

Such bieventive analysis was supported by languages like Japanese (adversity causatives) and Finnish (desiderative constructions) since those two have unaccusative causatives without an external argument. [1] Since English doesn't have an unaccusative causative, a structure with only CAUSE may not be universal.

On the other hand, the external argument is always introduced by Voice head

[1] Perlmutter and Postal (1984)'s diagnostic for external argumenthood: Sentences with derived subjects do not passivize.

(Kratzer, 1996):

(16) Voice: $\lambda x.\lambda e.\theta_{Ext}(e,x)$ (Kratzer, 1996)

Therefore, Pylkkänen (2008) further proposes that although CAUSE and Voice are separate pieces of functional heads, they can form a feature-bundle morpheme (one syntactic head) similar to the one formed by Tense and Agreement. She argues that Finnish and Japanese are examples of CAUSE and Voice being separate while English has CAUSE and Voice bundled together.

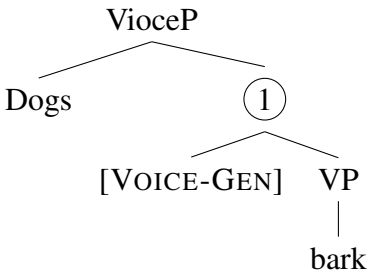
Following Pylkkänen (2008), Sybesma (2021) proposes that both bundled and separate Voice and v_{cause} (CAUSE) may be available in one language. In Mandarin, Voice and CAUSE are sometimes bundled (SVXO), and sometimes separate, in which case Voice is overtly marked with bǎ—result: S(bǎ)OVX. He also argues that since Mandarin aspectual sentences could have SVXO or SOVX, CAUSE is present, therefore VX could move into it and O will move to its specifier, yielding the order OV. However, Mandarin bare verb phrases only allow bareVO, no raising seems possible. Therefore, he assumes that CAUSE is absent in bare verb phrases thus Voice selects VP directly.

If we adopt Sybesma (2021)'s proposal, we could assume that Mandarin generics, which never use bǎ, either have a Voice bundling head or a pure Voice head without CAUSE. Either way, causality should be in the Voice bundling head of generics

since generics allow a non-canonical subject which will be further explained in the next section.

In the following, I will also assume that Mandarin generics do have causality and propose Mandarin to have a GEN-VOICE bundling head.

(17) a. Dogs bark.

b. 

It must be noted that the VOICE-GEN operator we propose here does not work exactly the same with Pylkkänen (2008)'s Voice. The latter is a function head that introduces an external argument syntactically while the VOICE-GEN operator, although has a similar function, but more focuses on licensing a proper external argument semantically and constructively. The idea is close to Dowty (1991)'s proto-agent properties. More specifically, semantic roles compete for subjecthood. Subjects are taken by arguments that contain more advantageous features including "(a). volitional involvement in the event or state; (b). sentence (and/or perception); (c). causing an event or change of state in another participant; (d). movement (relative to the position of another participant); (e). exists independently of the event named

by the verb." These overlap with the causal meaning of VOICE-GEN operator we introduce above. The difference between Dowty and this paper is that in Dawty's analysis, argument structure is decided by the lexical property of only verbs. However, this paper claims that it can also be affected by not only light verbs but also by a wider environment, particularly like aspects and genericity.

4.3 Proposal

As discussed in section 4.1, we borrow Cohen (1999)'s formal definition to calculate the relative probability. But considering the exceptions that couldn't be explained by pure probability (e.g., *Mosquitoes carry the West Nile virus.*), we follow van Rooij and Schulz (2019)'s revised term of Typicality. Therefore, a common feature e's Typicality is calculated with $\alpha = 1$ as (18-a) shows which would still calculate the probability in Cohen (1999)'s way. Whereas uncommon feature e's Typicality is calculated with $\alpha = \frac{1}{2}$ as in (18-b).

(18) $Typicality(e,k) =_{df} \frac{\alpha P(e|k)-(1-\alpha)P(e|\neg k)}{\alpha-(1-\alpha)P(e|\neg k)}$ $(\alpha \in [\frac{1}{2},1])$

a.

$$if\alpha = 1, Typicality1(e,k) = \frac{P(e|k)-(1-1)P(e|\neg k)}{1-(1-1)P(e|\neg k)} \quad (4.1)$$

$$= P(e|k) \quad (4.2)$$

b.

$$if\,\alpha = \frac{1}{2}, Typicality2(e,k) = \frac{P(e|k) - P(e|\neg k)}{1 - P(e|\neg k)} \tag{4.3}$$

By calculating the two types of Typicality, we can find out which Typicality matters in Mandarin generics. (See (19) and (20).)

