

The Compositionality of Mandarin Aspect

A Parallel Corpus Study

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**The Compositionality of
Mandarin Aspect**
A Parallel Corpus Study

**De Compositionele
Betekenis van Aspect in het
Mandarijn Chinees**
Een Vertaalcorpusstudie

(met een samenvatting in het Nederlands)

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All knowledge is, in final analysis, history.
All sciences are, in the abstract, mathematics.
All judgements are, in their rationale, statistics.

— C. Radhakrishna Rao

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Abbreviations

?	Infelicitous sentences
*	Ungrammatical sentences
BA	The <i>ba</i> construction
CL	Classifier
De	Resultative <i>de</i> construction
DE	<i>De</i> as marker of pre-nominal modifiers
ERG	Ergative case
IMP	<i>Imparfait</i>
INSTR	Instrumental case
M	Masculine agreement
PERF	Perfective
PRT	Particle
PS	<i>Passé simple</i>
RED	Verbal reduplication
RVC	Resultative verb complement
SG	Singular agreement

Chapter 1

Introduction

1.1 Background and dissertation goals

This dissertation deals with the semantics of aspect in Mandarin Chinese (henceforth simply “Mandarin”). Aspect is a linguistic category concerning how situations described by sentences unfold in time. According to Comrie (1976: 3), “aspects are different ways of viewing the internal temporal constituency of a situation,” such as whether the situation is viewed by the speaker as coming into being, ongoing, completed, and so forth. A wide range of kinds of aspects are found cross-linguistically. Mandarin is known for its complex aspect system, which is very different from aspect systems in European languages that are well-studied in formal semantics literature. To write a formal semantics of the Mandarin aspect system will allow us to learn how Mandarin characterizes situations, to expand our knowledge of aspect from its attestation in European languages to a more global picture, and to deepen our understanding of cross-linguistic variation and universal patterns of aspect.

The most common aspects discussed in the literature are Perfective¹ and Imperfective: sentences bearing the former describe complete situations, while sentences bearing the latter can describe ongoing situations. Complete and ongoing situations are perceived as events (temporally bounded) and states (temporally unbounded), respectively, with event and state falling under the category “eventuality” (Bach 1986). Sentences describing events/states thus have an eventive/stative interpretation. Romance languages such as French distinguish Perfective and Imperfective through verbal forms. For example, (1a) uses the French verbal form *passé simple*, indicating a complete listening while (1b) uses the *imparfait*, indicating an ongoing listening.

- (1) a. Il écouta une chanson.
he listen.PS a song
'He listened to a song.'
- b. Il écoutait une chanson.
he listen.IMP a song
'He was listening to a song.'

Besides the aspectual meaning, both forms convey the meaning of a situation held before the moment of speaking, which falls into the category of tense. Tense “relates the time of the situation referred to to some other time, usually to the moment of speaking” (Comrie 1976: 1–2). For example, a situation located temporally prior to or simultaneous with the moment of speaking can be described as in the past or in the present tense. The French verbal forms morphologically fuse tense with aspect: *passé simple* (1a) and *imparfait* (1b) fuse the past tense with Perfective aspect and Imperfective aspect, respectively. However, there are languages teasing apart tense and aspect. For example, the English translation of (1b) uses the inflected verb *was* to indicate the past tense and the *-ing* form to convey that the listening was in progress (*-ing* is thus known as the Progressive marker). Lacking the *-ing* form, the English translation of (1a) uses the verb *listened*, which bears the

¹ Initial capitals are used to refer to general semantic tense-aspect categories across languages.

past tense, and the sentence conveys a complete listening. Hence English shows an aspectual distinction of Progressive vs. non-Progressive. For terminological transparency, I will use the term “tense-aspect form” for all kinds of forms that convey tense and/or aspectual meanings, regardless of whether the meanings are amalgamated or independent in morphology.

Abundant formal semantic theories have been developed to account for tense-aspect forms in European languages, and they are extensively applied to analyze non-European languages. However, typological differences raise challenges for straightforwardly applying the theories to Mandarin. Mandarin has no morphological tense markers but employs multiple forms that convey aspectual information, to the extent that it is called an “aspect language” (Xiao & McEnery 2004: 2). The semantic distinctions made by the forms are not easy to capture from a European perspective. For example, to convey the ongoing meaning of (1b) in an out-of-the-blue context, Mandarin can use the grammaticalized morphemes *zai* (2a) or *zhe* (2b). Without morphological tense marker, the listening in (2a) or (2b) can be interpreted as happening either in the past or at present if the sentence is used in an out-of-the-blue context.

- (2) a. Ta zai ting yi-shou ge.
 he ZAI listen one-CL song
 ‘He was/is listening to a song.’
 b. Ta ting-zhe yi-shou ge.
 he listen-ZHE one-CL song
 ‘He was/is listening to a song.’

It is perplexing how the labor of describing ongoing meaning is divided between *zai* and *zhe*. Moreover, the completion meaning of (1a) can be expressed by different Mandarin tense-aspect forms, see (3a)–(3d).

- (3) a. Ta ting-le yi-shou ge.
 he listen-LE one-CL song
 ‘He listened to a song.’

- b. Ta ting-guo yi-shou ge.
he listen-GUO one-CL song
'He has listened to a song.'
- c. Ta ting-wan yi-shou ge.
he listen-finished one-CL song
'He listened to a song.'
- d. Ta ting-wan-le yi-shou ge.
he listen-finished-LE one-CL song
'He has listened to a song.'

(3a)–(3d) each describe a complete listening in the past. (3a) and (3b) use post-verbal *le* and *guo*, respectively, two grammaticalized morphemes. (3c) uses a resultative verb complement (RVC) *wan* 'finished' compounding with the verb *ting* 'listen'. The RVC is a morpheme specifying that the entire song was listened to. A multitude of adjectival and verbal morphemes in Mandarin can compound with verbs, functioning as resultative verb complements. Additionally, the completion meaning can also be conveyed by stacking an RVC and post-verbal *le* (3d). The aspectual distinctions between post-verbal *le*, *guo*, and RVCs are subtle and difficult to articulate. However, this is not the full story, because the completion meaning can also be conveyed by verbal reduplication. For example, (4) uses the verb reduplication *xiao-xiao* 'smile-smile' to describe a complete transient smiling occurring in the past.

- (4) Zhangsan chao wo xiao-xiao.
Zhangsan towards me RED=smile
'Zhangsan smiled at me.'

The richness of Mandarin tense-aspect forms is acknowledged in the literature, although no agreement has been reached on an exhaustive list of the forms, given that some expressions (e.g., the sentence-final particle *ne*) are still controversial. The semantic distinctions made by Mandarin tense-aspect forms, as reflected by (2a)–(2b), (3a)–(3d) and (4), are more complex than the aforementioned Perfective vs. Imperfective or Progressive vs. non-Progressive distinctions. There are many theory-driven case studies

of the individual Mandarin forms, but not all of them have been fully investigated, such as RVCs, which are notorious for having intricate interactions with verbs. Also, intensively studied forms such as post-verbal *le* and *guo* are still semantically controversial, receiving competing analyses in the literature (Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Smith & Erbaugh 2005; Lin 2006; Sun 2014; to name a few studies).

Additionally, although Mandarin sentences systematically use tense-aspect forms, an important but much less discussed phenomenon is that Mandarin allows sentences to be aspectually unmarked; consider (5), which contains a bare verb *xihuan* ‘like’:

- (5) Zhangsan xihuan Lisi.
 Zhangsan like Lisi
 ‘Zhangsan likes/liked Lisi.’

