

## **SOME NOTES ON THE TEMPORAL INTERPRETATION OF NOUN PHRASES IN MANDARIN\***

Wei-Cherng Sam Jheng  
*National Tsing Hua University*

### **ABSTRACT**

In this paper, I present a set of Mandarin data showing that the temporal interpretation of noun phrases (TIN) can be independent of that of clauses (clausal tense). I propose a formal semantic analysis to capture three TIN properties in Mandarin. Specifically, I motivate a stage-based analysis (Quine 1960), arguing that each host-individual ( $x$ ) is sliced into various temporal stages ( $x_{\%}$ ). The independent TIN results from the fact that each temporal stage ( $x_{\%}$ ) can be predicated of by different nominal predicates within the lifetime of the host-individual. This analysis is able to provide an elucidation of the phenomenon where noun phrases can be temporally anchored independent of clausal tenses. Along the same line, temporality-denoting expressions in Mandarin can be used to quantify over the stages of the host-individual, and specifically select a particular temporal stage for the computation of the independent TIN. This throws light on the puzzle of why the TIN is easily accessible when noun phrases are accompanied by overt temporal expressions in the form of adjectives or adverbials.

Key words: tense, temporal stages, temporal interpretation, noun phrases

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## **1. INTRODUCTION**

It has been widely acknowledged, or perhaps assumed, that there exist primitive and universal grammatical categories in linguistic theory, such as verbs, nouns, adjectives or prepositions. Nouns and verbs have attracted scrupulous attention due to their stark differences from other categories in three regards, that is, function, argument structure, and inflection. Nevertheless, drawing on data from other languages, such as Tariana (Nordlinger and Sadler 2001), Halkomelem (Wiltschko 2003), Somali (Lecarme 1996, 1999; Nordlinger and Sadler 2004a, b) or Tsou (Chang 2012a, b), it is revealed that noun phrases can also morphologically inflect for tense, aspect, and mood (henceforth TAM) to receive independent temporal interpretations. This amounts to a large degree of parallelism between the syntax of noun phrases and that of clauses in hosting a T(ense) node in the sense of generative syntax. This fact is revealing in a way that noun phrases can have a direct bearing on the TAM system and make their temporality/temporal interpretations independent of that of clauses. A morpho-syntactic analysis of the temporal interpretation of noun phrases (TIN henceforth) in some languages has been materialized by and large, but a semantic one remains a piece of the jigsaw. A mild sort of semantic curiosity is to examine whether the TIN can receive a semantic treatment.

Championed by Enç (1987), the temporal interpretation of noun phrases (NP) can be determined only by the context of utterance (Reichenbach 1947), as exemplified in (1), which is an assertion about the past fugitive who is in jail at present. The temporal span of the referent being a fugitive does not coincide with that of him/her being in jail (thus, a prisoner). This suggests that the temporal interpretation of the NP is independent of that of the clause. (1) is an instance of the TIN in English.

(1) Every fugitive is now in jail.

Intriguingly, a vantage point for discussion is whether the TIN is discernible in Mandarin. As illustrated in (2), suppose that there is a group of young professors attending Professor Lin's retirement party,

and these professors used to be Professor Lin's students in the past. One utters (2) while pointing to these professors:

- (2) Ni-men [<sub>NP</sub> **zhexie xuesheng**] xianzai yinggai haohaodi  
 you-PL these student now should sincerely  
 ganxie Lin jiaoshou-de zhidao.  
 thank Lin professor-POSS<sup>1</sup> guidance  
 'You students of the past should sincerely thank Professor Lin for his  
 guidance now.'

(2) shows that the individuals being students were true prior to the Speech Time (ST) of the verb *ganxie* 'thank', and at the ST these individuals actually assume a property of being professors. Besides, the verbal tense, signaled by the temporal adverb *xianzai* 'now', is specified as the present tense but the bold NP must be interpreted with respect to the past time. In addition to the past-tense oriented nominal interpretation, it is found that the NP can be temporally interpreted with respect to the future time, as shown in (3). Suppose that three singers, *Britney Spears*, *Justin Timberlake*, and *Christina Aguilera*, joined the *Mickey Mouse Club* as stage apprentices in the late 1990s, and became singers after 2000. In this scenario, the truth condition of the bold NP in (3) holds if and only if the individuals being singers is false before 2000 but true after 2000. The addition of the aspect *-le* provides an end-bound reading for the clause, denoting the realization of the resultative state arising from the endpoint of the joining event that occurred twenty years before. This resultative state ceases before 2000. Sentence (3) must be interpreted with respect to the past time, evidenced by the reference time provided by the temporal adverbial *ershinianqian* 'twenty years ago', but the temporal interpretation of the bolded NP must be severed from the clausal tense and anchored with respect to the future time, opposed to the past-time interpretation of the clause, when (3) was uttered, because

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<sup>1</sup> The abbreviations used in this paper include: AG for agreement markers, ASP for aspectual markers, ASS for assertion particles, COP for copular, CL for classifiers, EXT for extent markers, MOD for modifier markers, NOM for nominative markers, PASS for passive markers, PART for particles, PL for plural markers and POSS for possessive markers.

these individuals didn't assume a property of being singers twenty years before.

- (3) [<sub>NP</sub> **Zhexie geshou**] ershi-nian-qian canjia-le  
 these singer 20-year-ago join- ASP  
 Mickey Mouse julebu.  
 Mickey Mouse club  
 'These singers of the future joined Mickey Mouse Club twenty years ago.'

The above TIN facts illustrate the absence of overt tense markers that can be used to modify NPs, which have been observed in some languages, and NPs seem to be temporally bound by an element, say Operator (Op), in the universe of discourse, or by the Reference Time (RT). Of great interest is that a certain set of temporality-denoting expressions exist in Mandarin in the form of modifiers, as exemplified in (4), which seem to make explicit the presence of the TIN on NPs they modify, *yiqian* 'before' for example. (4) says that the NP *zuoxi* 'schedule' in which farmers arose in the early morning to get to work and go to bed early only held with respect to the past time.

- (4) [Context: Suppose that before the 1980s, farmers arose in the early morning to get to work and went to bed early. Suppose further that this daily schedule is not practiced by farmers nowadays anymore.]  
 Wo-men xianzai yinggai xiaofa **yiqian nongfu-de**  
 we-PL now should follow before farmers-POSS  
**zuoxi.**  
 schedule  
 'We should follow the schedule of farmers of the past now.'

With the addition of *yiqian* 'before', the past-tense interpretation of the bold noun phrase is easily obtained, compared with the absence of this temporal expression. The recalcitrant data in (4) raises a question regarding whether temporality-denoting expressions, when modifying NPs, can be analyzed as past tense markers. If not, an immediate question is what temporal contributions its presence makes to the TIN.

This paper will motivate discussions that combine empirical inquiry of the TIN facts, and formal explicitness. The paper is intended to examine an array of TIN facts in Mandarin with a formal semantic analysis proposed, and discuss issues involved in dealing with the TIN. The paper is organized as follows. The outset of section 2 mentions the syntax of tense in Mandarin (Lin 2003) in the interest of completeness because syntax has a direct bearing on the TIN. The remainder of section 2 is to provide an overview of the TIN properties in Mandarin with illustrative examples. Section 3 will start with a comparative study of similar TIN facts in Guaraní (Tonhauser 2007), and discuss the TIN asymmetries between Guaraní and Mandarin from a crosslinguistic perspective. The asymmetries throw a light on the nature of the TIN in Mandarin. A formal semantic analysis will be proposed subsequently. Section 4 concludes the paper with certain pending issues.

Before proceeding to the discussions on the TIN, let us begin with a brief sketch of the formal framework implemented in the paper. First, I assume that predicates of all categories have time arguments; that is, a semantic predicate  $P$  contributes an open formula, as shown in (5), to a semantic representation.

(5)  $P(x, t)$

Furthermore, I take the standard assumption that the time interval assigned to the time variable  $t$  cannot extend beyond the ST of the predicate, as summarized in (6).

(6) For all predicates  $P$ , individual  $x$ , time  $t$ ,  $P(x, t)$  is true iff  $x$  is  $P$  at  $t$  and  $t$  is included in the time interval during which  $x$  is  $P$ .

Tenses in points are dealt with free from complications irrelevant to the present argument. To make (5) and (6) relevant to our discussion, third, I assume that each NP is a (nominal) predicate itself, and takes a temporal argument, and such temporal argument is bound by some explicit or implicit quantifier to receive a value from the universe of discourse or context. (7a), for instance, says that an individual  $x$  is predicated of by a nominal predicate  $P$ , and the predicate takes a temporal argument, and

such argument is specified as prior to the ST, thus computing a past-time reading of the NP. The same reasoning applies to a present-time reading (7b), and a future-time reading (7c).

- (7) For all predicates P, individual  $x$  and times  $t$ ; (the superscript <sup>c</sup> represents the context)
- a.  $\llbracket [P(x, t) \& \text{PAST}(t)] \rrbracket^c = 1$  iff  $x$  is P at  $t$  &  $t < \text{ST}^c$ .
  - b.  $\llbracket [P(x, t) \& \text{PRES}(t)] \rrbracket^c = 1$  iff  $x$  is P at  $t$  &  $t$  at or around  $\text{ST}^c$ .
  - c.  $\llbracket [P(x, t) \& \text{FUT}(t)] \rrbracket^c = 1$  iff  $x$  is P at  $t$  &  $t > \text{ST}^c$ .

(7) is a simple account used to formalize the presence of the TIN. More empirical evidence and detailed semantic calculations will be proposed in section 3. Moreover, I will adopt a time-sequence model from Reichenbach (1947). Locating a situation in time linguistically involves three times: the Speech Time (ST), the moment of speech; the Event Time (ET), the time at which an event, predicative relation or state occurs or holds; and the Reference Time (RT), the temporal standpoint or perspective from which a situation is presented. (8) provides an overview of Reichenbach's model of tense in which tenses can be represented as a sequence of the three time points.

- (8)
- |              |                 |  |
|--------------|-----------------|--|
| a. E, R, S   | Present         | Sam is working   |
| b. S > E, R  | Future          | Sam will work.   |
| c. E, R > S  | Past            | Sam worked.  |
| d. E > R > S | Past perfect    | Sam had finished his homework<br><i>when his mother was home</i> <sub>(RT)</sub> .                 |
| e. S > E > R | Future perfect  | Sam will have finished his<br>homework <i>by the time his<br/>mother is home</i> <sub>(RT)</sub> . |
| f. E > S, R  | Present perfect | Sam has finished his homework<br><i>now</i> <sub>(RT)</sub>  |

Nevertheless, it is worth taking a moment to discuss two further issues here. First, if a predicate (P) takes one temporal argument ( $t$ ) and one individual ( $x$ ) to compute the temporal interpretation of the NP, what

provides a tense value for the temporal argument (*t*)? Second, the examples from (2) to (3) point to the importance of contextual cues, marked by the superscript <sup>c</sup> in (7). As indicated by one reviewer, this shows that the TIN is context-dependent/sensitive. I suggest that these two issues are two sides of the same coin. I follow Lin's (2015) proposal that Mandarin has (clausal) tense and tense is pronominal (See Partee 1973, 1984), which can be bound by a salient time in the context, usually the RT. I claim that the TIN be analyzed on a par with the clausal tense following Lin's analysis, (which will be detailed in section 2.4.2). Heavily simplified, the temporal argument of the P is bound by a RT, and such RT is equal to the ET of the predicate (P). This gives rise to a future reading, according to the time sequence in (8b). For example, the temporal argument of the NP *zhexie geshou* 'these singers' receives a tense value from the RT which comes from the context intended by the speaker and is equal to the ET of the property of being singers. Namely, this says that the individual (*x*) of being singers (P) holds true at the RT that is specified as the future time from the context intended by the speaker and is equal to the ET of the predicate *being singers* such that the predicate holds at the ET. This line of reasoning also applies to the past-time reading of the NP *zhexie xuesheng* "these students" in (2). However, the reasoning pursued here does not suffice. In other words, there is no way to differentiate between the TIN future time (RT=ET) or the TIN past-time reading (RT=ET), according to the time sequences (8). Thus, these two types of the TIN must be disambiguated by resorting to the ST of the verb (ST<sub>v</sub>) contained in the clause. In other words, the TIN can be specified relative to the ST<sub>v</sub> in the sense of relative tense (See Comrie 1985). Two scenarios are summarized as in (9). As one might notice, a determinative tense sequence in (9) is how ST<sub>N</sub> and ST<sub>v</sub> are ordered, which is sufficient to indicate a past TIN or a future TIN reading of the NP. Thus, I will only specify ST<sub>N</sub> and ST<sub>v</sub> in the following discussion. According to (9), (2) obtains a past reading because the ST<sub>N</sub> (in which the nominal predicate *xuesheng* 'student' holds true) precedes the ST<sub>v</sub> (the verb *ganxie* 'thank' specified as the present time), whereas (3) obtains a future reading because the ST<sub>v</sub> (the verb *canjia* 'join' specified as the past time) precedes the ST<sub>N</sub> (in which the nominal predicate *geshou* 'singer' holds true).