Figure 4.4: Scenario 1

(19) a. xiaobei he lvcha.
small.cup drink green.tea
'(In general,) the small cup(s) is/are used to drink green tea.'

Typicality1 = $\frac{2}{3}$ ($\alpha = 1$)

Typicality2 = $\frac{\frac{2}{3} - \frac{3}{4}}{1 - \frac{3}{4}} = -\frac{1}{3}$ ($\alpha = \frac{1}{2}$)

b. ?lvcha he xiaobei.
green.tea drink small.cup
Intended: '(In general,) the green tea is used to drink with a small cup.'

Typicality1 = $\frac{2}{5}$ ($\alpha = 1$)

Typicality2 = $\frac{\frac{2}{5} - \frac{1}{2}}{1 - \frac{1}{2}} = -\frac{1}{5}$ ($\alpha = \frac{1}{2}$)

Figure 4.5: Scenario 2

(20) a. ?xiaobei he lvcha.
small.cup drink green.tea
Intended: '(In general,) small cup are used to drink green tea.'

Typicality1 = $\frac{1}{3}$ ($\alpha = 1$)

Typicality2 = $\frac{\frac{1}{3}-0}{1-\frac{1}{3}} = \frac{1}{3}$ ($\alpha = \frac{1}{2}$)

b. lvcha he xiaobei.
green.tea drink small.cup
'(In general,) green tea is drunk with a small cup.'

Typicality1 = 1 ($\alpha = 1$)

Typicality2 = $\frac{1-\frac{2}{6}}{1-\frac{2}{6}} = 1$ ($\alpha = \frac{1}{2}$)

Examinating through the results of (19) and (20), it is not difficult to see that Typicality1 but not Typicality2 is highly relevant to the reading of Mandarin generics. Whenever Typicality1 is higher than $\frac{1}{2}$, the sentence can survive. Likewise, the sentence is off as long as Typicality1 is lower than $\frac{1}{2}$. Therefore, Typicality1 in (18-a)

is what we choose to be the component of the semantics of Mandarin generics.

We borrowed Kratzerian-style semantics of events (Kratzer, 1996, 2007). I use the following typing conventions: the symbols e, e' and e'' for events, and Q for (variables that range over) predicates of type $< e,\ t >$, t stands for time interval, $\mathbb{T}$ for the probability function that calculate the Typicality1 of property ϕ among ψ during the topic time t.

(21) $\mathbb{T}(\phi|\psi)^t = l$ iff

a. for every admissible history h and every $\varepsilon > 0$, there is a history $h' \sqsubset h$ s.t. for (e)very history h'', $h' \sqsubset h'' \sqsubset h$, the limiting Typicality1 of ϕ among ψ will be within ε of l; l should be within $(\frac{1}{2}, 1]$.

b. $h \subseteq t$

The denotation of the VOICE-GEN bundling head is proposed as follows:

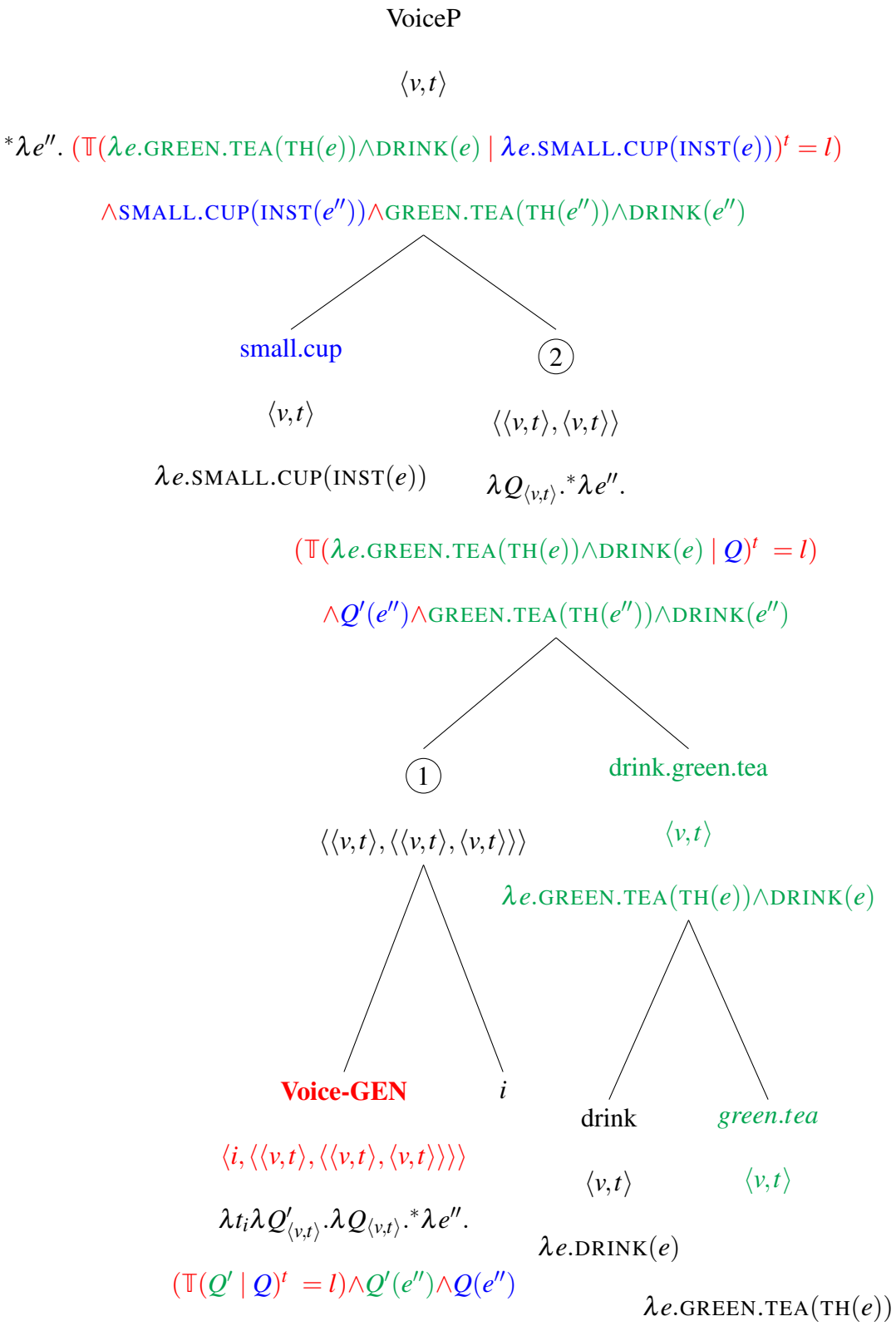
(22) $[\![\text{VOICE-GEN}]\!] = \lambda t_i \lambda Q'_{<v,t>}.\lambda Q_{<v,t>}.{}^*\lambda e''.(\mathbb{T}(Q' \mid Q)^t = l) \wedge Q'(e'') \wedge Q(e'')$

VOICE-GEN takes a topic time interval as an argument and returns a function between a set of events and a relation between another set of events and event iff (i) within the topic time t, the conditional probability of the set of event Q' given Q is

high and (ii) both Q and Q' contains event e''. Below I show the two structures of (9-a) and (9-a), a pair of Mandarin argument reversals.