(5) means that Zhangsan is/was in a state of liking Lisi. Whether (5) obtains a past or a present interpretation depends on the context. (5) exemplifies that aspectually unmarked Mandarin sentences can also be grammatical. Various analyses have been made for the interpretations of aspectually unmarked sentences, but no consensus has been reached (e.g., Smith 1997; Klein *et al.* 2000; Xiao & McEnery 2004; Sun 2014).

Since Mandarin verbs can but do not obligatorily carry tense-aspect forms in sentences, properly understanding the Mandarin aspect system requires specifying the factors that regulate the presence/absence of the forms and uncovering how different forms interact with verbs to derive different aspectual interpretations at the sentential level. Multiple elements in different syntactic layers, from the low-positioned unmarked verbs and aspectual morphemes, such as RVCs, to high-positioned grammatical markers, such as post-verbal *le*, can shape the aspectual interpretation of a sentence. Therefore, Mandarin aspect is compositional. The aspectual distinctions of Perfective vs. Imperfective and Progressive vs. non-Progressive are related to grammar, applied to verb phrases. The stative/eventive interpretation of sentences is another aspectual distinction commonly discussed in the literature; this interpretation is governed by

verbal lexicon as well as other elements in a sentence. To write a formal semantics for the Mandarin aspect system, it is necessary to unpack the compositionality of Mandarin aspect by specifying how various aspectual distinctions are made using different devices (and their interactions) and spelling out the semantics of the devices.

To contribute to the overarching goal of writing a formal semantics for the Mandarin aspect system, this dissertation hones in on more concrete goals. I will start with testing hypotheses drawn from the literature. As mentioned above, there are many semantic studies on Mandarin tense-aspect forms (including both the explicit forms and unmarked verb forms, hereafter). Since an overall empirical picture of the Mandarin aspect system is lacking in the formal semantics literature, my study will fill this gap by quantitatively testing the hypotheses in a corpus so as to evaluate (competing) analyses in previous studies. If there are hypotheses not in line with the corpus data, I will apply theories to qualitatively analyze the data that challenge the hypotheses so as to revise them, if needed. Throughout my research, I will assume Frege's Principle of Compositionality to deal with Mandarin data. Put briefly, the dissertation aims to reveal how aspectual interpretations of Mandarin sentences (stative/eventive interpretation) are compositionally derived from unmarked verbs and their interactions with tense-aspect forms in a bottom-up fashion, particularly by combining quantitative and qualitative studies to test semantic hypotheses drawn from the literature.

To reach the dissertation's goals, I exploit a parallel corpus rather than a monolingual Mandarin corpus, given that operationalizing the hypotheses in the latter is susceptible to circular reasoning (this becomes clearer in Section 1.2). As a study embedded in the *Time in Translation* research project, I use the Camus corpus created by the project,² which includes source texts from the French novel *L'Étranger* (*The Outsider*), written by Albert Camus, and their translations in multiple European languages and Mandarin. The corpus provides a cross-linguistic platform where I can study the meanings of Mandarin tense-aspect forms by investigating their associations with

² Visit <https://time-in-translation.hum.uu.nl> for more information about the project. See also van der Klis *et al.* (2021a) for more information about the corpus.

well-studied European tense-aspect forms. The investigation equips me with leverage to exploit the theories originally developed for analyzing European tense-aspect forms to capture the semantics of Mandarin tense-aspect forms. Furthermore, such a corpus expands the data source of formal semantic studies on Mandarin aspect. Traditional studies often use elicitation data presented without a detailed context, which sometimes gives rise to disagreement over interpretation, but my corpus constitutes contextualized real-world data, which has ensured felicity and clear interpretations. Due to the data choice, my study focuses on the use of Mandarin tense-aspect forms in narrative discourse. The next section will explain how the dissertation goals are achieved chapter by chapter.

1.2 The structure of the dissertation

To accomplish my research goals, the dissertation is structured as follows.

Chapter 2 provides the theoretical concepts relevant to my research and clarifies the starting point of my empirical testing. The chapter starts out by briefly presenting neo-Davidsonian event semantics, the fundamental framework adopted for the formal analyses throughout the dissertation. I then introduce the mainstream views on tense and illustrate the compositionality of aspect from the verbal level to the sentential level, particularly elaborating on two popular theories on aspect: the one-component approach (Parsons 1990; Kamp & Reyle 1993; de Swart 1998; Verkuyl 1999; Cipria & Roberts 2000 and others) and the two-component approach (Smith 1997; Depraetere 1995; Filip 1999; Bertinetto & Delfitto 2000 and others). Having introduced the general tense-aspect theories, I review studies mainly on Mandarin aspect that apply general tense-aspect categories originally developed for European languages (e.g., Perfective, Progressive) to analyze Mandarin tense-aspect forms. According to the studies, I formulate the following hypotheses:

Hypothesis 1: A resultative verb compound (V+RVC) denotes a culminated event plus result state (along the lines of Li & Thompson 1981).

- Hypothesis 2a: Post-verbal *le* is a Perfective marker (along the lines of Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014).
- Hypothesis 2b: Post-verbal *le* is a resultative Perfect marker (along the lines of Lin 2006).
- Hypothesis 3a: *Guo* is a Perfective marker (along the lines of Smith 1997; Lin 2006).
- Hypothesis 3b: *Guo* is an experiential Perfect marker (along the lines of Xiao & McEnery 2004).
- Hypothesis 4: *Zai* is a Progressive marker requiring a process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006; Sun 2014).
- Hypothesis 5: *Zhe* is an Imperfective marker requiring a state or process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006).
- Hypothesis 6: Verbal reduplication is a Perfective marker (along the lines of Smith 1997; Dai 1997; Xiao & McEnery 2004).
- Hypothesis 7a: Mandarin aspectually unmarked sentences are aspectually transparent (i.e., they have an eventive interpretation if the underlying eventuality description is quantized and have a stative interpretation if the eventuality description is homogeneous, along the lines of de Swart 1998).
- Hypothesis 7b: Mandarin aspectually unmarked sentences have neutral aspect (i.e., neither Perfective nor Imperfective, along the lines of Smith 1997).
- Hypothesis 7c: Mandarin aspectually unmarked sentences using non-dynamic eventuality descriptions have a stative interpretation whereas those using dynamic eventuality descriptions are underspecified for aspect (they receive a Perfective or an Imperfective interpretation depending on the discourse context, along the lines of Xiao & McEnery 2004).

Hypothesis 7d: Mandarin aspectually unmarked sentences have a stative interpretation (denoting lexical states or generics, along the lines of Sun 2014).

To quantitatively test the hypotheses in a corpus, I need to deductively operationalize them by converting the abstract general tense-aspect categories and aspectual notions (stative/eventive) into countable items. This could be done in a monolingual Mandarin corpus by exploiting a Mandarin native speaker's intuition to annotate the interpretation of the Mandarin data with the categories/notions and then quantitatively checking whether the hypotheses correctly predict the aspectual contributions made by the Mandarin tense-aspect forms used in the annotated data. The intuition-based annotation, however, may lead to circular reasoning. I thus opt for a parallel corpus, namely the Camus corpus, and the rationale is that the interpretation of Mandarin data can be reflected by their European translation equivalents in the corpus, and the European tense-aspect forms used in the translation equivalents, which are countable, can be used as representations of the general tense-aspect categories/notions.