- (9) a. Past time TIN:  $(RT_N, ET_N > ST_N) > ST_V$   
 b. Future time TIN:  $ST_V > (ST_N > RT_N, ET_N)$

Therefore, I take the minimal assumptions that (i.) the TIN is context-dependent, a similar view advocated in Reichenbach (1947), because the RT which is a salient time from the context is determinative in providing a tense value for the temporal argument ( $x$ ), following Lin's (2015) analysis of the clausal tense, and (ii.) what differentiates between the past TIN and the future TIN can be attributed to how  $ST_N$  and  $ST_V$  are ordered.

A word of reminder is that I leave aside a distinction between strong nouns and weak nouns (Milsark 1977) because it is indeed a case that strong nouns trigger an independent temporal reading different from the temporal reading of a clause, which results from a quantificational force which strong NPs carry and which obligatorily imposes pre-existentiality or presupposition on the NPs. To relate such distinction to the TIN under consideration extends beyond the scope of this paper. The interested reader is referred to Musan (1995).

## 2. PROPERTIES OF THE TIN IN MANDARIN

Before proceeding to the TIN properties in Mandarin, it is worth recapitulating the fact that the clausal position of a NP affects its temporal interpretation. Lin (2003)<sup>2</sup> observes a subject-object asymmetry in obtaining the temporal interpretation of NPs. Consider a pair of sentences in (10). (11a) is a paraphrase of (10a), and (10b) is allowed to have two readings in (11b). (10a) says that these individuals the Principal apologized to carry the property of being students at the  $ST_V$ . In stark contrast, the first reading of (10b) is identical to (11a) while the second reading in (11b) says that the individuals the Principal apologized to might carry a property of not being students (suppose that

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<sup>2</sup> Some intricacies in Lin's analysis (2003) are left without further elaboration at the moment, such as the c-command relation, as they are problematic and will incur animated debates. I will leave them aside here.



these students already graduated before the Principal made an apology for his criticizing the students for being moronic in public).

- (10) a. Xiaozhang      zuihou    zai      yi-chang    xiaowu  
 principal      finally    in      one-CL    school.affair  
 huiyi      [PP    dui    zhexie    xuesheng]  
 meeting      to      these      student  
 daoqian-le.  
 apologize-ASP  
 ‘Finally, the Principal apologized to these students in one school meeting.’
- b. [PP    Dui    zhexie      xuesheng],    xiaozhang      zuihou  
 to    these      student      principal      finally  
 zai    yi-chang    xiaowu      huiyi  
 in    one-CL    school.affair      meeting  
 daoqian-le.  
 apologize-ASP  
 ‘Finally, the Principal apologized to these students in one school meeting.’
- (11) a. It must be a case that the individual  $x$  the Principal apologized to carries a property of being students at the  $ST_v$ .
- b. (i.) It must be a case that the individual  $x$  the Principal apologized to carries a property of being students at the  $ST_v$ .
- (ii.) It must be another case that the individual  $x$  the Principal apologized to carries a property of being others before the  $ST_v$ . (Suppose that at the  $ST_v$  these students had already graduated.)

This asymmetry results from the pied-piping of the PP *dui zhexi xuesheng* ‘to these students to a higher position out of the VP domain. Lin contends that when the NP in a postverbal position (VP domain), the temporal interpretation of this NP (in the PP) must be obligatorily bound by the ET provided by the VP (See Zagana 1990). By contrast, when the PP is pied-piped to a higher position, and escapes from the VP domain,

its temporal interpretation can be selectively bound by the ET of the verbal (= (11.b.i)) or the RT in the universe of discourse (= (11.b.ii)). In light of such asymmetry, I will focus on NPs in the non-postverbal domain with a view to excluding the obligatory binding of the ET of the VP, whenever necessary.

Along this line, it should be noted that Mandarin utilizes various mechanisms for determination of the temporal interpretation of sentences, according to Lin (2006), including default aspect, temporal adverbs, the tense-particles, and pragmatic reasoning. It is not my attempt to discuss whether the TIN in Mandarin chooses these mechanisms for computing the temporal interpretation of NPs, but the minimal assumption I take is that aspects attached to verbs indeed have a temporal effect on the temporal interpretation of sentences, and even NPs.

Through Section 2.1 to 2.3, three primary properties of the TIN with respect to the past time and the future time are discussed. Meanwhile, the TIN data from Guaraní (Tonhauser 2007) will be adduced to concretize crosslinguistic differences between Mandarin and Guaraní.

## **2.1 The Precedence Meaning Property**

The precedence meaning property states that the nominal predication (P) that an individual ( $x$ ) was subject to in the past time holds only prior to the ST of the verbal predicate (the  $ST_v$ ). Consider (12).

- (12) [Context: The Principal criticized some students for being morons in public, and was asked to apologize to them in a school affair meeting after some time. When the Principal apologized, these students had already graduated.]

- a. [pp Dui zhexie xuesheng], xiaozhang zuihou  
to these student principal finally  
zai yi-chang xiaowu huiyi  
in one-CL school.affair meeting  
daoqian-le.  
apologize-ASP  
‘Finally, the Principal apologized to these students of the past in one school meeting.’
- b.  $\llbracket \text{student}(x, t^*) \& \text{PAST}(t^*) \rrbracket^c = 1$  iff  $x$  is a student at  $t^*$  &  $t^* < \text{ST}_v$ .
- c. There is an individual  $x$  and a time  $t$  and a time  $t^*$ , such as that  $x$  is a student at  $t^*$  and  $t^* < \text{ST}_v$ .

From (12), it is shown that the individuals of being students were true prior to the  $\text{ST}_v$ , after which the property of being students ceases. This precedence meaning property can be attributed to a time sequence as  $t^* < \text{ST}_v$ . With respect to the future time, the precedence meaning property is formalized as  $\text{ST}_v < t^*$ , a natural translation of which says that the nominal predication of an individual is false at the  $\text{ST}_v$  and becomes true after the  $\text{ST}_v$ . Example (13) is an instance of the future time of the TIN.

- (13) [Context: Suppose that there was a group of students just passing the graduate school entrance exam, and would be official MA students as a new semester began. Professor Lin maintained a need to give them a lecture to prepare them for advanced studies in the graduate school.]

- a. Lin      laoshi      jiang      dui      zhexie  
Lin      teacher      will      to      those  
yanjiu-sheng      geiyu      jingshen      xunhua.  
graduate-student      give      spiritual      lecture  
'Mr. Lin will give those graduate students of the future a survival lecture.'
- b.  $\llbracket \text{graduate\_student}(x, t^*) \ \& \ \text{FUT}(t^*) \rrbracket = 1$  iff  $x$  is a graduate student at  $t^*$  &  $\text{ST}_v < t^*$ .
- c. There is an individual  $x$  and a time  $t$  and a time  $t^*$ , such that  $x$  is a graduate student at  $t^*$  and  $\text{ST}_v < t^*$ .

## 2.2 A Change of State Meaning Property

From a crosslinguistic perspective, two temporal nominal markers in Guaraní, *-kue* and *-ra*, impose a change of state on the NP they modify. Take the past-tense oriented marker, *-kue*, for example. (14b) is an infelicitous continuation of (14a) because of the absence of a change of state; that is, *Juan* cannot be a teacher from the past to the present without an interval of being a non-teacher. One strategy for repairing the infelicity is the insertion of the adverb *jey* 'again', as shown (14c), in which *Juan* resumes the property of being a teacher.

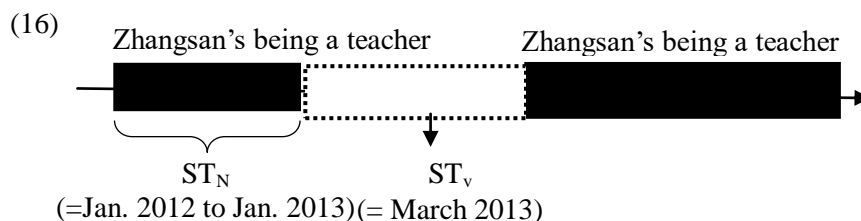
- (14) a. Juan     petei            mbo'e-ha-ra-kue.  
           Juan     one            teach-NOM-AG-KUE  
           'Juan is a former teacher.'
- b. #...ha            mbo'e-ha-ra            gueteri  
           and        teach-NOM-AG        still  
           '... and he's still a teacher.'
- (Tonhauser 2007:(13))
- c. Juan     petei            mbo'e-ha-ra-kue,     ha     ko'aga  
           Juan     one            teach-NOM-AG-KUE     and     now  
           mbo'e-ha-ra            jey.  
           teach- NOM-AG        again  
           'Juan is a former teacher, and now he's a teacher again.'
- (Tonhauser 2007:(14))

The change of state meaning is also attested in Mandarin. Consider (15). The infelicity of the bold NP in (15a) can be obtained in a context that *Zhangsan* is not a teacher anymore when the Principal meets him in March 2013; in other words, the individual's property of being a teacher ceases at the ST<sub>v</sub> of the Principal. Interestingly, given this context, (15b) can be a felicitous continuation of (15a) if and only if that *Zhangsan* is not a teacher at the ST<sub>v</sub>. Similar to the adverb *jei* 'again' in (14c), the adverb *zai* 'again' triggers a resumption of *Zhangsan*'s being a teacher in (15b). If the past-time interpretation of the bold NP in (15a) can be obtained, it can be a case that this NP takes a temporal argument from the universe of discourse.

(15) [Context: Zhangsan is a one-year contract-based teacher of one class in a junior high school in January, 2012. After one year, say January, 2013, his contract expired. The Principal calls for a meeting with this teacher in March, 2013.]

- a. Xiaozhang    jue ding    gen    **na-wei**    **laoshi**  
 principal    decide    with    that-CL    teacher  
 jianmian    taolun    xuesheng-de    biao xian.  
 meet    discuss    student-MOD    performance  
 ‘The principal decides to meet up with that teacher of the past to discuss the performance of students (in that class).’
- b. ...    bing qie    kaolu:    zai    pin    na-wei  
          and    consider    again    hire    that-CL  
 laoshi.  
 teacher  
 ‘...and considers continuing to hire that teacher of the past...’