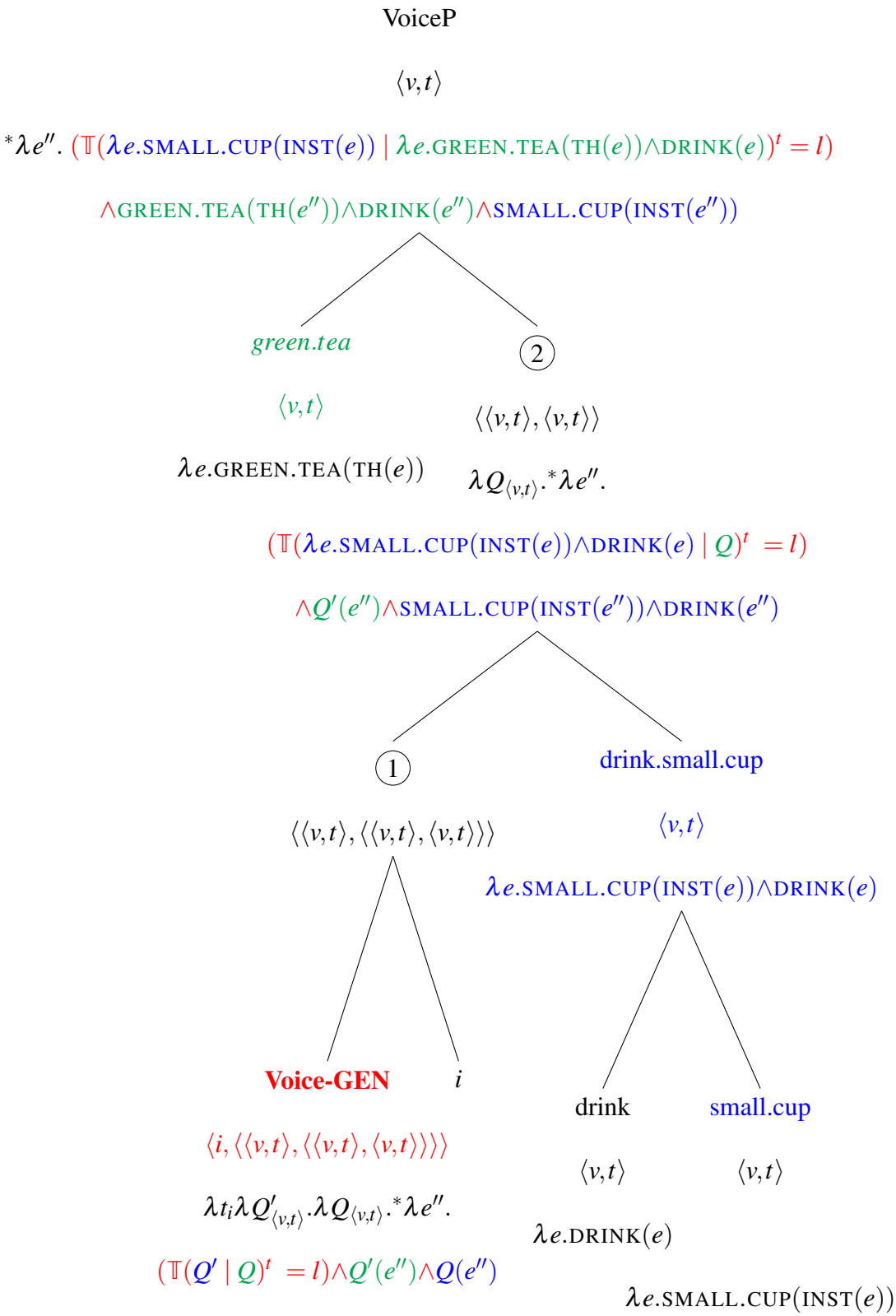
(23) a. small.cup drink green.tea (Generic + Instrument > Theme)

b.


VoiceP
⟨v,t⟩
*λe″. (𝕋(λe.GREEN.TEA(TH(e))∧DRINK(e) | λe.SMALL.CUP(INST(e)))^t = l)
∧SMALL.CUP(INST(e″))∧GREEN.TEA(TH(e″))∧DRINK(e″)
small.cup
2
⟨v,t⟩
⟨⟨v,t⟩,⟨v,t⟩⟩
λe.SMALL.CUP(INST(e))
λQ⟨v,t⟩.*λe″.
(𝕋(λe.GREEN.TEA(TH(e))∧DRINK(e) | Q)^t = l)
∧Q′(e″)∧GREEN.TEA(TH(e″))∧DRINK(e″)
1
drink.green.tea
⟨⟨v,t⟩,⟨⟨v,t⟩,⟨v,t⟩⟩⟩
⟨v,t⟩
λe.GREEN.TEA(TH(e))∧DRINK(e)
Voice-GEN
i
drink
green.tea
⟨i,⟨⟨v,t⟩,⟨⟨v,t⟩,⟨v,t⟩⟩⟩⟩
⟨v,t⟩
⟨v,t⟩
λti λQ′⟨v,t⟩.λQ⟨v,t⟩.*λe″.
λe.DRINK(e)
(𝕋(Q′ | Q)^t = l)∧Q′(e″)∧Q(e″)
λe.GREEN.TEA(TH(e))

(24) a. green.tea drink small.cup (Generic + Theme > Instrument)

b.