Since the Camus corpus involves French source texts and their Mandarin translations, Chapter 3³ preliminarily tests H1 through H7d in the corpus via a contrastive study between French and Mandarin tense-aspect forms. The study, conducted in conjunction with *Time in Translation* colleagues, uses French tense-aspect forms to represent general tense-aspect categories (and aspectual notions) and tries to find the Mandarin variants of the general categories. We use absolute frequency to measure the tendencies regarding which Mandarin tense-aspect forms are used to translate which French tense-aspect forms. The results are in line with H4 and H6, but unexpected findings also appear. The findings question *whether* the intervention of translation could invalidate the use of parallel corpora for cross-linguistic variation studies. We thus discuss and compare three major

³ Chapter 3 is adapted from Le Bruyn *et al.* (2022) "Parallel Corpus Research and Target Language Representativeness: the Contrastive, Typological and *Translation Mining* Traditions". In view of the joint authorship, the chapter uses the first-person plural pronoun *we*.

traditions that methodologically apply parallel corpora to investigate cross-linguistic variation: the contrastive tradition (Johansson 1998a, 2007; Granger & Lefer 2020), the typological tradition (Wälchli 2010; Wälchli & Cysouw 2012), and the *Translation Mining* tradition (van der Klis *et al.* 2017, 2021a; Le Bruyn *et al.* 2019; Bremmers *et al.* 2021). Consequently, we confirm the validity of parallel corpora for cross-linguistic studies and find that the *Translation Mining* tradition suits our testing best.

Further discussion on the unexpected findings of the preliminary testing in Chapter 3 points out that tense-aspect forms in French (or any other single European language in the corpus) are insufficient to represent general tense-aspect categories. The problem cannot be solved if we implement standard *Translation Mining* methodology, which only compares individual languages. We therefore develop a variation on the methodology, dubbed *Aggregated Translation Mining*, which is introduced in Chapter 4. In a data-driven way, it aggregates multiple European tense-aspect forms which appear in cross-linguistic translation equivalents into European tense-aspect tuples. I argue that the tuples encode cross-linguistic tense-aspect categories (e.g., Past Perfective, Present Perfect) and are thus better representations of general tense-aspect categories.

Using the European tense-aspect tuples, Chapter 4 subjects H1–H7d to further sophisticated testing. Similar to the preliminary testing, frequency is used to measure the tendencies that Mandarin tense-aspect forms occur in contexts instantiating the tuples that represent general tense-aspect categories. A context is a datapoint in the Camus corpus, consisting of aligned cross-linguistic translation equivalents. The results indicate that Mandarin tense-aspect forms have many-to-many associations with European tense-aspect tuples. To unpack and measure the associations, I use the bi-directional association measure Normalized Pointwise Mutual Information (NPMI). The NPMI scores and frequencies are not in line with H3a (on *guo*) and H7b (on aspectually unmarked sentences) but in line with the following hypotheses: *guo* is an experiential Perfect marker (H3b); *zai* is a Progressive marker (H4); and *zhe* is an Imperfective marker (H5). I also zoom in on the verbs marked by *zai* or *zhe* in my data and find that the input requirements of the markers specified by H4/H5 are borne out.

Moreover, the remaining hypotheses on RVCs (H1), post-verbal *le* (H2a,b), verbal reduplication (H6), and aspectually unmarked sentences (H7a,c,d) receive weak positive statistical evidence, with the consequence that more in-depth qualitative analysis of the corpus data is needed to properly interpret the statistics and evaluate these hypotheses. As a corpus-based study, this dissertation leaves H6 open due to the limited amount of data for verbal reduplication. Since I aim to figure out how bare verbs compositionally interact with all kinds of tense-aspect forms to derive aspectual interpretations at the sentential level, the following research in the dissertation takes a syntactically bottom-up perspective by first investigating aspectually unmarked sentences (Chapter 5) and then moving on to RVCs (Chapter 6) and post-verbal *le* (Chapter 7).

Chapter 5 tackles aspectually unmarked sentences by re-examining H7a, 7c and 7d (recall that H7b was rejected in Chapter 4). I find that H7a and H7d can be reconciled if the Mandarin inventory of overt aspectual expressions is enriched to include not only grammatical markers but also telicity-indicating methods. I thus propose an inventory of Mandarin telicity-indicating methods. The methods function within or across clauses, including RVCs, *de*-resultatives, endpoint-indicating phrases, a consequent state in the causative construction, (in)direct speeches, and dynamic telicity indicating. With the enriched inventory of overt aspectual expressions in place, I formulate Hypothesis 7e, which pushes the reconciliation of 7a and 7d further by integrating Sun's (2014) generalizations on grammatical aspectual markers:

Hypothesis 7e: Mandarin sentences with predicates using aspectually unmarked verbs have a stative interpretation. Mandarin sentences with an eventive interpretation must use overt aspectual expressions (including grammatical aspectual markers or telicity-indicating methods).

To test H7e, I reanalyze my Mandarin data and find that multiple sentences using aspectually unmarked verbs contain telicity-indicating methods. Using particular European tense-aspect tuples again to indicate whether reanalyzed

Mandarin sentences have eventive or stative interpretation, I find H7e is supported by the statistics of NPMI and absolute frequency. Since H7e is incompatible with H7c, H7c then is no longer retained. I finally conclude that Mandarin sentences predicated by aspectually unmarked verbs have a stative interpretation, while in the absence of grammatical aspectual markers, sentences using verbs along with telicity-indicating methods (within or across clauses) have an eventive interpretation.

Having analyzed aspectually unmarked sentences, in Chapter 6 I deal with the semantics of RVCs so as to re-evaluate H1. RVCs are the telicity-indicating method most closely interacting with verbs such that the two form verb compounds. RVCs comprise a complex family (Smith 1997; Xiao & McEnery 2004) consisting of completive RVCs, result-state RVCs, directional RVCs, and frozen RVCs. To spell out the semantics of different RVC verb compounds, I apply Ramchand's (2008) first-phase syntax and its associated post-Davidsonian event semantics to decompose them. The framework proposes that culminated events consist of three subeventualities: initiation state, process, and result state, which are introduced by a hierarchical sequence of functional projections, labeled *initP*, *procP*, and *resP*. Applying Ramchand's framework to check all the RVC data in the Camus corpus, I find that RVC verb compounds always denote culminated events with three projections and that RVCs are embedded in *resP* (either as the *res* head or the complement of *res*), specifying the result states. Since the results of the qualitative analysis are in line with H1, I conclude that H1 is compatible with my data and attribute the weak NPMI evidence for H1 found in Chapter 4 to the labor divided between RVCs, other telicity-indicating methods, and post-verbal *le* in terms of assigning sentences an eventive interpretation. Additionally, Chapter 6 applies Ramchand's framework to analyze other telicity-indicating methods functioning within clauses (recall Chapter 5), reaching the conclusion that they are also embedded in *resP*, conveying the culmination of events. I thus generalize that Mandarin sentences denoting culminated events obligatorily project *resP*.

Chapter 7 tackles the semantics of post-verbal *le* so as to re-evaluate H2a and H2b based on qualitative analysis. Given that in Chapter 4, both

hypotheses receive weak statistical evidence, I propose that they can be reconciled in an improved version of Lin's (2006) proposal. In the improved version, I enrich Lin's preliminary event structure with Ramchand's fine-grained first-phase syntax and associated semantics, arguing that semantically, post-verbal *le* has aspectual duality, as it denotes Perfective aspect for the initiation and process of an eventuality but Imperfective aspect for the result state (if any) of an eventuality; syntactically, post-verbal *le* identifies the Asp head and takes *initP* as its complement. Specifically, when marking verbs that do not encode result states, post-verbal *le* functions as a Perfective marker (H2a). Otherwise, it functions as a resultative Perfect marker (H2b). Furthermore, Lin's (2006) argument that post-verbal *le* encodes relative past tense in addition to its aspectual meanings is retained in my improved proposal. To test the proposal, I apply it to the corpus data marked by post-verbal *le* and find that it does a good job at accounting for my data.