(16) sketches the temporal relation between (15a) and (15b), illustrating that *Zhangsan*’s being a teacher in the past time does not overlap with that in the future time. The non-overlapping part, marked in dotted lines, instantiates a temporal interval between two states ( $ST_N$  represents the speech time of the NP).



The effect of a change of state also is obtained for the future-oriented nominal interpretation in Guarani, as in (17). For (17) to be felicitously uttered, according to Tonhauser (2007), the nominal property of the individuals must be false between the ST of the clause and that of the NP-*ra*. Specifically, the property of Marco's being a farmer is true at the ST but false between the ST and the ST of the NP-*ra* (the future time). Then, the property is true at the ST of the NP-*ra*.

- (17) [Context: Marco is currently a farmer but has to move to the city for a couple of years. After that, he wants to come back to his land and be a farmer again.]

Marco     petei   chocokue   ha     Marco     aveio     petei  
 Marco     one     farmer     and     Marco     also     one  
 chocokue-ra.  
 farmer-RA

‘Marco is a farmer and he is also a future farmer.’

(Tonhauser 2007:(17))

Of great interest is that such change of state is also found in the future-time TIN in Mandarin. (18) allows one reading that the property of *Zhangsan*’s being a farmer is true at the  $ST_v$ , and false between the  $ST_v$  and the  $ST_N$ .

- (18) [Context: Zhangsan is currently a farmer but has to move to another city for a couple of years. After the years, he wants to come back to his land and be a farmer again.]

Zhangsan     xianzai     shi     nongfu     erqie     zhihou  
 Zhangsan     now     COP     farmer     and     later  
 yeshi     **nongfu.**  
 also     farmer

‘Zhangsan is a farmer, and also a farmer later.’

Nevertheless, it is found that this change of state meaning cannot be a necessary condition on the licensing of both the past-time and the future-time nominal interpretation, as evidenced by (19). A natural translation of (19a) attests a past-time interpretation of the bold NP, saying that *Zhangsan* might not be the teacher of this class, because the property of *Zhangsan*’s being the teacher holds true prior to the  $ST_v$ . Despite this, (19b) is still a felicitous continuation of (19a), which amounts to saying that there is no interval between the  $ST_v$  and the  $ST_N$  between (19a) and (19b).

(19) [Context: Suppose that in 2014 Spring Lisi is reporting the performance of a class in 2013 Fall to Wangwu. He utters (19a) to Wangwu while pointing to this class on the paper.]

- a. **Zhe-ge**      **banji-de**      **daoshi**      shi  
     this-CL      class-MOD      advisor      COP  
     Zhangsan.  
     Zhangsan  
     ‘Zhangsan was the advisor of this class (of the past).’
- b. Erqie    ta    xianzai    hai    shi      **zhe-ge**  
     and    he    now      still    LIK      this-CL  
     **banji-de**      **daoshi**.  
     class- POSS    advisor  
     ‘and he is still the advisor of this class.’

The data in (19) suspends the effect of a change of state in licensing the past-time/future-time nominal interpretation, which is obligatorily motivated in Guaraní temporal nominal interpretations. Then, how do we account for the suspension in Mandarin? A viable solution is to postulate that the TIN in Mandarin involves implicature rather than assertions of a property. Consider (20). In English, (20a) does not assert that Cecilia is sick at the ST; instead, it triggers the implicature that Cecilia might be not sick at the ST<sub>v</sub> but it is possible that she is sick at the ST<sub>v</sub>. Thus, (20b) is a felicitous continuation of (20a).

- (20) a. Cecilia was sick on Thursday.  
         (Implicature: Cecilia is not sick at ST)  
     b. She is still sick today.

Consider (19) again. It seems to be the case that (19a) only triggers the implicature that *Zhangsan* might not be the teacher of this class before the ST<sub>v</sub> but, in the meantime, opens a possibility that he can be the teacher at the ST<sub>v</sub>.

In view of the suspension of a change of state, the TIN does not request a temporal interval between the ST<sub>v</sub> and the ST<sub>N</sub>. An immediate question arises; if a nominal predication (P) can last without a temporal interval, the TIN might lose its status in accounting for the temporal



anchor of a nominal predication (imagine that time is a flat line without any boundary, no period of temporal frame being specified). To solve the complicated matter here, I suggest that the TIN in Mandarin only points out the time in which a given nominal predicate (P) of an individual (x) is true prior to or after the  $ST_v$ . (21) summarizes two types of the TIN under consideration in Mandarin.

(21) a. Past-tense nominal interpretation

$\llbracket P(x, t^*) \& \text{PAST}(t^*) \rrbracket^c = 1$  iff  $x$  is predicated of at  $t^*$  &  $t^* < ST_v$

b. Future-tense nominal interpretation

$\llbracket P(x, t^*) \& \text{FUT}(t^*) \rrbracket^c = 1$  iff  $x$  is predicated of at  $t^*$  &  $ST_v < t^*$

### 2.3 The Lifetime Effects

The third TIN property says that the existence of an individual or a property (P) denoted by a NP must hold true at the  $ST_v$ . Lin (2003) interprets this restriction as pre-existentiality imposed on the past-time interpretation of NPs, as exemplified in (22). The infelicity of (22) results from the fact that dinosaurs do not exist at the  $ST_v$  (of the verb *pao* ‘run’), which is specified as the present time. The observation of (22) is an instance of the lifetime effect, which requests that the lifetime span of a given individual must extend to or overlap the  $ST_v$ .

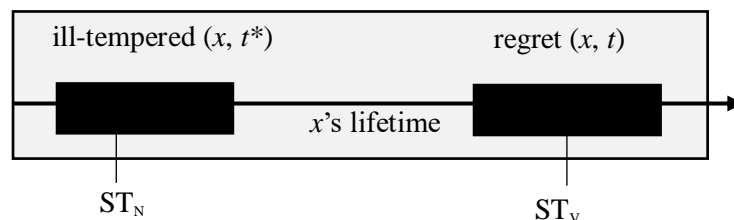
- (22) #Yiqian-de konglong pao-de hen kuai.  
 before-MOD dinosaur run- EXT very fast  
 ‘Dinosaurs of the past run very fast.’

If the lifetime effect must be exerted on the P, the infelicity of (23a) is therefore accounted for, compared with the felicity of (23b); namely, *John F. Kennedy* died in 1961, so his lifetime span cannot extend to the  $ST_v$  (the future time), whereas in (23b) the lifetime of *Bill Clinton* overlaps the  $ST_v$  though the property of being a president was true only prior to the  $ST_v$ .

- (23) a. [Context: Suppose that the former President of the United States, *John Fitzgerald Kennedy*, will visit Taiwan next year.]  
 # **Meiguo** **zongtong** jiang baifang Taiwan.  
 American president will visit Taiwan  
 ‘The American president (of the past) will visit Taiwan.’
- b. [Context: Suppose that the ex-President of the United States, *Bill Clinton*, will visit Taiwan next year.]  
**Meiguo** **zongtong** jiang baifang  
 American president will visit  
 Taiwan.  
 Taiwan  
 ‘The American president (of the past) will visit Taiwan.’

More evidence for the lifetime effect comes from (24). Suppose that *Zhangsan* was ill-tempered in the past time, and in the present time he feels regretful about it. In this context, the felicity of the bold NP in (24) holds. By contrast, if *Zhangsan* died or does not exist at the  $ST_v$ , the felicity of (24) fails to hold. The gray part represents the lifetime of *Zhangsan*.

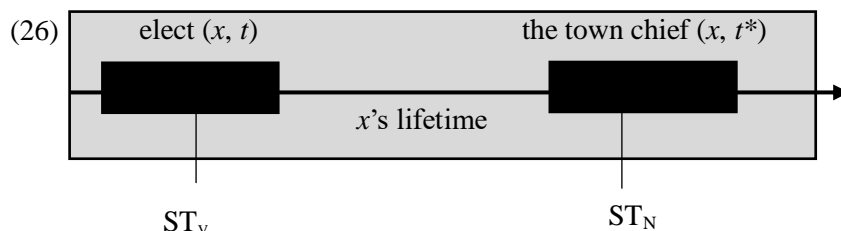
- (24) a. Zhangsan hen aohui jizi-de **huai**  
 Zhangsan very regretful self -POSS bad  
**piqi** (cengjing zaocheng henduo ren kunrao).  
 temper ever cause many people trouble  
 ‘Zhangsan is regretful about his bad temper (of the past), which used to trouble many people.’
- b.  $\exists x \exists t \exists t^* [(Zhangsan(x, t) \& Zhangsan's\_being\_ill\text{-}tempered(x, t^*) \& PAST(t^*))]$
- c. There is an individual  $x$  and a time  $t$  and a time  $t^*$ , such that  $x$  is *Zhangsan* at  $t$  and *Zhangsan's being ill-tempered* at  $t^* < ST_v$ .
- d.



A caveat is that both the  $ST_N$  *ill-tempered* and that  $ST_V$  *regret* must be within the lifetime frame of the individual, *Zhangsan* (marked in gray). The preceding discussion focuses primarily on the past-tense nominal interpretation, but an immediate question is whether the future TIN exhibits such a property. Consider (25). Suppose that *Zhangsan* was elected the town chief this year, and next year will take on the role of a town chief. For (25) to be felicitous, it must be the case that *Zhangsan* is not only alive at the  $ST_V$  but also next year so as to become the town chief. By contrast, the infelicity of the bold noun phrase arises if *Zhangsan* was deceased before the  $ST_N$ .

- (25) a. Zhangsan      bei      xuan      wei      **zhe-ge**    xiao  
          Zhangsan      PASS    elect    as      this-CL    small  
          **zhen-de**      **zhenzhang.**  
          town-MOD    chief.town  
          ‘Zhangsan is elected the town chief of this small town (of the future).’  
       b.  $\exists x \exists t \exists t^* [(Zhangsan(x, t) \& \text{town chief}(x, t^*) \& \text{FUT}(t^*))]$   
       c. There is an individual  $x$  and a time  $t$  and a time  $t^*$ , such that  $x$  is *Zhangsan* at  $t$  and *Zhangsan's being a town chief* at the  $ST_V < t^*$ .

How do we account for this? This is so simply because an individual, *Zhangsan*, can be the town chief during his lifetime of existence; deceased people cannot participate in any eventuality in both the present time and the future time. In this light, the NP *zhege xiaozhen zhenzhang* ‘the town chief of this small town’ and the predicate *shi* ‘become’ imposes a lifetime existence restriction on the arguments ( $x$ ) they take. As depicted in (26), the  $ST_N$  of the NP *zhege xiaozhen zhenzhang* ‘the town chief of this small town’ and the  $ST_V$  of *xuan wei* ‘elected as’ must be included in the lifetime of the individual  $x$  ( $= Zhangsan$ ).



Yet, a reviewer points out that there are two problems with the lifetime effect discussed above. First, the reviewer indicates that it is impossible for one to regret a future situation. Along this line, the reviewer shows that the predicate *yihan* ‘regret’ is incompatible with a deceased person since a deceased person cannot regret anything. Second, it remains unclear whether such an effect is due to pragmatics or world knowledge. I will discuss these problems in the following paragraphs.