VoiceP
⟨v,t⟩
*λe″. (𝕋(λe.SMALL.CUP(INST(e)) | λe.GREEN.TEA(TH(e))∧DRINK(e))^t = l)
∧GREEN.TEA(TH(e″))∧DRINK(e″)∧SMALL.CUP(INST(e″))
green.tea
2
⟨v,t⟩
⟨⟨v,t⟩,⟨v,t⟩⟩
λe.GREEN.TEA(TH(e))
λQ⟨v,t⟩.*λe″.
(𝕋(λe.SMALL.CUP(INST(e))∧DRINK(e) | Q)^t = l)
∧Q′(e″)∧SMALL.CUP(INST(e″))∧DRINK(e″)
1
drink.small.cup
⟨⟨v,t⟩,⟨⟨v,t⟩,⟨v,t⟩⟩⟩
⟨v,t⟩
λe.SMALL.CUP(INST(e))∧DRINK(e)
Voice-GEN
i
drink
small.cup
⟨i,⟨⟨v,t⟩,⟨⟨v,t⟩,⟨v,t⟩⟩⟩⟩
⟨v,t⟩
⟨v,t⟩
λtiλQ′⟨v,t⟩.λQ⟨v,t⟩.*λe″.
λe.DRINK(e)
(𝕋(Q′ | Q)^t = l)∧Q′(e″)∧Q(e″)
λe.SMALL.CUP(INST(e))

Chapter 5

Extension

5.1 Incompatible with aspect markers

In (4-b) and (5-b) (repeated below), we have already seen that with aspect marker (like perfective marker *le* or experiencer marker *guo*), sentences violating TH only lead to a semantically weird reading. The intended proper reading is missing.

(1) a. #lvcha (qunian) he-le xiaobei.
green.tea last.year drink-PERF small.cup
Intended: 'The green tea has been used to drink with small cups.'

Literal: 'The green tea has drunk small cups.' #Theme > Instrument

b. #niurou (qunian) qie-guo dadao.
beef last.year cut-EXP big.knife
Intended: 'The big knife has been used to cut beef.'

Literal: 'The beef has cut the big knife.' #Theme > Instrument

In (2), with perfective marker *le*, sentences following TH can have the episodic reading.

(2) a. zhe-ba dao (qunian) qie **le** shucai .
this-CL knife last.year cut LE vegetable
Reading 1: *'This knife was usually used to chop vegetables (last year).'

Reading 2: 'This knife was used to chop vegetables (last year).'

b. zhe-ge beizi (qunian) he **le** lvcha.
this-CL cup last.year drink LE green.tea
Reading 1: *'This cup was usually used to drink green tea (last year).'

Reading 2: 'This cup was used to drink green tea (last year).'

(1) and (2) suggest that argument reversal is incompatible with aspect markers. For that incompatibility, there are two possible explanations.

The first explanation is that the sentence would become undefined due to the conflict between the requirement of generics and aspectual sentences. Wu (2005) discusses the denotation of Mandarin *le* as in (3-a). He points out that the perfective *le* identifies the Significant Point(SigP) of an event. As (3-a) shows, *le* locates the interval from the starting point of the event to its SigP before a reference time (t') (which is usually the speech time). Mandarin topic time (t) is optional.

(3) a. $[\![\text{LE}]\!] =_d \lambda P(\lambda t)\lambda x\lambda t'\lambda e\exists i[P(x,e)\wedge i=[start(e),SigP(e)]\wedge(i\subseteq t)\wedge i\prec t']$

b. **Revised version**:

$[\![\text{LE}]\!] =_d \lambda P_{<v,t>}.\lambda t'_i.\exists e''\exists i[i = [start(e''), SigP(e'')] \wedge SigP(e'') \prec t'_{end} \wedge P(e'')]$

We revise Wu (2005)'s denotation into event predicate style for compositional convenience as in (3-b). *le* takes an event predicate and returns a relation between the time interval and truth value iff there is an event e'' and a time interval i such that the significant point of i precedes the end point of t' and e'' satisfies P.

More importantly, Wu (2005) argues that the SigP performs differently in various situation types. See (4) to (7).

(4) Situation type and SigP:

a. **Accomplishment**: noticeable process between initial endpoint and natural final endpoint, the SigP is its natural final point.

b. **Achievement**: the initial endpoint coincides with the natural final endpoint, and the SigP is its starting point/natural final endpoint.

c. **Activity**: no natural final endpoint, the SigP is underspecified.

d. **State**: The SigP for a stage-level state is its starting point; The SigP for an individual-level state is undefined.

From (4) we see that the SigP varies for verbs of different situation types. The SigP

for an individual-level state is undefined. As shown in (5), $\mid \phi \mid$ is the temporal schema for an event/eventuality. A stage-level state has a start point ($t_{initial}$) while an individual-level state never has one. Therefore, individual-level states are not compatible with *le* at all

(5) a. stage-level state(ϕ) $\rightarrow$ ($\mid \phi \mid =_d t_{initial} \prec s \prec s \prec s...$)

b. individual-level state(ϕ) $\rightarrow \rightarrow$ ($\mid \phi \mid =_d ... \prec s \prec s \prec s...$)

That is how Wu (2005) explains the opposite acceptability of *le* with stage-level state and individual-level state in (6) and (7).