Based on the improved proposal, Chapter 7 also compares post-verbal *le* and RVCs by investigating minimal pairs in the corpus that contain one of the two expressions. In a nutshell, post-verbal *le* is related to grammatical aspect, setting temporal restrictions for the subeventualities of decomposed eventualities; RVCs belong to eventuality description, lexicalizing result states of events. RVCs always make sentences entail culminated events, while post-verbal *le* can make sentences convey culminated events as a conversational implicature. Also, post-verbal *le* is obligatorily used in sentences to denote non-culminated events or to coerce a verb that describes a state into an event description. Moreover, RVCs and post-verbal *le* can co-occur in the same sentence, as in (3d), so as to give it a stative interpretation by emphasizing the current relevance of the result state (the interpretation of resultative Perfect). The weak NPMI evidence for H2a,b found in Chapter 4 is attributed to the competition between post-verbal *le*, RVCs, and other telicity-indicating methods as overt aspectual expressions to make sentences eventive (H2a) and to the competition between post-verbal *le* and *guo* in terms of making sentences have a Perfect meaning (H2b).

Finally, Chapter 8 concludes the dissertation and presents topics for future research.

Chapter 2

Tense-aspect theories and Mandarin aspect studies

2.1 Introduction

Chapter 1 has announced the roadmap of the dissertation. This chapter will introduce the theoretical background and previous studies that are necessary for understanding the issues to be addressed in subsequent chapters and will formulate the hypotheses waiting to be tested according to the literature.

The term “aspect” is used by linguistics in varied ways and has many definitions. Traditionally, it has been applied to the grammaticalized viewpoints on situations, which are denoted by tense-aspect forms. Later on, the temporal properties of situations, conveyed by verbs or verbal phrases, were also included within the range of the term because linguists started to appreciate their contribution to the temporal interpretation of situations. For example:

- (1) Mary was eating an apple.
- (2) Mary ate an apple.

In (1), the verb-argument structure *eat an apple* contributes the concept of a situation: the action of consuming an apple. The English tense-aspect form

-ing, known as the Progressive marker (recall Chapter 1), specifies that the action is viewed as being in progress. Whether the apple was completely eaten is unknown because the whole sentence just describes an action of eating that extended over time. The situation denoted by (1) is stative, which is temporally unbounded. Both the verb-argument structure and the *-ing* form contribute to the aspectual interpretation that (1) is stative. The past tense indicated by *was* further specifies that the situation happened in the past. In contrast, although (2) uses the same verb-argument structure and the past tense, it lacks the Progressive marker *-ing* such that the sentence describes a completed eating action that ceased at some time in the past. The situation described by (2) is eventive, which is temporally bounded.

The distinction between (1) and (2) reflects that the aspectual interpretation of a sentence, i.e., whether it is stative or eventive, is determined by what elements constitute the sentence and their compositional interaction. Recall how Chapter 1 mentioned that Mandarin aspect is found to be compositional, and Mandarin allows sentences to use zero to multiple tense-aspect forms. The idea that aspect is compositional is extensively accepted (Verkuyt 1972, 1989, 1993; Declerck 1979; Smith 1997; Depraetere 1995; de Swart 1998; Filip 1999; Bertinetto & Delfitto 2000; Xiao & McEnery 2004; among others).

In the literature there are two approaches to model the compositionality of aspect. One is referred to as the two-component approach (Depraetere 1995; Smith 1997; Kratzer 1998; Filip 1999; Bertinetto & Delfitto 2000; and others) because it assumes two semantic machineries for different layers of aspect. For concreteness, I choose Smith (1997) for illustration. Smith proposes two notions, situation type and viewpoint aspect, to deal with the compositionality of aspect. The situation described by the verb-argument structure *eat an apple* in (1) belongs to the situation type of accomplishment (elaborated in Section 2.3.1) which is dynamic and has a process and an inherent final endpoint. The endpoint is indicated by the total consumption of the apple. The Progressive marker *-ing* functions as a “lens” that ignores the initial and final endpoints of the situation and only makes a portion of its process visible. Technically, it links the situation to a time interval including times after the initial endpoint of the situation and before its final endpoint.

As a result, what (1) presents is an eating situation with its two endpoints deprived, thus being temporally unbounded. Without such a “lens”, the situation described by (2) has two endpoints, thus being temporally bounded.

Other terms for the situation type/viewpoint aspect include aspectual class/grammatical aspect (de Swart 1998), lexical aspect (or *Aktionsart*)/grammatical aspect (cf. Siewierska 1991: 116; Olsen 1997; Bickel 1997: 115; Hsieh 2001: 234), inner aspect/outer aspect (Verkuyl 1989, 1993; Travis 2010), etc. Since the two-component approach argues that every sentence has exactly one viewpoint aspect, it has to assume a “neutral” viewpoint aspect to handle sentences without grammatical aspectual markers, such as (2) which only uses a past tense form.

However, the situation type/viewpoint aspect distinction is blurred in the one-component approach to aspect that uses the same semantic machinery to analyze the different layers of aspect (Moens & Steedman 1988; Parsons 1990; Kamp & Reyle 1993; de Swart 1998; Verkuyl 1999; Cipria & Roberts 2000). As a result, viewpoint is optional in this approach such that there is no need to assume a “neutral” viewpoint for aspectually unmarked sentences. The one-component approach originally draws insights from what tense-aspect forms contribute to the temporal structure of narrative discourse. Kamp & Rohrer (1983) point out that in French, *passé simple* is distinguished from *imparfait* (recall Chapter 1): *passé simple* sentences have an eventive interpretation, which moves the story line on, whereas *imparfait* sentences are stative and cannot push the story line forward but provide background information. In English, sentences marked by the Progressive form *-ing* have a stative interpretation (Hinrichs 1986). Focusing on the discourse level, these studies do not probe into how the eventive/stative interpretation of sentence is compositionally derived.

Importantly, de Swart’s (1998) theory integrates the insights from discourse studies and the situation type/viewpoint aspect distinction of the two-component approach such that it can handle the compositionality of aspect. See her analysis for the layered syntactic structure of the sentence in (3), where the Kleene star * indicates that the structure can have zero, one, or more aspectual operations. (2) reflects that grammatical aspect is optional in English. Sentences without grammatical aspectual markers such as (2) are

considered to have no aspectual operation.

(3) [Tense [Grammatical aspect* [Eventuality description]]]¹

De Swart (1998), following the ontology of Comrie (1976), Mourelatos (1978), Bach (1986) and Piñón (1995), assumes that situations are generalized into three types of ontological entities, i.e., states, processes, and events, and they are covered by the term “eventualities”. This dissertation accepts the tripartite ontology. Verbs or verb phrases are eventuality descriptions, introducing states, processes, or events to sentences. The eventuality types are also known as aspectual classes, which have different internal constituencies. States “continue as before unless changed” (e.g., situations described by *know* and *love*) whereas events (e.g., situations described by *arrive* and *eat a cake*) and processes (e.g., situations described by *walk* and *eat*) “require a continual input of energy if they are not to come to an end” (Comrie 1976: 13). Intuitively, processes and states are temporally unbounded whereas events are temporally bounded. For example, the verb-argument structure *eat an apple* in (1) and (2) introduces an event because the eating action requires energy input and the situation has a temporal boundary indicated by the complete consumption of the apple.