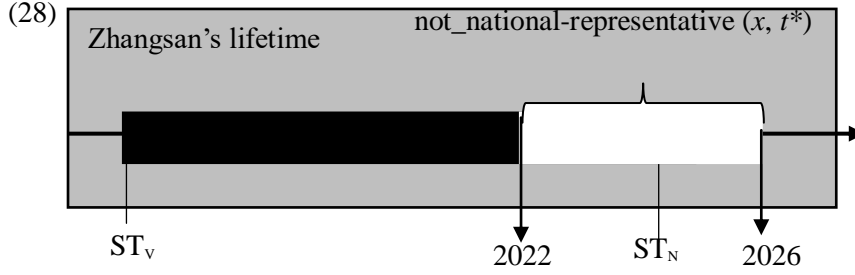
First, I suggest that it is possible for one to regret a future situation. Consider (27).<sup>3</sup> The context says that *Zhangsan*’s being the national representative holds true at the  $ST_v$  but his feeling regretful overlaps his not being the national representative at the  $ST_N$ , whose temporality is measured from 2022 and ends sometime in the future if he re-assumes the representative status in another Olympics event in the far future, in 2026 for example. The diagram in (28) illustrates such a temporal relation.

(27) [Context: Zhangsan is a national representative of Taiwan in weightlifting in the Olympics of 2016, but is not selected as the national representative in weightlifting for the Olympics in 2022, and feels disappointed.]

Zhangsan	yihan	wuyuan	chengwei	daibiao
Zhangsan	regret	no.chance	become	represent
<b>Taiwan</b>	<b>de</b>	<b>Aolinpike</b>	<b>guoshou.</b>	
Taiwan	MOD	Olympics	national.representative	

‘Zhangsan regrets that he will not be the national representative of Taiwan in weightlifting for the Olympics in 2022.’

<sup>3</sup> The verb *yihan* is due to one reviewer’s suggestion, which makes this sentence sound more acceptable.



The future reading in (27) can be interpreted as the  $ST_N$  being included within the  $ST_v$ . A word of clarification is that in (27) the bare NP *guoshou* should be interpreted as ‘not being the national representative’ according to the context established here.<sup>4</sup> Assuming Kratzer (1998) and Partee’s (1973, 1984) pronominal tense system, Lin (2015) argues that the (clausal) future tense reading arises from the imperfective reading, as formalized in (29), where the RT is included in the ET ( $t \subseteq \text{time}(e)$ ), and the RT provides a tense value for the tense ( $t$ ). Following his insight, the imperfective reading (or the future time) of the NP *guoshou* in (28) can be derived as follows. The individual not being a national representative holds true in 2022, and the RT is 2022. Also, the event of the predicate (=the ET) *yihan* ‘regret’ does not have an endpoint, lacking the realization of the resultative state arising from the attachment of the endpoint. Naturally, the RT of the NP is within the ET of the predicate *yihan*. In this light, let’s apply the imperfective function (29) to the NP *guoshuo* ‘the national representative’, as illustrated in (30), which takes the RT (=2022) as a constant assigned to the pronominal tense.<sup>5</sup> (30a-c) illustrates the calculation of the future interpretation of the NP *guoshou* ‘national representative’ in (27). The semantic calculation of the future

<sup>4</sup> Admittedly, this negative reading might be related to the lexical item *wuyuan* ‘no chance’. I will leave this aside as it doesn’t directly affect the line of reasoning pursued here.

<sup>5</sup> Lin (2015) applies the function in (30a-c) to the clausal tense; however, his analysis is able to be applied to the calculation of the future TIN, though certain modifications are needed. I will leave it aside for expository reasons but focus on the fact that the NP, when used with the verb *yihan* ‘regret’, is able to have a future reading.

reading is not conclusive, but suffices to show that a future reading is compatible with the use of the verb *yihan* ‘regret’.

- (29) Imperfective:  $\lambda P_{\langle I, \langle s, t \rangle \rangle} . \lambda t_i . \lambda w_s . \exists e_1 (t \subseteq \text{time}(e) \ \& \ P(e)(w) = 1)$   
‘Reference time included in event time’  
(qtd in Lin 2015:(50))

- (30) a. Predicate:  $\lambda t_i . \lambda w_s . \exists e_1 (t \subseteq \text{time}(e) \ \& \ \text{Zhangsan-not-national-representative}(e)(w) = 1)$   
b. Pronominal tense: the reference time  $r (=2022)$   
c. Conversion:  $\lambda t_i . \lambda w_s . \exists e_1 (t \subseteq \text{time}(e) \ \& \ \text{Zhangsan-not-national-representative}(e)(w) = 1)(r) = \lambda w_s . \exists e_1 (r \subseteq \text{time}(e) \ \& \ \text{Zhangsan-not-national-representative}(e)(w) = 1)$   
(Lin 2015:(53) and (54))

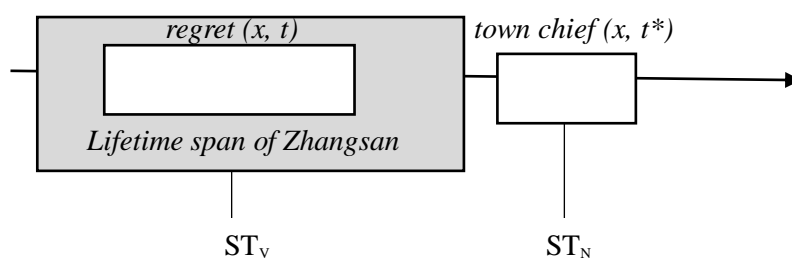
Regarding the problem that the predicate *yihan* ‘regret’ is incompatible with deceased people, I suggest that this incompatibility can be accounted for by the lifetime effect. The lifetime effect states that the future reading of the NP holds true if and only if the  $ST_N$  is included within the life span of the individual ( $x$ ). Consider the example in (31). *Zhangsan*’s identity of being the town chief holds true after he becomes the town chief. Viewed with respect to the lifetime effect, the future reading of the NP *zhenzhang* must be included within the life span of *Zhangsan*. If *Zhangsan* died at the  $ST_v$  of (32), (31) becomes infelicitous, as evidenced by the continuation (32) of (31). The addition of *-le* yields a bound reading, denoting the realization of the resultative state arising from the attachment of the endpoint of the dying event. Diagram (33) is the temporal sketch of (31) and (32), and shows that the lifetime effect imposes a restriction on a temporal relation where the  $ST_N$  is not included within the lifetime span of the individual (marked in gray).

- (31) [Context: Zhangsan feels regretful after realizing that there is a cut in the salary of the next town chief (due to the reduced state financial revenues) because he spent much money on the election campaign.]

Zhangsan yihan xuan wei xia-yi-ren  
 Zhangsan regret elect as next-one-CL  
 zhenzhang.  
 town.chief  
 ‘Zhangsan regrets being elected as the town chief.’

- (32) #danshi ta si-le.  
 but he die-ASP  
 ‘However, he died.’

- (33)



(33) also predicts that the future reading of the NP is blocked. In this light, another way of specifying the restriction of the lifetime effect is that it requests that the  $ST_N$  must be included with the lifetime span of an individual; otherwise, a future reading is impossible when an individual involved is deceased and its future status/property cannot hold true because his lifetime span fails to include the  $ST_N$ . As will become apparent, a stage-based analysis, as will be put forward in section 3.2, predicts when a temporal stage of the individual ( $x$ ) does not exist in the future, a property ( $P$ ) anchored at the  $ST_N$  fails to take the individual ( $x$ ) as its argument.

In response to the second problem, I suggest that the lifetime effect can be considered a semantics-pragmatics interface notion; to be specific, there is a division of labor between semantics and pragmatics in

formalizing the lifetime effect. First, the lifetime effect only ensures the felicity of an NP (which has an independent temporal interpretation) in a context; that is, whether the NP is felicitously uttered in the context. Consider two examples below from Guaraní. The past-denoting marker *-kue* is incompatible with the NP *pa'i* 'priest' in (34), but compatible with it if the possessive marker is added in (35). Tonhauser (2007) contends that this is due to the fact that the individual, *Jose*, being a priest ceases to exist as *Jose* died, and the marker *-kue* cannot modify such nominal predication because the individual does not exist at the ST<sub>v</sub>. (35) is slightly different from (34) in a way that there is a possessive relation between the priest *Jose* and (the individuals of) the community. Even if the lifetime effect cannot be satisfied by the existence of *Jose*, it can be satisfied by the lifetime existence of (the individuals of) the community.

- (34) [Context: The town of San Isidro once had a priest called Jose. This man died as a priest.]

#pe pa'i-**kue** Jose  
that priest-kue Jose  
'that ex-priest'

(Tonhauser 2007:(21))

- (35) [Context: The town of San Isidro once had a priest called Jose. This man died as a priest.]

ore-pa'i-**kue** Jose  
1.PL.EXCL-priest-kue Jose  
'our ex-priest Jose.'

(Tonhauser 2007:(22))

Adopting Tonhauser's insight, the temporal interpretation of an NP is checked against the existence of the NP. This is a pragmatic aspect of the lifetime effect. The semantic aspect of the lifetime effect is that the temporal interpretation of an NP can be calculated; however, whether the NP can be felicitously uttered depends on its felicity condition in the context. In other words, the semantic aspect does not ensure the felicity of the NP in the context. Following this line of reasoning, (34) or (31-32) is semantically acceptable but its felicity in the context renders itself



unacceptable. I agree that the TIN facts bear directly on semantics and pragmatics but, as will be detailed later, the semantic aspect of the lifetime effect is attributed to Nocc in modal semantics, Best (Circ, Nocc, P), following Kratzer (1991, 1998).

Summarizing, the third TNI property says that  $ST_N$  must overlap  $ST_v$  within the lifespan of an individual, formalized as the lifetime effect.

## **2.4 Remaining Issues from a Comparative View**

In addition to the above properties, I will address two further issues surrounding the TIN, and suggest that the TIN bears a resemblance to clausal tenses.

### **2.4.1 Productivity**

As put forward by Nordlinger and Sadler (2004:778-779), four diagnostics are formulated to pin down the existence of nominal tense (in a morph-syntactic sense), as summarized in (36)

(36) Diagnostics for nominal tense

- a. *Temporal distinction*: Nouns (or other NP/DP) show a distinction in one or more of the categories of tense, aspect, and mood, where these categories are standardly defined as they would be for verbs.
- b. *Productivity*: This TAM (tense, aspect, mood) distinction is productive across the word class and not simply restricted to a small subset of forms.
- c. *Encoding on arguments/adjuncts*: The TAM distinction is not restricted to nominals functioning as predicates of verbless clauses but is encoded on arguments and/or adjunct NP/DPs in clauses headed by verbs.
- d. *Not as a syntactic clitic*: The TAM marker is a morphological category of the nominal word class and cannot be treated as a syntactic clitic that merely attaches phonologically to the NP/DP.

Of the four diagnostics, productivity is the one Tonhauser (2007) takes to for the bulk of evidence casting a doubt on the statement of the nominal tense in Guaraní. She observes two kinds of nouns which cannot be modified by the Guaraní past-oriented nominal marker, *-kue*, such as food artifacts *kesu* ‘cheese’, and natural kinds (*water*, for instance). The former cannot be modified by *-kue* because this type of noun must obey structural homogeneity (Krifka 1992), as stated in (37). According to (37) once cheese is cut into several pieces, these pieces are still cheese, which does not satisfy a requirement of a change of state meaning property imposed on the licensing of the past-time nominal interpretation. By contrast, natural kinds are conceptualized as denoting permanent stages and permanent properties of an entity, whose existence terminates as it changes.

- (37) If *P* is the property denoted by an artifact noun, and *P*(*x*) is true at a time *t*, then the entity *x* is structurally homogeneous if and only if, for all proper parts *y* of *x*, *P*(*y*) is true at *t*.

(Krifka 1992:(26))

Nevertheless, the TIN facts in (38) and (39) in Mandarin challenge this view. The NP *qisi* ‘cheese’ in (38) has become spoiled at the *ST<sub>v</sub>* and is totally different from what it was in terms of taste or color, for example, when produced in the first place (that is, the *ST<sub>N</sub>*). A major point made here is that the NP *qisi* ‘cheese’, when uttered in the context (38), is not cheese anymore but its presence in the utterance is still felicitous if and only if the hearer interprets it with respect to the past time when it was indeed cheese and was not yet spoiled.