(6) stage-level state

a. hua hong le.

flower red Pfv

b. ta gaoxing le.

he happy Pfv

(7) individual-level state

a. *ta congming le.

he smart Pfv

b. *ta xiang le ta baba.

he resemble Pfv he father

According to Carlson (1977a); Kratzer et al. (1995), 'stage-level states involve a change of state while individual-level states do not'. In fact, individual(-level) statives are not realized through a spatio-temporal relation. The quality denoted is a relatively permanent one, usually not liable to change. On the other hand, stage(-level) statives have flexibility in involving change.

Generics behave a lot like individual-level states. Chierchia et al. (1995) argues that i-level predicates are inherently generic. van Rooij and Schulz (2019) also uses causal powers for the analysis of i-level predicates like 'being intelligent' and 'being blond' since this kind is stable over time. Thus i-level predicates are capable of describing the character or disposition of the person. In other words, 'being Suu (or anyone else in the scenarios)' causes 'being intelligent' and 'being blond'. Given this, if we assume that generic sentences are individual-level states that have causal power, then it seems natural to explain their incompatibility with *le* by simply the *le*'s requirement of SigP: Since generics behave just like individual-level states and i-level states have undefined SigP. In the meantime, *le* requires a SigP. Therefore generics can never be compatible with the perfective *le*.

Despite the similarity, however, we are not capable of claiming generic sentences to be completely the same with individual-level states. What might be more convincing to assume is that it is the morphological paradigm of *le* that conflicts with generics. As we can see, perfective aspect markers like *le* require the com-

pleteness of an event. On the other hand, a generic sentence needs to be incomplete over the topic time so the property can remain for a long period. This conflict causes the illness of sentences like (1). In other words, the reason those episodic sentences can not realize generics is that the imperfectiveness of generics conflicts with the perfectiveness of aspects markers like *le* or *guo*.

The second explanation could be related to the unqualified admissible history with *le*. Cohen (1999, p. 242) points out that generics require homogeneity with respect to the time partition. By his as well as Salmon (1977)'s definition, a temporal predicate is homogeneous when, if it is true of an interval, it is true of every subinterval of this interval. In other words, for every sufficiently long interval (H'' in (22)), the relevant relative frequency must satisfy the same condition (i.e., always high), the same as the frequency over the whole history. However, perfective *le* requires that the predicate P must end within the topic time. In sentences like (1-a), 'predicate '$\mathbb{T}(Q \mid Q')$ *is high*' ends' means "$\mathbb{T}(Q \mid Q')$ *is low*' begins' in certain H'' and therefore violates the homogeneity constrain of generics. In other words, that H is no longer a qualified history.

In summary, both the SigP-requirement of perfective *le* and the 'admissible history constraint' of generics cause *le* to be incompatible with generics. In other words, *le* would lead to only episodic readings. Therefore in (8-a), VOICE-GEN couldn't apply, and Instrument > Theme doesn't violate the Thematic Hierarchy.

Similarly, in (8-b), since VOICE-GEN doesn't apply, *green tea* couldn't become a Causer through the probability calculation of VOICE-GEN and thus has to remain as a Theme. Theme > Instrument then would violate the Thematic Hierarchy.

(8) a. xiaobei he-le lvcha.
small.cup drink-LE green.tea
'The small cup(s) has/have been used to drink green tea.'

b. #lvcha he-le xiaobei
green.tea drink-LE small.cup
Intended: 'The green tea has/have been used to drink with small cup(s).'

Literal: 'The green tea has drunk small cup(s).'

Different than *le*, imperfective *zai* doesn't require any SigP and doesn't conflict with the homogeneity of the predicate it takes. Thus *zai* is compatible with generics. In (9-a), a covert VOICE-GEN is optional, leading both generic (Causer > Causee) and progressive readings (Instrument > Theme). Since Theme > Instrument is forbidden, only generic reading can make sense in (9-b) (Causer > Causee).

(9) a. xiaobei zai-he lvcha.
small.cup ZAI-drink green.tea
Reading 1: 'The small cup(s) is usually used to drink green tea.'