Between eventuality description and tense lies grammatical aspect, as (3) illustrates. Markers of grammatical aspects denote aspectual operators. Aspectual operators are argued to be eventuality modifiers mapping “sets of eventualities (of a certain type) onto sets of eventualities (of some possibly other type)”, according to de Swart (1998). The output of the aspectual operator is a set of eventualities, and such an eventuality is later existentially closed by the tense operator denoted by the tense marker. The tense operator additionally specifies the temporal location of the eventuality on the time axis in terms of its relation to a time reference in the context (recall the definition of tense in Chapter 1). Since the default time reference is the moment of utterance, i.e., speech time, tense is usually described as deictic. The commonest tenses found in languages are past, present and future tenses,

¹ De Swart (1998) uses the notion “aspect” rather than “grammatical aspect” in the structure. I make the adaptation here for terminological consistency.

which denote an eventuality temporally located prior to, simultaneous with, or subsequent to speech time, respectively (Comrie 1976: 2). Take (1) as example; the Progressive marker *-ing* maps the event denoted by *eat an apple* to a state, and the past tense indicated by *was* locates the state in a time before speech time, deriving the past interpretation. Without any aspectual marker, in (2) the event introduced by *eat an apple* is preserved at the sentential level, and the finite verb *ate* bears a past tense marker that anchors the event preceding speech time on the time axis. Besides the tense born by finite verbs, there is relative tense (Comrie 1976: 2), which specifies the temporal relations between two eventualities in the same sentence. In the example *Having eaten an apple, Mary saw John*, the perfect participle *having eaten* indicates that the eating event temporally precedes the seeing event.

Although both approaches treat tense and aspect as independent notions, Chapter 1 has mentioned that morphologically, they can be fused (e.g., in French) or separated (e.g., in English). Particularly, Mandarin lacks morphological tense markers (recall Chapter 1) but whether Mandarin has the syntactical tense projection (TP) is controversial. Lin (2006) claims that Mandarin fuses relative past tense and Perfective aspect, not projecting TP. However, Sun (2014) argues that Mandarin has a covert NONFUT tense that indicates non-future interpretation. I leave the TP issue open as it is beyond my research scope.²

Formal modeling of the compositionality of aspect in the two approaches will become clear later in the chapter. Although both approaches provide notions that will be used/mentioned in my later analysis, this chapter does not commit to either approach on the analysis of any tense-aspect forms, because my empirical testing of hypotheses on Mandarin tense-aspect forms in Chapter 3 adopts a form-based approach. The chapter is organized as follows: Section 2.2 introduces the fundamental semantic framework and formal notations used in the dissertation. With the formal toolkit in place, I illustrate the compositionality of aspect in a detailed bottom-up way by

² As noted in Chapter 1, Chapter 7 will show that Lin's (2006) claim accounts well for my corpus data marked by post-verbal *le*. Nevertheless, to solve the controversy requires investigating more empirical data.

delving into eventuality descriptions and grammatical aspects in Section 2.3. Section 2.4 and Section 2.5 introduce Mandarin eventuality descriptions and grammatical tense-aspect markers, respectively. Particularly, Section 2.5 also formulates a series of hypotheses on Mandarin tense-aspect markers based on the literature. The hypotheses will be tested in Chapter 3. Given that aspectual marking is optional in Mandarin, Section 2.6 presents aspectually unmarked Mandarin sentences and proposes hypotheses for the sentences according to related studies. Section 2.7 concludes the chapter.

2.2 Neo-Davidsonian event semantics

Neo-Davidsonian event semantics assumes that events are primitive linguistic entities, an idea dating back to Davidson's (1967) study about action sentences (namely sentences denoting events or processes, following my tripartite ontology). Davidson argues that such a sentence always has an underlying event variable e , which is one argument of the predicate verb in the sentence. For example, the denotation of (4a) in Davidsonian analysis should be (4b) where the verb *kill* is a three-place predicate rather than a traditionally two-place predicate (Davidson (1967) ignores tense).

- (4) a. Mary killed John.
 b. $\exists e[\textit{kill}(\textit{mary}, \textit{john}, e)]$

Davidson's influential insight gives rise to neo-Davidsonian event semantics (e.g., Parsons 1990), which applies thematic roles to analyze the arguments of verbs so as to analyze the semantics of verbs more deeply. Specifically, verbs denote sets of events, providing information about events. The arguments of verbs are connected to verbs as they are event participants, playing thematic roles (e.g., Agent, Theme) in events. Generally, the Agent is the entity intentionally carrying out the event, and the Theme is the entity that directly receives the event. According to neo-Davidsonian event semantics, *kill* has the denotation (5a), and (4a) is represented by (5b), asserting that there is an event of killing, of which the Agent is Mary and the Theme is John.

- (5) a. $[[[\text{kill}]]] = \lambda y \lambda x \lambda e [\text{Killing}(e) \ \& \ \text{Agent}(e,x) \ \& \ \text{Theme}(e,y)]$
 b. $\exists e [\text{Killing}(e) \ \& \ \text{Agent}(e, \text{mary}) \ \& \ \text{Theme}(e, \text{john})]$

Parsons (1990) has applied neo-Davidsonian event semantics to sentences predicated by verbs describing not only events but also states or processes. Nowadays, neo-Davidsonian event semantics is a standard analysis of sentences. Since it treats eventualities as primitives at the sentence level, it is compatible with and thus adopted by many aspect studies. I also use it for semantic representation in this dissertation. However, to tackle the compositional complexity of eventuality descriptions in Mandarin, my study additionally exploits Ramchand's (2008) first-phase syntax and its associated post-Davidsonian event semantics, which decomposes eventualities into subeventualities. Ramchand makes a more fine-grained analysis of verb meanings based on the neo-Davidsonian tradition. Specifically, she decomposes VP³ into a hierarchy of possible functional phrases and establishes their mappings to subeventualities (for a detailed introduction, see Chapter 6). She also assumes that VP is the complement of Asp head and AspP, the complement of T head. Marrying Ramchand's syntactic hierarchy with de Swart's syntactic structure in (3), I assume that eventuality pertains to VP only, and it is the input of the grammatical aspectual operator that takes the position of Asp head (6).

- (6) $[_{TP} \text{Tense}[_{AspP} \text{Grammatical aspect}^* [_{VP} \text{Eventuality description}]]]$

Tables 1 and 2 summarize notations for semantic types and variables throughout the dissertation. Following Ramchand's (2008) notion, I use e for eventuality variables and $e_1, e_2...$ for subeventuality variables, and use constant predicates (Process or State) to indicate whether a variable is a process or a state (event has internal complexity: it is analyzed as the combination of substate and subprocess, as Chapter 6 will show). Times are ontologically treated as intervals rather than points. Since the semantic issues I will tackle are mainly extensional, I systematically ignore the world

³ In fact, Ramchand uses the term *initP* rather than VP, but I stick to the canonical term VP in this chapter.

variable in the dissertation and only mention it if necessary.

Linguistic entities	Types
Individual	e
Eventuality (event/state/process)	v
Time interval	i
Truth value	t

Table 1: Notation for types

Types of variables	Notations
Individual	x, y... (lowercase letters)
Eventuality (event/state/process)	e (e ₁ , e ₂ ...for subeventuality)
Time interval	t
Proposition	p
Predicate	P, Q... (uppercase letters)

Table 2: Notation for variables

With the formal toolkit and the notions in place, Section 2.3 will formally articulate the compositionality of aspect in a bottom-up way.