(38) Artifact

[Context: There was a large piece of cheese which expired yesterday and became spoiled. Zhangsan is thinking how to handle it.]

Zhangsan	xianzai	zai-xiang	zeyang	chuli
Zhangsan	now	ASP-think	how	handle
<b>zhe-kuai qisi.</b>				
this-CL	cheese			

‘Zhangsan is thinking how to handle this piece of cheese (of the past) now.’

Similarly, for natural kinds, which cannot be modified by the past-tense marker *-kue* in Guarani, the NPs of this type in Mandarin can be interpreted with respect to the past time, as evident in (39). For the bold NP *shuikude shui* ‘the water of the reservoir’ to be felicitously uttered at the ST<sub>V</sub>, it must be interpreted with respect to the past (that is, before the ST<sub>V</sub>).

(39) Natural kinds

[Context: Water in a reservoir was polluted due to the long-term deforestation and became non-drinkable thick liquid. The government takes immediate measures to purify it.]

Zhengfu	jueding	zhuoshou	chuli
government	decide	embark	handle
<b>shuiku-de</b>		<b>shui,</b>	(xiwang keyi
reservoir-POSS	water	hope	possible
yi-nian	nei	wancheng).	
one-year	able	finish	

‘The government decides to handle the water of the reservoir, (with the hope that the work can be finished within one year.)’

One reviewer wonders whether (39) constitutes a counterexample to (23a) by suggesting that if the cheese is spoiled, its existence seems to cease and there is no way to derive a temporal interpretation of it. I agree with the reviewer’s comment but (39) and (23a) yield more support for the pragmatic aspect of the lifetime effect. First, another way of viewing the entity of *cheese* is to treat it as an entity/substance (*x*) of carrying

properties necessary for it to become cheese in terms of taste, color, and so on. However, its existence must remain constant at the  $ST_v$ . Given the existence, it is possible that such entity/substance ( $x$ ) is able to bear other properties. This line of reasoning also applies to the NP *shui* ‘water’ by treating it as an entity/substance ( $x$ ) of bearing necessary properties for it to become what pragmatics or world knowledge defines as water, such as liquids,  $O_2$ , etc. Second, note that it is possible for *shui* ‘water’ to have a future reading, as in (40). At the  $ST_v$ , the NP *water* bears a property of being polluted but at the  $ST_N$ , it will bear another property of being disinfected. (40) is taken to show that the entity water must exist not only at the  $ST_N$  but also the  $ST_v$ . The fact that the Mandarin TIN does not obey structural homogeneity (37) remains to be resolved. However, this can be accounted for. As will become apparent, in section 3.2, I will argue that this is due to modal semantics, Nocc in Best (Ciric, Nocc, P), that is to ensure the realization of the property P in the future, in conjunction with the lifetime effect.

- (40) [Context: Suppose that the Environmental Protection Administration (EPA) is taking necessary measures to purify the polluted water in the reservoir by pouring a certain amount of disinfectant liquid into the reservoir now to kill viruses. However, after the purification work, the EPA needs to solve how to remove the disinfectant remaining in the water.]

Huanbaoshu	xia-yi-bu	yao	xiang-zhe	ruhe
EPA	next-one-step	must	think-ASP	how
chuli	zhe-yi-qu	de	shui.	
deal	this-one-CL	MOD	water	

‘The EPA needs to think how to handle the water of the future, (which will contain the disinfectant remaining after the amount of disinfectant liquid is poured into it).’

The observations above make three points. First, Tonhauser’s doubt about the universality of productivity for nominal tense (or the TIN in our sense) needs to be scrutinized further because artifacts and natural kinds in (38) and (39), respectively, can receive an independent temporal interpretation, apparently violating structural homogeneity. Second, it is

also found that the lifetime effect is also exerted on (38) and (39). Put in another way, the existence of artifacts and natural kinds must exist at the  $ST_v$ .

#### 2.4.2 Tense as a Pronominal in Mandarin?

The TIN facts above show that an NP can take a temporal argument for the composition of temporal interpretation. An immediate question, one might raise, is what this temporal argument is. I suggest that the temporal argument is similar to tense and is referential.

Partee (1973, 1984) proposes that tense can be treated as the representation of a pronominal, and it refers to a time salient in the context, which is used as the reference time determining the temporal interpretation of a sentence. Consider one English past tense sentence below.

(41) John didn't turn off the stove. (Partee 1973:602)

Following Partee's analysis, when uttered halfway down the turnpike, (41) does not mean that there exists some time at which John did not turn off the stove or there exists no time in the past at which John turned off the stove; instead, (41) refers to a definite time interval whose identity can be inferred from the extra-linguistic context, similar to (42), where *she* is clear from the utterance context accompanied with a gesture pointing to a woman, for example.

(42) She shouldn't be here.

The identification of the time interval in (41) and the woman (referring to *she*) in (42) can be made known to any hearer that has the requisite knowledge of the situation and the conversational requirements of relevance.<sup>6</sup> Besides, Partee's pronominal tense system also indicates an asymmetry between pronouns and tense; a sentence containing a full NP

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<sup>6</sup> As claimed by Partee, the English present tense and the past tense behave differently; the former can be analyzed as the first person *I*, which has an unambiguous and unique referent, whereas the latter is vague in its reference

does not require a pronoun as an addition, whereas a sentence has a tense regardless of the presence of a temporal adverbial. In a sentence like (43), the time specification of the sentence is provided by the adverbial *four weeks ago*, and the tense seems to be redundant.

(43) We went to America four weeks ago.

Then, what role does this temporal adverbial play in the composition of the tense interpretation of (43)? Partee hypothesizes that a tense morpheme serves as the variable that can be quantified by an adverb. Two pieces of evidence are provided as follows. Consider the example (44a), which can be paraphrased as in (44b). It is apparent that the tense in (44a-b) is quantified by the universal quantifier *never*, which amounts to the variable nature of the tense that can be bound. The other piece of evidence related to this variable-binding phenomenon comes from the *if*-sentence in (45). Partee claims that the present tense in the subordinate clause is bound by the present tense in the *if*-clause, whereas the immediate future in the subordinate clause is measured from the time of Susan's arrival. Given this line of reasoning, it follows that tense behaves like a variable and can be bound by a universal quantifier *never* in (44) or an existential one *if*-clause in (45).

- (44) a. John never talks when he is eating. (Partee 1973:(21c))  
b. There is no time  $t$  such that John talks at  $t$  and John is eating at  $t$ .  
(Partee 1973:(21c'))

(45) If Susan comes in, John will leave immediately.  
(Partee 1973:(15))

Now, let us return to the TIN facts in Mandarin. Though Partee's pronominal tense system primarily deals with the temporal interpretation of English sentences, (or traditionally called the clausal tense), it still applies to the TIN in Mandarin.

Mandarin seems to be a case that the TIN is pronominal in nature, freely bound by a quantifier, though covert, in the discourse of the universe. To corroborate such a view, consider (2), repeated as in (46),

where a tense-denoting expression is present. Sentences (47a-b) are the possible paraphrases of (4).

- (46) [Context: The Principal criticized some students for being morons in public, and was asked to apologize to them in a school affairs meeting after some time. When the Principal apologized, these students had already graduated.]

Xiaozhang      xianzai      zai      yi-chang      xiaowu  
principal      now      in      one-CL      school.affair  
huiyi      dui      qunian-de      xuesheng.  
meeting      to      last.year-MOD      student  
daoqian-le.  
apologize-ASP

‘Now, the Principal is apologizing to the students of the last year in one school meeting.’

- (47) a. #It must be a case that the individual  $x$  the president is apologizing to is a student.  
b. It must be a case that the individual  $x$  the president is apologizing to is not a student.

As discussed at the outset of section 2, the NP in a postverbal position can be bound by the ET provided by the verb. Following this line of reasoning, we predict that (46) is predicted to obtain the reading in (47a), because the verb can provide the  $ET_v$  which corresponds to  $ST_v$ , as signaled by the adverb *xianzai* ‘now’. The prediction is not borne out, actually, due to the presence of a closer temporal adverbial *qunian* ‘last year which binds the temporal interpretation of the bold NP in (46). The fact in (46-47) says that such temporal adverbial respects the temporal effect (Lin 2003) and exerts its past-time orientation on the NP it modifies. It seems that the TIN in Mandarin, at first glance, relies on the modification of a temporality-denoting expression, such as *qunian* ‘last time’. Lin (2003) argues for a semantic representation of *yiqian* ‘before’ in (48), and claims that such an expression also takes a temporal argument.

- (48) *Yiqian*:  $\lambda T.\lambda P.\exists t [T < t_s \wedge t < T \wedge \forall t' [t' < T \wedge t' \neq t \rightarrow t' < t] \wedge P(t) \wedge P(t_s)]$   
 (T: time interval; t, t': time instant/interval; t<sub>s</sub>: the speech time)

Nevertheless, I argue that (48) cannot be solely treated as TIN-related because the semantic composition (48) cannot account for the TIN properties we reviewed in section 2, except for the precedence meaning property, and sheds no light on the issues discussed in section 2.4.1-2. Also, despite the absence of *yiqian*, the nominal past TIN can be obtained, as evidenced by (49). (49) shows that *ziji gaozhong de mianmao* ‘one’s appearance of the high school year’ must be interpreted with respect to the past time, independent of ST<sub>V</sub>, which is anchored at the present time, and there is no past-time expression.

- (49) [Context: Upon seeing her picture taken in the high school, Meimei misses her young appearance of the time when she was 18 years old.]  
 Kan-zhe kan-zhe, Meimei qingbuzijin xiangnian-qi  
 look-ASP look-ASP Meimei can’t.help miss-start  
 ziji meili de mianmao.  
 self pretty DE appearance  
 ‘While looking at her photo again and again, Meimei cannot help but miss her beautiful appearance (of the past).’

To support the view that tense is a pronominal, let's see how example (49) can be accounted for by Partee's pronominal tense system. In (49), there is no time adverbial but the NP *mianmao* ‘appearance’ is interpreted with respect to the past time, which is salient in the context in which Meimei looked at the photo taken in the past. This shows that the NP receives a tense value not provided in the clause but from an extra-linguistic context. Again, this proves that tense is deictic, similar to a pronominal. (46) indicates that the presence of a temporality-denoting expression *qunian* ‘last time’ obligatorily binds the temporal interpretation of a NP it modified. This amounts to showing that the tense of the NP, if it has one, is bound by the expression. In this light, tense is like a variable.

The line of reasoning above is supported by Lin's (2015) proposal that clausal tense is a pronominal. Specifically, the tense interpretation of a clause depends on the RT that determines the temporal interpretation of



a clause. For example, (50) assumes a past reading if the RT is the ST. (51) is the semantic composition of (50), and it is shown that if the ET ( $e$ ) is included in the RT ( $\text{time}(e) \subseteq s$ ), a past reading is obtained (Also see Kratzer 1998 for the composition of the perfective, the imperfect, and the perfect reading.). What is noteworthy is the RT in (51), which is salient from the extra-linguistic context. The tense of the clause is a variable that can be bound by the RT with respect to the ET ( $e$ ).