Reading 2: 'The small cup(s) is being used to drink green tea.'

b. lvcha zai-he xiaobei
green.tea ZAI-drink small.cup
Reading 1: 'The small cup(s) is usually used to drink green tea.'

Reading 2: *'The small cup(s) is being used to drink green tea.'

5.2 Causative Resultatives

Although *le* by-it-self seems to conflict with argument reversal as we just analyzed, recall that in section 3.4. We show that causative resultatives can actually mediate such a conflict. As repeated below, adding morphemes like *zang* 'dirty' or *zui* 'drunk' would make the 'reversed' sentence much more natural, even in an episodic one with *le*.

(10) a. lvcha he zang le xiaobei.
green.tea drink dirty PERF small.cup
'Green tea caused the small cup to become dirty due to the drinking.'

Theme > Instrument

b. hongjiu he zui le Zhangsan.
wine drink drunk PERF Zhangsan
'The wine caused Zhangsan to be drunk.' Theme > Agent

Recall that we have already assumed that the Causal Power can be determined by both Typicality and Impact.

(11) $\textit{Causal Power}(k \rightarrow e) = \textit{Typicality}(e,k) \times \textit{Impact}(e)$

'*k*s are *e*' is true, or acceptable if and only if the *Causal Power* from *k* to *e*

is high.

In episodic sentences with *le*, the Typicality is incalculable for some reasons we have discussed. Thus no Causal Power could be contributed to the original lower thematic role so that it could become a CAUSER and take a higher position. However, Impact seems to be able to help. Take (10-b) for example, adding *zui* 'drunk' into the sentence clearly enhances the causal relation between 'the wine' and 'Zhangsan': The wine causes Zhangsan to be drunk. Such operation turns Zhangsan's role from an Agent to an Experiencer and turns 'the wine' into a Causer and eventually reorganizes the argument structure. From these, we find that argument structure is affected by not only verbs, and light verbs, but also by genericity and other syntactic structures.

5.3 English middles vs. Mandarin AR

Now recall the difference between Mandarin generics and English middle sentences. The restriction of English middles is repeated below.

(12) a. The car drives nicely.

b. Greek translates easily. (Keyser and Roeper, 1984)

(13) a. *The car drives (during) daytime.

b. *Greek translates (in) libraries.

(14) a. ?Yesterday, the mayor bribed easily, according to the newspaper.

b. ?At yesterday's house party, the kitchen wall painted easily.

(Keyser and Roeper, 1984)

We have already seen that both Mandarin Chinese generics and English middles are non-episodic. The difference is that English only allows non-canonical arguments in the subject position while Mandarin also allows non-canonical arguments in the object position. In other words, English middles only work for intransitive verbs while Mandarin AR generics also work for transitive verbs. We propose that both Mandarin Chinese generics and English middles share the same generic operator VOICE-GEN. Thus both languages calculate the probability of certain events and license the proper argument at the subject position. The reason why English doesn't tolerate postverbal non-canonical argument seems to be syntactic. This cross-linguistic difference between Mandarin and other languages with a similar middle structure (e.g., English, German, Russian (Ackema and Schoorlemmer, 2017)) calls for further study in the future.

5.4 Argument structure is determined compositionally

Another finding that calls for attention is that the argument structure is determined compositionally. More concretely speaking, previous research (e.g., Lin 2001; Li 2014) argues that the non-canonical argument and the Thematic Liberality in Mandarin are caused and affected by various combinations of light verbs and verbs, which would expect that argument structure should have nothing to do with higher-level functional head like tense, modal or aspect. This paper, however, proves that the argument structure is not only determined by verbs or light verbs, at least the viewpoint aspect is another factor to restrict the Thematic Liberality. For transitive verbs, only when a sentence is generic or non-episodic could it tolerate argument reversal since in that case. For episodic sentences, as the aspect is fixed, the argument structure still needs to follow the Thematic Hierarchy.

Chapter 6

Conclusion

Argument structure has been considered to be determined only by verbs and light verbs. Previous research uses the liberality of Mandarin's light verb combination to explain Mandarin's non-canonical arguments. This paper presents novel data to show the incompatibility of argument reversal and viewpoint aspects, which argues that the traditional Thematic Hierarchy cannot be violated unconditionally but has to under a certain environment. One of the environments is generics. Within generics, a traditional thematic role (e.g., Theme, Instrument) could undergo a probability calculation of events containing it. The qualified roles will be capable of taking a higher position as a new thematic role: a Causer. This actually leaves the broader Thematic Hierarchy unviolated. On the other hand, such probability calculations are unavailable in episodic sentences due to the requirements of generics. Our argument

expands the cognition that argument structure is affected on a larger scale, even to the aspect or modal level. This would help to understand phenomena like middle structure and other non-canonical arguments cross-linguistically.