2.3 Compositionality of aspect

This section zooms into the compositionality of aspect. Section 2.3.1 discusses all sorts of eventuality descriptions (associated with VP) and formally defines their properties. Section 2.3.2 illustrates general grammatical aspects (associated with AspP) with their instances in specific languages.

2.3.1 Eventuality description

As introduced in Section 2.1, eventualities/aspectual classes fall into states, processes, and events (Bach 1986; Verkuyl 1993; de Swart 1998). They can be introduced to sentences by verbs or verb phrases (verb-argument or

verb-complement structure), which are eventuality descriptions. Here are some examples:

- (7) a. State descriptions: *live, have, love, want, know...*
 b. Process descriptions: *walk, swim, run...*
 c. Event descriptions: *recognize, arrive, win, eat a cake, eat up*

The three types of eventualities have different properties. States are static (not changing over time) while processes/events are dynamic (involving changes over time). Meanwhile, states/processes lack inherent endpoints (intuitively being temporally unbounded) but events have them (being temporally bounded). The endpoint is also known as “culmination” (Parsons 1990) in the literature, and an eventuality reaching its inherent endpoint is called a “culminated” eventuality. Whether eventualities have inherent endpoints has syntactic manifestation: state or process descriptions can combine with *for*-adverbials which specify the length of a time span, but not with *in*-adverbials which indicate the endpoint of a time span. For example, the sentences in (8a) use a state description *live* and a process description *swim* respectively, and the time spans of the living state and the swimming process are specified by *for*-adverbials (8b). However, sentences in (8c) are infelicitous because the living state and the swimming process do not provide inherent endpoints that *in*-adverbials can semantically access to.

- (8) a. John lived in Utrecht./ John swam.
 b. John lived in Utrecht for two years./ John swam for three hours.
 c. ? John lived in Utrecht in two years. / ? John swam in three hours.

On the contrary, event descriptions are compatible with *in*-adverbial but not with *for*-adverbial, as (9a)–9(c) show.

- (9) a. Eve drew a circle.
 b. ? Eve drew a circle for ten minutes.⁴

⁴ As de Swart (1998) notes, the sentence can have a reading that Eve drew a circle repeatedly for ten minutes, which is non-intended but coerced by the context.

c. Eve drew a circle in ten minutes.

de Swart (1998)

In addition to the three-way ontology, there is a more fine-grained Vendlerian classification. It originated from Vendler (1957) who distinguishes four different “terms” in English according to the “time schemata” that verbs or verb phrases presuppose, namely states (*have, love, desire*), activities (*run, walk, push a cart*), accomplishments (*run a mile, draw a circle, grow up*), and achievements (*recognize, win the race, start*). As Verkuyl (1993: 33) points out, Vendlerian classes are actually ontological categories and their contribution to aspect studies is relevant at the lexical level. The Vendlerian quadripartition is later explained by three binary features (see Table 3), i.e., [\pm dynamic], [\pm durative] and [\pm telic] (Olsen 1994, 1997; Kearns 2000; among others), and is popularly used to classify verbs, which are treated as combinations of the features. Dynamic verbs denote eventualities involving changes over time. Durative verbs denote eventualities extending over time. Telic verbs denote eventualities with inherent endpoints/culmination (Rothstein 2004: 7).

	Dynamic	Durative	Telic
States	–	+	–
Activities	+	+	–
Accomplishments	+	+	+
Achievements	+	–	+

Table 3: Vendlerian classes explained by binary features

The Vendlerian ontology can be translated into my three-way ontology: Vendlerian states and activities correspond to my states and processes, respectively, while both accomplishments and achievements belong to the category of events. The *for-/in-*adverbial shown above can test telicity so as to distinguish accomplishments and achievements from the other classes. Accomplishments and achievements can be further distinguished in English

by the Progressive aspectual marker *-ing*. Accomplishment verbs can be marked by *-ing* (10a) but achievement verbs cannot (10b).

- (10) a. Eve is drawing a circle. (accomplishment)
b. *Eve is recognizing a circle. (achievement)

However, Verkuyl (1993) argues that there is no clear-cut distinction between accomplishments and achievements because in many cases achievement verbs are compatible with the Progressive aspect (e.g., *Alice is reaching the summit*). I accept Verkuyl's argument and thus stick to the three-way ontology, but Vendlerian terminologies will be mentioned later in the dissertation and my analysis will draw insights from studies using Vendlerian classes.

In Section 2.1, I have highlighted that aspect is compositional. Verkuyl (1972, 1993) notes that at the level of verb-argument structure, the compositionality is reflected by the fact that the aspectual interpretations of sentences are regulated not only by the semantics of verbs (see sentences using intransitive verbs in (8a)) but also by the semantics of verbs' arguments, e.g., (11a,b). Although using the same verb *eat* that introduces a process, (11a,b) differ in aspectual interpretations. (11a) describes a particular eating event while (11b) describes a habit of eating, which is aspectually a state.

- (11) a. John ate *three sandwiches*.
b. John ate *sandwiches*.

The distinction between (11a) and (11b) is caused by the quantificational feature of argument, according to Verkuyl (1972, 1993). *Three sandwiches* encodes a definite quantity specifying the endpoint of the eating event. In contrast, *sandwiches* asserts an indefinite quantity such that (11b) is interpreted as a state. A formalization of Verkuyl's insight with neo-Davidsonian event semantics is found in Krifka's (1989, 1992) studies of the correlations between quantized/cumulative arguments and telic/atelic predicates (i.e., verb-argument structures). (12a) and (12b) show Krifka's

(1989) definitions for the cumulative/quantized properties, using the lattice-theoretical analysis of plurals (Link 1983; Bach 1986).⁵

- (12) a. $\forall P[\text{CUM}_S(P) \leftrightarrow \forall x \forall y [P(x) \wedge P(y) \rightarrow P(x \cup_S y)]]$
 (P has cumulative reference)
 b. $\forall P[\text{QUA}_S(P) \leftrightarrow \forall x \forall y [P(x) \wedge P(y) \rightarrow \neg y \subset_S x]]$
 (P has quantized reference)

S represents a certain predicate characterizing individuals of a certain sort, with its extension having the structure of a complete join semi-lattice without bottom element (cf. Link 1983). P is a first-order predicate variable that applies to the entities of the sort S . P is cumulative if and only if the join of two entities, both of which satisfy P , also satisfies P . The plural NP *sandwiches* is cumulative because the join of sandwiches is still sandwiches. On the other hand, P is quantized if and only if for any two entities which satisfy P , they cannot be a proper part of each other. *Three sandwiches* is quantized because any reference denoted by *three sandwiches* cannot be a proper part of each other.

According to Krifka, the extent of the eating event in (11a) or (11b) is measured out by the extent of the object denoted by the nominal argument which is an incremental (i.e., gradual) Theme (event and process in my ontology is under the cover term *event* in Krifka's terminology. I stick to Krifka's terminology when introducing his theory). Consumed or created objects are typical incremental Themes, appearing in the events denoted by consumption or creation verbs such as *eat* or *write*. To formalize his idea, Krifka proposes a homomorphism relation between the mereological part-whole structures of events and objects when the objects are incremental Themes. Krifka (1989) characterizes the homomorphism between events and objects by proposing the predicates Mapping to Objects (13a) and Mapping to Events (13b). Both predicates operate on a thematic relation R which is held between an event and an incremental Theme.⁶ (13a) means that for an

⁵ The symbol \cup indicates the two-place "join" operation while \subset indicates the two-place relation "proper part".