(50) Zhangsan da-po yige beizi.  
 Zhangsan hit-broken one glass  
 ‘Zhangsan broke a glass.’ (Lin 2015:(51))

(51) [TP [T *pro*] [PRED Zhangsan da-po yige beizi]]  
 Zhangsan broken one glass  
 a. Predicate:  $\lambda t_i. \lambda w_s. \exists e_1 (\text{time}(e) \subseteq t \ \& \ \mathbf{Zhangsan-break-a-glass}_{(e)(w)} = 1)$   
 b. Pronominal tense: the speech time  $s$   
 c. Conversion:  $\lambda t_i. \lambda w_s. \exists e_1 (\text{time}(e) \subseteq t \ \& \ \mathbf{Zhangsan-break-a-glass}_{(e, w)} = 1)(s) = \lambda w_s. \exists e_1 (\text{time}(e) \subseteq s \ \& \ \mathbf{Zhangsan-break-a-glass}_{(e, w)} = 1)$   
 (Lin 2015:(53))

It is not my attempt to claim that the NP also contains tense, similar to the one of the clauses; instead, I suggest that the NP is open to temporal modification, and this might be due to the fact that the NP has a temporal argument, or a variable, which can be analyzed on a par with a tense. Such temporal argument behaves like a pronominal in the spirit of Partee’s pronominal tense system as well as Lin’s (2015). If this line of reasoning is on the right track, it follows that the temporal argument can be bound by the RT that is salient in the context, and its temporal interpretation is determined, similar to (51). Nevertheless, it remains unclear whether the semantic composition of a past reading in (51) is able to capture the three properties of the TIN. What’s more, there is ample reason to think how to define what tense is, and whether it exists in the nominal domain. In this paper, I suggest that the NP can have an independent temporal interpretation, and where such interpretation is

related to the nominal tense will not be discussed for expository reasons. In section 3, I will propose a stage-based account, which adopts Partee's insight.

### 3. TOWARD A SEMANTIC ANALYSIS

#### 3.1 A Stage-Based Account

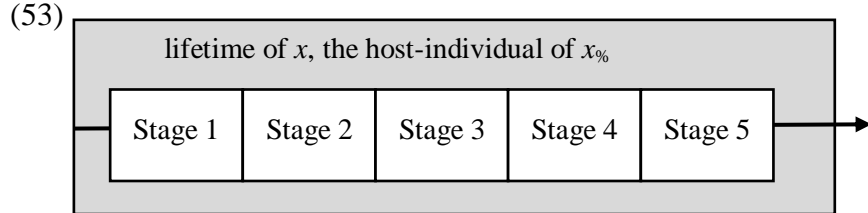
Now, let's recapitulate the observations as well as the above-mentioned issues. First, three TIN properties are pressed into service, including the precedence meaning properties, the suspension of a change of state, and the lifetime effect. Second, artifact foods (such as *cheese*) and natural kinds (such as *water*) can receive a past-time interpretation. This amounts to motivating a working hypothesis that the NP can take a temporal argument, independent of that of a verbal predicate.

To account for the TIN facts in Mandarin, I propose an ontological account from a philosophical view. Following Quine (1960), stages are sliced individuals/entities or temporal parts. In other words, an individual/entity ( $x$ ) can be sliced into several temporal stages ( $x_{\%}$ ). Take a stage-level predicate *available* for example. *Available* is not predicated of an individual in its whole temporal extendedness (that is, the lifetime existence) but only of the temporal stage of the individual that is available. Supposed that a NP itself is a nominal predicate, and an individual can be sliced into smaller temporal stages ( $x_{\%}$ ), one of which is predicated of by this nominal predicate. Each stage can be predicated of by a different nominal predicate as long as the existence of this individual remains at the  $ST_v$ . (12), repeated in (52), exemplifies this stage account; one stage ( $x_{\%}$ ) of a host individual ( $x$ ) is predicated of by a nominal predicate *being a student* in the past, and the life existence of the individual ( $x$ ) must extend to the ST of the verb *daoqian* 'apologize'.

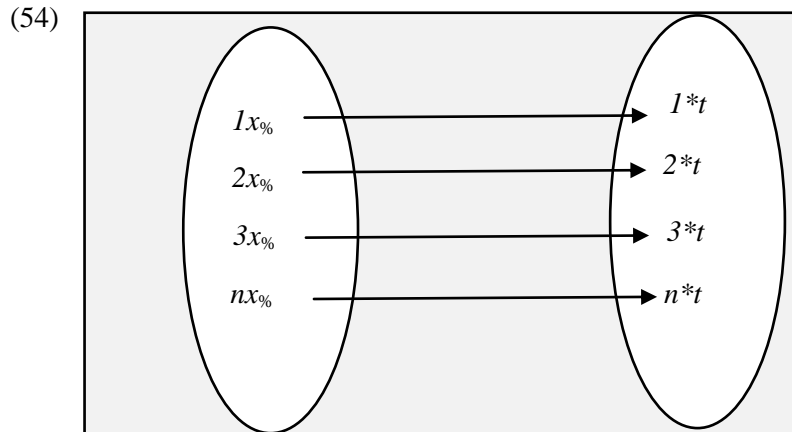
(52) [Context: The Principal criticized some students for being morons in public, and was asked to apologize to them in a school affairs meeting after some time. When the Principal apologized, these students already graduated.]

- a. [pp Dui zhexie xuesheng], xiaozhang zuihou  
to these student principal finally  
zai yi-chang xiaowu huiyi.  
in one-CL school.affair meeting  
daoqian-le.  
apologize-ASP  
‘The principal finally apologized to these students (of the past)  
in a school affairs meeting.’
- b.  $\llbracket \text{student}(x_{\%}, t^*) \subseteq \tau(x) \ \& \ \text{PAST}(t^*) \rrbracket^c = 1$  iff a stage of the host individual ( $x$ ) is student at  $t^*$  such that the stage is included the lifetime of  $x$  and  $t^* < \text{ST}_v$ .

This stage-based account of the TIN merits some observations as follows. First, an individual ( $x$ ) (the host-individual) is decomposed into several temporal stages ( $x_{\%}$ ), each of which can be predicated of by a different predicate within the life span of  $x$ . To legitimate this predication, it must be the case that the existence of the host individual remains constant at the  $\text{ST}_v$ . This can be viewed as a manifestation of the lifetime effects. Second, a constellation of stages of a host-individual are temporally organized. Therefore, a preceding relation between them is adjacent. Third, since stages can be organized, as visualized in (53), it is clear that one stage can be adjacent to another stage without involvement of a change of stage intervening. A more natural translation of ‘a change of state’ should be treated as resulting from the fact that a stage being predicated is adjacent to another predicated by a different predicate; that is, different predicating relations create an illusion of a change of state.



The stage-based account seems promising in a way that the three TIN properties are accounted for in a principled manner. Yet, we need to address two remaining issues. First, we contend there is a need to explain the specifications of temporal stages ( $x\%$ ). I argue that each temporal stage is analyzed on a par with a temporal argument. (54) represents the semantic formula,  $P(x\%) = t^*$ , which shows that a (nominal) predicate as a function  $f$  takes a stage ( $x\%$ ) as its argument and maps it to a time ( $*t$ ) for it to obtain a truth value.

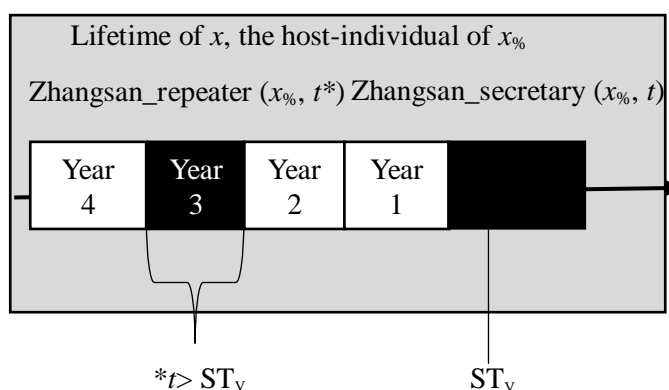


Granted (54), following Partee's insight (1984), I argue that each stage ( $x\%$ ) is a variable bound by a quantifier, if present. The quantifier can be a temporal adverbial like *yiqian* 'before', or a RT salient in the context. Nevertheless, the second issue is to specify the function of temporal expressions. I assume that the temporal length of a temporal stage ( $x\%$ ) can be determined by the restricting predicate of an overt temporal

expression (e.g. *sannianqian* ‘three years ago’), if it is present. Consider (55). As shown in (55d), the function of the temporal adverb *sannianqian* ‘three years ago’ is used to restrict a set of stages ( $x_{\%}$ ) being true prior to three years counting from the  $ST_v$  and precisely maps a stage ( $x_{\%}$ ) to a time ( $t^*$ ) *Year 3*. Being an existential quantifier of some sort, this temporal adverbial binds a stage ( $x_{\%}$ ), which is in turn taken by the nominal predicate *a repeater* and maps it to a time ( $t^* > ST_v$ ) for the predication to be true.

(55) [Context: Suppose that three years ago *Zhangsan* spent so much time pursuing a girl that he failed his studies and became a repeater. Now, he is a secretary and is laughing at his being a repeater when recalling.]

- a. Zhangsan    chaoxiao-ze    san-nian-qian-de  
     Zhangsan    laught-PROG    three-year-before- MOD  
     ziji,    (huafei    taiduo    shijian    zai  
     self    spend    too    time    in  
     bu    zhongyao-de    shi).  
     not    important-MOD    matter  
     ‘Zhangsan is laughing at himself of three years ago (as a repeater), (because he spent too much time on the matters that were not important).’
- b.  $\exists x_{\%} \exists t \exists t^* [(Zhangsan\_secretary(x_{\%}, t) \& Zhangsan\_repeater(x_{\%}, t^*) \& PAST(t^*))]$ .
- c. There is a stage  $x_{\%}$  and a time  $t$  and a time  $t^*$ , such that  $x_{\%}$  is a secretary at  $t$  and  $x_{\%}$  is a repeat at  $t^* < ST_v$ .
- d.



Moreover, it is found that the TIN is easier to be obtained when NPs are modified by overt temporal expressions in the form of adjectives, such as *san nianqian-de* ‘three years ago’ or *yiqian* ‘before’. Musan (1995) maintains that easier access to the TIN of a given individual has to do with whether the individual is presupposed in the discourse. I suggest that the temporal expressions in Mandarin serve the function of presupposing an individual in the discourse, as proposed by Lin (2003), because such a temporal expression is able to specifically select a particular stage of an individual, as illustrated in (55d), where the individual being a repeater three years before (=the  $ST_N$ ) hold true relative to the  $ST_V$ .

The stage-based account casts light on the issue on the nominal interpretation of food artifacts and natural kinds. Take *water* for example. The entity of being water ( $\llbracket \text{water}(x) \rrbracket$ ) can be sliced into a set of stages ( $x_{\%}$ ), each of which can be predicated of by a different predicate  $\llbracket P(x_{\%}) \rrbracket$  again. This line of reasoning is revealing in a way that the reason the polluted water is still water is due to the fact that it is the stage ( $x_{\%}$ ) of the host-individual ( $x$ ) being predicated of by ( $\llbracket \text{polluted}(x_{\%}, t^*) \rrbracket$ ) rather than the host-individual ( $x$ ) in  $\llbracket \text{polluted}(x, t^*) \rrbracket$ . This stage of predication with respect to the temporal interpretation is related to the lifetime effect; that is, if the existence of an individual/entity does not exist at the  $ST_V$ , it cannot be sliced into stages, not to mention being temporally interpreted. The full discussion on these two types of NPs with respect to the semantic computation of the TIN will be provided in the next section.