Bibliography

Ackema, P. and Schoorlemmer, M. (2017). *Middles*, pages 1–73. John Wiley Sons, Ltd.

Barrie, M. and Li, Y.-H. A. (2012). Noun incorporation and non-canonical objects. *Proceedings of the 30th West Coast Conference on Formal Linguistics (WCCFL 30), ed*.

Carlson, G. N. (1977a). *Reference to kinds in English.* University of Massachusetts Amherst.

Carlson, G. N. (1977b). *Reference to kinds in English.* University of Massachusetts Amherst.

Chierchia, G. et al. (1995). Individual-level predicates as inherent generics. *The generic book*, 125.

Cohen, A. (1999). Generics, frequency adverbs, and probability. *Linguistics and philosophy*, 22(3):221–253.

Dowty, D. (1979). *Word Meaning and Montague Grammar: The Semantics of Verbs and Times in Generative Semantics and in Montague's Ptq*, volume 7. Springer Science & Business Media.

Dowty, D. (1991). Thematic proto-roles and argument selection. *Language*, 67:547–619.

Ellis, B. (1999). Causal powers and laws of nature. In *Causation and laws of nature*, pages 19–34. Springer.

Fagan, S. M. (1992). The syntax and semantics of middle constructions: A study with special reference to german.

Fillmore, C. (1968). I968. the case for case. *Universal* in Linguistic Theory. New York: Holt, Rinehart & Winston, I-90*.

Grimshaw, J. (1990). *Argument structure.* the MIT Press.

Harré, R. (1975). Causal powers. a theory of natural necessity.

Her, O.-S. (2009). Apparent subject-object inversion in chinese.

Huang, C.-T. J., Li, Y.-h. A., and Li, Y. (2009). *The syntax of Chinese*, volume 10. Cambridge University Press Cambridge.

Huang, J. (2006). Resultatives and unaccusatives: A parametric view. *Bulletin of the Chinese Linguistic Society of Japan*, 2006(253):1–43.

Jackendoff, R. S. (1972). Semantic interpretation in generative grammar.

Keyser, S. J. and Roeper, T. (1984). On the middle and ergative constructions in english. *Linguistic inquiry*, 15(3):381–416.

Kratzer, A. (1996). Severing the external argument from its verb. In *Phrase structure and the lexicon*, pages 109–137. Springer.

Kratzer, A. (2007). On the plurality of verbs. *Event structures in linguistic form and interpretation*, 269:300.

Kratzer, A. et al. (1995). Stage-level and individual-level predicates. *The generic book*, 125:175.

Larson, R. K. (1988). On the double object construction. *Linguistic inquiry*, 19(3):335–391.

Lawler, J. (1972). Generic to a fault', papers from the eighth regional meeting of the chicago linguistic society. *Chicago: University of Chicago Dept. of Linguistics 1972*, pages 247–58.

Li, Y.-H. A. (2010). Non-canonical objects and case.

Li, Y.-H. A. (2011). Non-canonical objects and case. , 49:21–51.

Li, Y.-H. A. (2014). Thematic hierarchy and derivational economy. *Language and Linguistics*, 15(3):295–339.

Lin, T.-H. (2001). *Light verb syntax and the theory of phrase structure*. University of California, Irvine.

Parsons, T. (1990). Events in the semantics of english: A study in subatomic semantics.

Pylkkänen, L. (2008). *Introducing arguments*, volume 49. MIT press.

Salmon, W. C. (1977). Objectively homogeneous reference classes. *Synthese*, pages 399–414.

Sheps, M. C. (1958). Shall we count the living or the dead? *New England Journal of Medicine*, 259(25):1210–1214.

Sybesma, R. (2021). Voice and little v and vo–ov word-order variation in chinese languages. *Syntax*, 24(1):44–77.

van Rooij, R. and Schulz, K. (2019). A causal power semantics for generic sentences. *Topoi*, pages 1–16.

Wu, J.-S. (2005). The semantics of the perfective le and its context-dependency: An sdrt approach. *Journal of East Asian Linguistics*, pages 299–336.

Zhang, N. N. (2018). Non-canonical objects as event kind-classifying elements. *Natural Language & Linguistic Theory*, 36(4):1395–1437.