⁶ The subscripts E and O in (13a, b) stand for the domains of event and of object,

event and an object forming the R relation, every part of the event corresponds to and holds the R relation with a part of the object. (13b) means the opposite correspondence between the part-whole structure of the object and that of the event.

- (13) a. $\forall R[\text{MAP-O}(R) \leftrightarrow \forall e \forall e' \forall x [R(e,x) \wedge e' \subseteq_E e \rightarrow \exists x' [x' \subseteq_O x \wedge R(e',x')]]]$
 b. $\forall R[\text{MAP-E}(R) \leftrightarrow \forall e \forall x \forall x' [R(e,x) \wedge x' \subseteq_O x \rightarrow \exists e' [e' \subseteq_E e \wedge R(e',x')]]]$

Applying (13a, b) to (11a), every part of the eating event in (11a) corresponds to a part of the three sandwiches, and every part of the three sandwiches corresponds to a part of the eating event. Therefore, the quantized property of *three sandwiches* makes the predicate in (11a) telic. Similarly, the cumulative property of *sandwiches* makes the predicate in (11b) atelic.

Furthermore, to explain the temporal interpretations of events by relating events to times, Krifka (1989) introduces the temporal trace function τ which maps an event to its temporal trace (“run time”), and it is “a homomorphism relative to the joins” (14). In (14), T stands for the domain of times, carrying a complete join semi-lattice without bottom element. With the function τ , the eatings in (11a, b) can be linked to the time axis.

$$(14) \quad \forall e \forall e' [\tau(e) \cup_T \tau(e') = \tau(e \cup_E e')]$$

Krifka’s theory is incorporated into Ramchand’s (2008) post-Davidsonian event semantics, and I will use the latter to explain the compositionality of aspect at the level of eventuality description. Event descriptions have quantized references while state/process descriptions have cumulative and meanwhile, divisive references (for example, parts of being happy/walking qualify as being happy/walking), according to de Swart (1998). See (15) for the definition of the divisive property (Krifka 1989).

respectively. Both domains have the algebraic structure of complete complementary join semi-lattice without bottom element.

$$(15) \quad \forall P[\text{DIV}_s(P) \leftrightarrow \forall x \forall y [P(x) \wedge y \subseteq_s x \rightarrow P(y)]]$$

(P has divisive reference)

It should be noted that basic eventualities can form supercategories (de Swart 1998). For instance, states and processes form a homogeneous supercategory that satisfies cumulative and divisive properties, distinguishing themselves from events which are quantized. Processes and events form a dynamic supercategory, in contrast to states which are static. The coming Section 2.3.2 will show that some language-specific tense-aspect forms only apply to particular supercategories. Also, the eventive/stative interpretation of sentences, which reflects the temporally bounded/unbounded intuition, is correlated with the quantized/homogeneous distinction of eventualities. Eventive sentences denote events because events are quantized and thus are bounded on the time axis (with the help of function τ). On the other hand, stative sentences denote states or processes because states and process are homogeneous and thus are not bound on the time axis.

This subsection has shown the compositionality of aspect at the level of eventuality description (i.e., verb-argument structure, associated with VP). Next, I will introduce grammatical aspect (ignored in Krifka 1989), the higher aspectual layer interacting with eventuality description.

2.3.2 Grammatical aspect

Grammatical aspect, as (6) in Section 2.2 indicates, is associated with AspP and intermediates between eventuality description and tense. It is analyzed in two different ways in the literature (recall Section 2.1). The one-component approach (e.g., de Swart 1998) argues that grammatical aspect denotes an aspectual operator, which is an eventuality description modifier. The modifier maps the set of eventualities (of a certain type) denoted by the eventuality description onto the set of eventualities (of some possible other type) that later is anchored to the time axis and existentially closed by the tense operator. The two-component approach (e.g., Smith 1997) treats grammatical aspect as the viewpoint (“lens”) taken by the speaker towards

an eventuality.

Remember Chapter 1 mentioned that languages make different distinctions of grammatical aspects. Cross-linguistically, there are general grammatical aspects, e.g., Progressive,⁷ Perfective, Imperfective, which are semantic distinctions abstracting over the meanings of language-specific tense-aspect forms (Comrie 1976: 10). This subsection will illustrate general grammatical aspects with typical instances (which have adequate semantic overlap with the aspects) from the European languages that will be exploited in my corpus study, i.e., Romance and Germanic languages.

The Progressive aspect, which means an eventuality is in progress, is grammaticalized in English, see (16a) copied from (1). (16a) uses the tense-aspect form named past continuous: the Progressive marker *-ing* conveys the ongoing status of the eating and the past tense locates the situation in the past. Copied from (2), (16b) however, only uses the form of simple past, and has a non-Progressive meaning: the eating was finished with the apple fully eaten. In English, Progressive is independent from tense, as it is used in the past/present/future domain (16a, c).

- (16) a. Mary was eating an apple.
b. Mary ate an apple.
c. Mary is eating an apple. /Mary will be eating an apple.

According to de Swart (1998), Progressive aspect only applies to dynamic eventualities, i.e., the supercategory consisting of process and event, and its output is a state which describes a stage of the process/the event as being in progress. Thus Progressive aspect denotes a function $PROG: P \cup E \rightarrow S$ (P , E , S stand for the sets of processes, of events and of states, respectively), rendering sentences a stative interpretation. Progressive is semantically intensional (Dowty 1979; Landman 1992; Asher 1992), see Landman's (1992) classical definition that PROG applies to VP:

⁷ The initial letters of general grammatical aspects are capitalized, recall footnote 1 in Chapter 1.

- (17) $[[\text{PROG}(e, P)]]^{w,g}=1$ iff $\exists e' \exists w': \langle e', w' \rangle \in \text{CON}(g(e), w)$ and $[[P(e')]]^{w',g}=1$, where $\text{CON}(g(e), w)$ is the continuation branch of $g(e)$ in w .⁸

Informally, (17) says that an eventuality e described by $\text{PROG}(P)$ in an evaluation world w has a reasonable chance to be part of an eventuality e' realizing the property P in another possible world w' that resembles w in certain ways. This means that when the Progressive operator works on an event, the Progressive sentence describes a development of the event which would lead to a culmination (in the evaluation world or a possible world similar to the evaluation world). For instance, (16a) does not entail that the apple was completely eaten but it would be in a possible world.

The Progressive aspect is characteristic of English. Nevertheless, in Romance languages such as French, the so-called Imperfective aspect is grammaticalized rather than Progressive aspect. Imperfective aspect “pays essential attention to the internal structure of [a] situation” and makes sentences have a stative interpretation, having Progressive aspect as a subdivision (Comrie 1976: 16, 25). See the French examples (18a–c) using the tense-aspect form *imparfait* to convey Imperfective aspect. The aspect gives rise to not only an in-progress interpretation (18a) but also a stative interpretation (18b) and a habitual interpretation (18c). Imperfective aspect is distinguished from Perfective aspect that “indicates the view of a situation as a single whole, without distinction of the various separate phases that make up that situation” (Comrie 1976: 16). Sentences with Perfective aspect have an eventive interpretation. In French, Perfective aspect is conveyed by the tense-aspect form *passé simple* (18d). (18d) describes a writing event with the thesis completely written, telling nothing about any intermediate stage of the writing.

⁸ $\text{PROG}(e, P)$ is true in w relative to g iff in some world w' on the continuation branch of $g(e)$ in w , some eventuality e' realizes the property P . The continuation branch of an eventuality e in w is the smallest set of eventuality-world pairs such that the history of w' is the same as w up to and including the run time of e . The formal definition of continuation branch see Landman (1992). By the definition of continuation branch, $g(e)$ is a stage of e' (namely, e' contains e as a part and e' is a further development of e .)