### 3.2 Computing the TIN

For the purpose of presenting a semantic composition of the past and future TIN, I make the following assumptions. First, I adopt Krifka’s (1989) temporal trace function  $\tau$  to characterize the ET:  $\tau(P(x))$  denoting the ET of  $P(x)$ , which is a consecutive time at which the property is true of  $x$ . However, to integrate  $\tau(P(x))$  into the above discussion, the individual  $x$  is replaced with stages ( $x_{\%}$ ), thus deriving  $\tau(P(x_{\%}))$ . Thus, the ET of (criminal ( $x_{\%}$ )) is a maximal, consecutive time at which the property  $P$  is true of  $x_{\%}$ . Second, to account for the future-time interpretation, I also adopt Kratzer’s (1991) theory of modals. Her theory

contends that the property (P) is true of the individual  $x$  in all worlds that are ‘best’ with respect to three parameters: a circumstantial modal base (for Circ), an ordering source ‘Nocc’(for ‘nonoccurrence’) and the property P. The theory says that modals quantify over possible worlds, where the meaning of the modal marker and two contextual parameters (the modal base and the ordering source) fix the set of worlds quantified over. Under these assumptions, the semantic composition of the past TIN and the future TIN respectively are represented as in (56).

- (56) a. The meaning of the past TIN  
 $\forall P \forall x_{\%} (\tau(P)(x_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \exists t^* (t^* < ST_v \wedge \tau(P)(x_{\%})) \wedge P(x_{\%}) \subseteq \tau(x)$   
 (For all properties P and stages  $x_{\%}$  of a host-individual  $x$ , the property (P) is true of  $x_{\%}$  in a world  $w$  at  $t^*$  if and only if there is a time  $t^*$  that precedes the  $ST_v$  and  $t^*$  is the ET of P ( $x_{\%}$ ) in world  $w$  and  $x_{\%}$  is included in the lifetime of  $x$ .)
- b. The meaning of the future TIN  
 $\forall P \forall x_{\%} (\tau(P)(x_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \forall' \in \text{Best}(\text{Circ}, \text{Nocc}, P) \exists t^* \exists x_{\%} (ST_v <^* \wedge x_{\%} = \tau(x_{\%})) \text{ in } w' \wedge P(x_{\%}) \subseteq \tau(x)$   
 (For all properties P and stages  $x_{\%}$  of an host-individual  $x$ , the property FUT (P) is true at  $x_{\%}$  at  $t^*$  in the actual word  $w$  at  $t^*$  if and only if for all worlds  $w'$  that are in the set of words given by Best (Circ, Nocc, P) there is a time  $t^*$  and a temporal stage  $x_{\%}$  such that  $t^*$  follows the  $ST_v$ ,  $t^*$  is also the ET of P( $x_{\%}$ ) in  $w'$ , and  $x_{\%}$  is included in the lifetime of  $x$ .)

The semantic compositions above capture two properties, the precedent meaning ( $t^* < ST_v$  for the past-time TIN, and  $ST_v < t^*$  for the future-time TIN), and the lifetime existence effect ( $P(x_{\%}) \subseteq \tau(x)$ ). I will show how (56a) and (56b) apply to the TIN facts later. Nevertheless, there are certain complications behind (56a-b) worth thoroughly discussing here.

One reviewer appeals to simplification of the semantic composition in (56b), in particular, modal semantics. Nevertheless, I suggest a need to motivate Kratzer’s (1981, 1991) modal semantics, Best (Circ, Nocc, P) in (56b), to account for the future TIN properties. The modal base is a circumstantial one in Best (Circ, Nocc, P), determining that the worlds

accessible from  $w'$  are those where the propositions that specify the currently relevant circumstances are true, whereas the ordering source 'Nocc' requests that whatever event does not lead to the non-realization of the property (P) in the future. Thus, Best (Circ, Nocc, P) with respect to the future  $TIN$  can be interpreted as saying that the worlds in Best (Circ, Nocc, P) are those where the world continues to develop after the  $ST_N$  as expected based on the current relevant circumstances from the  $ST_V$  to the  $ST_N$ , and nothing happens that would block the property (P) from becoming true of the stage ( $x_{\%}$ ) at the  $ST_N$ . This line of reasoning suggests that Nocc can be treated as the semantic aspect of the lifetime effect. Namely, Nocc is to forbid the non-realization of a property (P) such that a stage ( $x_{\%}$ ) of a host-individual ( $x$ ) can be predicated of by the property (P) at the  $ST_N$ . Let us consider one example provided by the reviewer in (57), which claims that a future reading of a possessive relation between *Zhangsan* and I is easily obtained without resorting to modal semantics, Best (Circ, Nocc, P).

- (57) (Zhangsan shi wode xuesheng), wo yiding yao  
 Zhangsan COP my student I definitely must  
 shou **ta** de.  
 take him ASS  
 '(He is my student), I will take him as my student.'

- (58) Danshi ta che-huo si-le.  
 but he car-accident die-ASP  
 'But he died because of the car accident.'

Nevertheless, this line of reasoning is not sustained. First, with the addition of (58) to (57), (57) becomes infelicitous immediately. This is due to the lifetime existence restriction, according to which if *Zhangsan* does not exist at the  $ST_N$ , there is no way for a temporal stage ( $x_{\%}$ ) of the host-individual ( $x$ ) *Zhangsan* to be predicated of by this possessive relation at the  $ST_N$ . For the possessive to hold at the  $ST_N$ , the lifetime effect ( $P(x_{\%}) \subseteq \tau(x)$ ) does not suffice. Nocc must be motivated to ensure nothing happens that prevents the possessive relation, a kind of property (P), from being not realized at the  $ST_N$ . In this light, the semantic aspect,



Nocc in Best (Circ, Nocc, P), needs to ensure the realization of the property (P), whereas the pragmatic aspect, the lifetime effect,  $(P(x_{\%}) \subseteq \tau(x))$ , is to ensure the host-individual (x) in the future. It remains to be seen how to account for the case in (57) with the addition of (58), if modal semantics is dispensed with.

In addition, let us consider the semantic computation of the future TIN of the NP *shui* ‘water’ in (39), repeated as in (59). The correct future TIN reading is obtained in (60a): apply all the functions (60b-f) to the future TIN predicate (60a). Best (Circ, Nocc, *disinfectant*) says that the temporal stage ( $x_{\%}$ ) of the host-individual *water* (x) developed as expected given all the current circumstances (*the water is polluted, the water is in the reservoir, the water needs purification, the EPA pours disinfectant liquid into the reservoir...*), and there is no event that prevents  $x_{\%}$  from being disinfectant because of Nocc. Therefore, Best (Circ, Nocc, *disinfectant*) ensures that in the future time, the NP *water* obtains a future reading, being disinfectant, different from being polluted with viruses in the past; in other words, a temporal state ( $x_{\%}$ ) of the x (water) bearing a property of being disinfectant holds true at the  $ST_N$ .

- (59) [Context: Suppose that the Environmental Protection Administration (EPA) is taking necessary measures to purify the polluted water in the reservoir by pouring a certain amount of disinfectant liquid into the reservoir now to kill viruses. However, after the purification work, the EPA needs to solve how to remove the disinfectant remaining in the water.]

Huanbaoshu	xia-yi-bu	yao	xiang-zhe	ruhe
EPA	next-one-step	must	think-ASP	how
chuli	zhe-yi-qu	de	shui.	
deal	this-one-CL	MOD	water	

‘The EPA needs to think how to handle the water (of the future), (which contains the remaining disinfectant).’

(60) The calculation of the future TIN of (59)

a. Future TIN predicate:

$$\forall P \forall x_{\%} (\tau(P)(x_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \forall' \in \text{Best}(\text{Circ}, \text{Nocc}, P)$$

$$\exists t^* \exists x_{\%} (ST_v <^* \wedge x_{\%} = \tau(x_{\%})) \text{ in } w' \wedge P(x_{\%}) \subseteq \tau(x)$$

b. Property (P): *disinfectant*

c. Host-individual (x): *shui* ‘water’

d. Stages of the host-individual (*water\_{\%}*): stages of *x*

e. Time (*t*):  $ST_v$  (the speech time of the verb *xiang*) = present time

f. Time (*t*<sup>\*</sup>):  $ST_N$  (the speech time of the (P) *disinfectant*) = future time

g.  $\text{Circ}(P=\text{water})$ : {‘The water is polluted’, ‘the water is in the reservoir’, ‘the water needs purification’...}

h.  $\text{Nocc}(P=\text{water})$ : {‘The water does not disappear’, ‘the water does not fly’, ‘the water does not evaporate’...}

i. Function application 1:

$$\forall P \forall x_{\%} (\tau(P)(x_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \forall' \in \text{Best}(\text{Circ}, \text{Nocc}, P)$$

$$\exists t^* \exists x_{\%} (ST_v <^* \wedge x_{\%} = \tau(x_{\%})) \text{ in } w' \wedge P(x_{\%}) \subseteq \tau(x) \text{ (disinfectant)}$$

$$= \forall x_{\%} (\tau(\text{disinfectant})(x_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \forall' \in \text{Best}(\text{Circ}, \text{Nocc}, \text{disinfectant}) \exists t^* \exists x_{\%} (ST_v <^* \wedge x_{\%} = \tau(x_{\%})) \text{ in } w' \wedge$$

$$\text{disinfectant}(x_{\%}) \subseteq \tau(x)$$

Function application 2:

$$\forall x_{\%} (\tau(\text{disinfectant})(x_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \forall' \in \text{Best}(\text{Circ}, \text{Nocc},$$

$$\text{disinfectant}) \exists t^* \exists x_{\%} (ST_v <^* \wedge x_{\%} = \tau(x_{\%})) \text{ in } w' \wedge$$

$$\text{disinfectant}(x_{\%}) \subseteq \tau(x) \text{ (water}_{\%})$$

$$= (\tau(\text{disinfectant})(\text{water}_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \forall' \in \text{Best}(\text{Circ}, \text{Nocc},$$

$$\text{disinfectant}) \exists t^* (ST_v <^* \wedge x_{\%} = \tau(\text{water}_{\%})) \text{ in } w' \wedge$$

$$\text{disinfectant}(\text{water}_{\%}) \subseteq \tau(x)$$

Function application 3:

$$(\tau(\text{disinfectant})(\text{water}_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \forall' \in \text{Best}(\text{Circ}, \text{Nocc},$$

$$\text{disinfectant}) \exists t^* (ST_v <^* \wedge x_{\%} = \tau(\text{water}_{\%})) \text{ in } w' \wedge$$

$$\text{disinfectant}(\text{water}_{\%}) \subseteq \tau(x) \text{ (} ST_N = \text{future time)}$$

$$= (\tau(\text{disinfectant})(\text{water}_{\%})) = 1 \text{ at } ST_N \text{ in } w \text{ iff } \forall' \in \text{Best}(\text{Circ},$$

$$\text{Nocc}, \text{disinfectant}) ST_N (ST_v <^* \wedge x_{\%} = \tau(\text{water}_{\%})) \text{ in } w' \wedge$$

$$\text{disinfectant}(\text{water}_{\%}) \subseteq \tau(\text{water})$$

‘For all properties *P disinfectant* and temporal stages  $x_{\%}$  of a host-individual  $x$  *water*, the property FUT (*disinfectant*) is true at  $water_{\%}$  at the  $ST_N$  (=future time) in the actual world  $w$  at the  $ST_N$  (=future time) if and only if for all worlds  $w'$  that are in the set of worlds given by Best (Circ, Nocc, P) there is a time  $ST_N$  (=future time) and a temporal stage  $water_{\%}$  such that the  $ST_N$  (=future time) follows the  $ST_V$  (=present time), the  $ST_N$  (=future time) is also the ET of  $water_{\%}$  of being disinfected in  $w'$ , and  $water_{\%}$  is included in the lifetime of  $x$  *water*.’

The above discussion shows that Best (Circ, Nocc, P) plays a vital role in deriving a future reading by ensuring that one stage ( $x_{\%}$ ) of a host-individual ( $x$ ) develops given all relevant circumstances, and a property (P) is to be realized on the stage ( $x_{\%}$ ) by preventing any possible event that is able to lead to the non-realization of the property (P), that is, making the P of the stage ( $x_{\%}$ ) not hold at the  $ST_N$ . Before ending this section, it is worthwhile to see how a past reading is obtained using the past TIN composition in (56b). Consider example (19), repeated as in (61). A past-time reading of the NP *Zhangsan* is computed in (62): the functions (62b-f) apply to the past TIN predicate successively.

- (61) [Context: Suppose that in 2014 Spring Lisi is reporting the performance of a class in 2013 Fall to Wangwu. He utters (61) to Wangwu while pointing to this class.]

**Zhe-ge banji-de daoshi** shi Zhangsan.  
 this-CL class-MOD advisor COP Zhangsan  
 ‘Zhangsan was the advisor of this class.’

(62) a. Past TIN predicate:

$$\forall P \forall x_{\%} (\tau(P)(x_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \exists t^* (t^* < ST_v \wedge \tau(P)(x_{\%})) \wedge P(x_{\%}) \subseteq \tau(x))$$

b. Property (P): *daoshi* ‘advisor’

c. Host-individual (x): Zhangsan

d. Stages of the host individual ( $x_{\%}$ ): *Zhangsan*<sub>%</sub>

e. Time:  $ST_v$  (the speech time of the verb *shi*) = present time

f. Time:  $ST_N$  (the speech time the nominal predicate *daoshi*) = past time

g. Function application 1:

$$\begin{aligned} &\forall P \forall x_{\%} (\tau(P)(x_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \exists t^* (t^* < ST_v \wedge \tau(\text{advisor}(x_{\%})) \\ &\wedge \text{advisor}(x_{\%}) \subseteq \tau(x)) (\text{advisor}) = \forall x_{\%} (\tau(\text{advisor})(x_{\%})) = 1 \text{ at } t^* \\ &\text{in } w \text{ iff } \exists t^* (t^* < ST_v \wedge \tau(\text{advisor}(x_{\%})) \wedge \text{advisor}(x_{\%}) \subseteq \tau(x)) \end{aligned}$$

Function application 2:

$$\begin{aligned} &\forall x_{\%} (\tau(\text{advisor})(x_{\%})) = 1 \text{ at } t^* \text{ in } w \text{ iff } \exists t^* (t^* < ST_v \wedge \tau(\text{advisor}(x_{\%})) \\ &\wedge \text{advisor}(x_{\%}) \subseteq \tau(x)) (\text{Zhangsan}_{\%}) = (\tau(\text{advisor}))(\text{Zhangsan}_{\%}) = 1 \\ &\text{at } t^* \text{ in } w \text{ iff } \exists t^* (t^* < ST_v \wedge \tau(\text{advisor}(\text{Zhangsan}_{\%})) \wedge \\ &\text{advisor}(\text{Zhangsan}_{\%}) \subseteq \tau(x)) \end{aligned}$$

Conversion 3:

$$\begin{aligned} &(\tau(\text{advisor}))(\text{Zhangsan}_{\%}) = 1 \text{ at } t^* \text{ in } w \text{ iff } \exists t^* (t^* < ST_v \wedge \tau(\text{advisor} \\ &(\text{Zhangsan}_{\%})) \wedge \text{advisor}(\text{Zhangsan}_{\%}) \subseteq \tau(x)) (ST_N = \text{past time}) \\ &= (\tau(\text{advisor}))(\text{Zhangsan}_{\%}) = 1 \text{ at } ST_N \text{ in } w \text{ iff } \exists t^* (ST_N < ST_v \\ &\wedge \tau(\text{advisor}(\text{Zhangsan}_{\%})) \wedge \text{advisor}(\text{Zhangsan}_{\%}) \subseteq \tau(x)) \end{aligned}$$

‘For all properties *P* *advisor* and temporal stages  $x_{\%}$  of a host-individual *x* *Zhangsan*, the property of being an advisor is true of the stage of *Zhangsan* in a world *w* at the  $ST_N$  (= the past time) if and only if there is the  $ST_N$  (= the past time) that precedes the  $ST_v$  and the  $ST_N$  (= the past time) is the ET of the *Zhangsan*<sub>%</sub> of being the advisor in world *w* and the *Zhangsan*<sub>%</sub> is included in the lifetime of *Zhangsan* *x*.’

In this section, I have put forward the stage-based semantic analysis of the past and future TIN that provides a principled account of the TIN facts laid out in this paper. Also, I presented a brief calculation of the past-time TIN and the future-time TIN. In response to the reviewers’

comments, I also justified the need to motivate Kratzer's modal semantics while maintaining the empirical coverage of the future-time TIN.

#### **4. CONCLUSION**

In this paper, I discussed the TIN phenomena in Mandarin and the issues involved in dealing with it and proposed a semantic analysis of the past-time and the future-time TIN. The analysis is articulated as follows. First, in the case of the Mandarin TIN, an entity or an individual ( $x$ ) can be sliced into a series of stages ( $x_{\%}$ ) of a host-individual ( $x$ ), which is bound by a covert operator (or a RT) in the universe of discourse or the ET provided by the VP, if no overt temporal expression is present. Second, any temporal stage ( $x_{\%}$ ) of the host-individual ( $x$ ) is mapped to a  $t^*$  to obtain a truth value via function application. Third, for this function application to take place, the lifetime existence must be put into effect to ensure that the stage ( $x_{\%}$ ) with a truth value at the  $ST_v$  is connected to a live individual or entity. This analysis carries out a prediction that artifact foods and natural kinds can receive an independent temporal interpretation, which further lends support to productivity in Nordlinger and Sadler's NT diagnostics (2004a).

However, there are three matters not yet addressed directly because the complications arising from them extend beyond the scope of the current paper. First, as pointed out previously, whether the TIN can be analyzed on a par with the nominal tense in some languages remains a subject of further research. The TIN facts presented in the paper only indicate that NPs are open to temporal modification without agreeing with the clausal tense. What undermines a parallelism between the TIN and clausal tense is whether clausal temporal, aspectual, and modal features (TAM features), can be consistently mapped onto the nominal domain (See Liao 2011 for a syntactic view). Also, it is apparent that Mandarin NPs lack overt morpho-syntactic evidence realizing TAM features, opposed to the nominal tense languages discussed in Nordlinger and Sadler (2004a, b). Second, despite the parallelism remaining not materialized, it is worthwhile to note that the TIN behaves similarly to clausal tense in a way that both are consistently context-dependent; in

other words, the temporal interpretation of the NP or the clause relies on a RT time salient from the context in the spirit of Partee (1973, 1984) and Lin (2015). Third, one reviewer suggests that the TIN might have a bearing on negative sentences. I agree with the reviewer's suggestion because the TIN seems to behave similarly to a negative sentence containing *yiqian*. Compare the following two sentences in (63-64) under the same context.

- (63) [Context of utterance: Zhangsan has been a considerate boy since he was around age 10. Since then, he has often helped his parents clean the house, wash the dishes, etc. Now, he is studying in a college.]

Zhangsan shang daxue yiqian, ta jiu yijing  
 Zhangsan attend university before he then already  
 hen dongshi le. Chang bang bama zuo jiashi,  
 very sensible PART often help parents do housework  
 ta zhen shi yi-ge nande-de haizi.  
 he really be one-CL admirable child  
 'Zhangsan had already been sensible before he went to a college. He  
 often did housework for his parents. He is really an admirable  
 child.'  
 (Lin 2016: (1))

- (64) Zhangsan mei shang daxue yiqian, ta jiu yijing  
 Zhangsan not attend university before he then already  
 hen dongshi le.  
 very sensible PART  
 'Zhangsan had already been sensible before he went to a college.'  
 (Lin 2016: (2))

As noted by Lin (2016), it is observed that the construction 'P *yiqian*/zhiqian, Q' is interpreted as the event denoted by Q having happened prior to the event denoted by P. Interestingly, when the *yiqian*-clause in (63) is negated in (64), the truth condition of the sentence is not changed. Lin (2016) proposes that the complement clause taken by *yiqian* denotes a potential change of state from the prior non-existent state to the resulting post-state, and the meaning of *yiqian*

selects either the initial point or the final point of the complement eventuality as a RT. The insertion of *mei* ‘no’ under the scope of *yiqian* fails to distinguish between the latest time of the prior-state or the earliest time of the post state. This amounts to explaining why the scope of negation does not affect that of the *yiqian*-clause. Of great interest is that a similar effect is also observed in the TIN but is slightly different. Consider examples (65-66), with the insertion of the past-time denoting expression *yiqian* ‘past’ and the negation *mei* ‘no’.

- (65) [Context: The Principal criticized some students for being morons in public, and was asked to apologize to them in a school affairs meeting after some time. When the Principal is apologizing, these students had already graduated.]
- a. Xiaozhang haishi mei zai xiaowu huiyi  
 principal still NEG in school.affair meeting  
 dui yiqian-de xuesheng-men daoqian.  
 to before-MOD student-PL apologize  
 ‘The Principal still did not apologize to the students (of the past) now in one school affairs meeting.’
- b. Xiaozhang haishi mei zai xiaowu huiyi  
 principal still NEG in school.affair meeting  
 dui xuesheng-men daoqian.  
 to student-PL apologize  
 ‘The Principal still does not apologize to the students (of the past) now in one school affairs meeting.’

In (65a), the *yiqian*-NP is under the scope of *mei*, and the *yiqian*-NP still obtains a past-time reading; otherwise, it is predicted that a non-past-time reading, a future time, is obtained. This prediction is not carried out. Also, even if *yiqian* is dropped, the past-time reading of the NP *xuesheng* is still obtained. Following the pronominal tense account, the temporal argument is bound by a RT, and it is straightforward that *mei* fails to alter the temporal relation. At the moment, I do not have a solution to this puzzle. Nonetheless, from another perspective, I suggest the examples (65a-b) lend support for the analysis that the NP contains a temporal argument, and such argument is a pronominal tense (variable).

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If a pronoun is bound by a referent in the context, the sentential negation cannot alter the binding relation. Similarly, if a tense variable is bound by a RT salient in the context, the negation fails to alter the binding relation for the same reason. Yet, it remains to be explored whether the expletive negation observed in (63-64) in relation to the temporality-denoting expression *yiqian* can be observed in the TIN.



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Wei-Cherng Sam Jheng  
Institute of Linguistics  
National Tsing Hua University  
Hsinchu, Taiwan 116, ROC  
[formalsyntaxsam@gmail.com](mailto:formalsyntaxsam@gmail.com)

關於漢語名詞時制的一些註記

鄭偉成  
國立清華大學

本文的主旨在於討論漢語名詞組可以有獨立於句子的時制，稱名詞時制。文中我先討論漢語名詞時制的三種現象，並且提出形式語言學的分析。我採取階段分析 (Quine 1960)，主張漢語名詞組可視為一個主個體 (host-individual)，而該主個體是由許多空間階段 (temporal stages) 所組成。漢語名詞時制現象是由於每個空間階段可以被不同名詞謂語修飾，而修飾關係必須發生在主個體的生存時段 (lifetime span) 內。除此之外，本文主張漢語時制中指涉詞能夠量化空間階段，並且選取特定的時間階段做名詞的時制解讀，無須訴諸於句子時制。這樣的分析能夠解釋為什麼帶有時制指涉詞的名詞組能夠容易得到名詞時制的語意。

關鍵字：時制、空間階段、時制解讀、名詞組