- (18) a. Il écrivait sa thèse en 2009.
 he wrote.IMP his thesis in 2009
 ‘He was writing his thesis in 2009.’
- b. Julie était amoureuse de Marc.
 Julie was.IMP in.love of Marc.
 ‘Julie was in love with Marc.’
- c. Le samedi, Julie jouait au tennis.
 the Saturday, Julie played.IMP at tennis
 ‘On Saturdays, Julie played tennis.’
- d. Il écrivit sa thèse en 2009.
 he wrote.PS his thesis in 2009.
 ‘He wrote his thesis in 2009.’

(de Swart 2012: 759,760)

Technically, *passé simple* and *imparfait* are analyzed as aspectually sensitive past tense operators that select particular types of eventualities as inputs and locate them in the past (de Swart 1998). *Passé simple* selects events (18d) and specifies that the event is included in a past time ($e \subseteq t$, $t < n$, n for “now”) whereas *imparfait* selects states (18b) or processes (18c), the homogeneous supercategory, and specifies that the state/process overlaps with a past time ($s \circ t$ or $p \circ t$, $t < n$). However, (18a) has the conflict that the input requirement of *imparfait* is not satisfied by the event denoted by *écrivait sa thèse* ‘write his thesis’. The conflict leads to contextually governed reinterpretation that introduces a coercion operator $C_{eh}: E \rightarrow P \cup S$ (the subscript e stands for event and h for the homogeneous supercategory consisting of process and state, recall Section 2.3.1). In (18a), C_{eh} strips the writing event of its culmination point and describes it as being in progress. On top of that, *imparfait* locates the state of the writing in progress in the past. (19a) involves another conflict between *passé simple* and the state description *sut* ‘know’. The sentence is reinterpreted to have an inchoative meaning that Jeanne came into the state of knowing. The conflict triggers another coercion operator $C_{he}: P \cup S \rightarrow E$ (19b) which introduces an event variable and maps the state input (knowing) to that event in such a way that the event describes the onset of the state. Then *passé simple* locates the inchoative event in the past.

- (19) a. (Soudain,) Jeanne sut la réponse.
 (Suddenly,) Jeanne knew-PS the answer.
 ‘(Suddenly,) Jeanne knew the answer.’
 b. [PAST[C_{he} [Jeanne know the answer]]]

(de Swart 1998)

Besides French, Spanish also makes the Perfective vs. Imperfective distinction by the tense-aspect forms *pretérito indefinido* vs. *pretérito imperfecto*. Both languages will be involved in my corpus study. Although semantic studies usually tease aspect apart from tense, the two notions have morphological interplay. For example, Perfective/Imperfective aspect is morphologically fused with past tense in Romance languages and the distinction is limited to the past domain. Pragmatically, events cannot be located within speech time such that “all simple present tense sentences express unbounded situations” (Smith & Erbaugh 2005), thus having a stative interpretation. Many European languages have the tense-aspect category known as Perfect which consists of the auxiliary verb *have* (or its cross-linguistic counterpart) plus the past participle.⁹ This category bears a present tense (indicated by the auxiliary verb) and “relates some state to a preceding situation” (Comrie 1976: 52), making sentences have a stative interpretation. It generally asserts the continuing relevance of a past situation. Take English as an example, English Perfect has four uses: the Perfect of result, the experiential Perfect, the Perfect of persistent situation, and the Perfect of recent past (Comrie 1976: 56).

- (20) a. John has arrived in Beijing. [Perfect of result]
 b. John has been to China. [Experiential Perfect]
 c. John has lived in China since 2000. [Perfect of persistent situation]
 d. The clock has just struck 3. [Perfect of recent past]

Perfect of result refers to a present state that has resulted from a past situation (Comrie 1976: 56); e.g., (20a) refers to John’s state of being in

⁹ Perfect has a morphological mirror image in the past domain known as Pluperfect (Comrie 1976: 53).

Beijing, resulting from John's arrival, holding at present. Given that this use of Perfect applies to all kinds of eventuality descriptions, de Swart (1998) defines it as a function $\text{PERF}: \varepsilon \rightarrow S$, mapping an eventuality onto a state (ε stands for the sets of eventualities). The Perfect operator asserts the existence of an event e and its result state s that starts immediately after e ($e \supset \subset s$), and s is further anchored by the tense operator to overlap with the present time ($s \circ n$). In this way, Perfect gives the meaning that the eventuality happened in the past and its result state holds at present.

Besides the canonical Perfect of result, (20b)–(20d) show other uses of Perfect. The experiential Perfect “indicates that a given situation has held at least once during some time in the past leading up to the present” (Comrie 1976: 58). For example, (20b) indicates that John went to China at least once. Perfect of persistent situation describes a situation that “started in the past but continues (persists) into the present” (Comrie 1976: 60), as illustrated by (20c) which means that John started living in China in 2000, with the living state continuing at present. Perfect of recent past indicates a past situation temporally close to the present (Comrie 1976: 60). The current relevancy of (20d) is that the happening of the clock-striking is in the very recent past.

Not all languages with the Perfect form have the four uses of Perfect. In fact, the semantics of Perfect form cross-linguistically varies a lot (Section 3.5.1 will elaborate on the cross-linguistic variation). The German Perfect form (*Perfekt*) has an interpretation oscillating between tense and aspect. In southern German dialects, *Perfekt* has extended to take over the simple past form (*Präteritum*) and has become the only past tense (Comrie 1976: 53). See *hat gebaut* in (21) from Kratzer (1998), which bears the form of *Perfekt* and conveys a past completed meaning. It is translated into *built* that bears the English simple past tense. Similarly, in French (especially spoken French), the Perfect form *passé composé* has extended to replace *passé simple* (Comrie 1976: 53, 127); see (22) for *ai bu* which uses *passé composé* and is translated into *drank* that uses the English simple past tense.

- (21) Wer hat diese Kirche gebaut? Borromini hat diese Kirche gebaut.
 who has this Church built? Borromini has this church built.
 ‘Who built this Church? Borromini built this church.’

- (22) J'ai bu.
I've drunk
'I drank.'

The general aforementioned categories are technically analyzed in the one-component approach. Later, in my introduction to Mandarin grammatical tense-aspect markers (see Section 2.5), the two-component approach's temporal-relational analysis of Perfective and Imperfective will also be involved: they relate the run time of eventuality with the topic time of sentence (Klein 1994; Smith 1997; Kratzer 1998; among others). Topic time of sentence, or Reichenbach's (1947) reference time, is the time about which a sentence is asserted and assigned a value from the context or some temporal adverbial in the sentence. (23a,b) are Kratzer's (1998) definitions for Perfective and Imperfective aspects: the aspects (associated with Asp head) denote operators that map properties of eventualities (characterized by P , associated with VP) to properties of times, specifying the relation between the run time of eventuality ($\tau(e)$) and topic time (t). The variable of topic time (t) is later introduced by the tense operator (associated with T head). Generally, a sentence has a past/present/future interpretation if its topic time precedes/includes/follows speech time (Klein 1994: 122).

- (23) a. Perfective aspect: $\lambda P\lambda t \exists e [\tau(e) \subseteq t \ \& \ P(e) = 1]$ ¹⁰
b. Imperfective aspect: $\lambda P\lambda t \exists e [t \subseteq \tau(e) \ \& \ P(e) = 1]$

The definition of Perfective in (23a) requires topic time temporally including the run time of eventuality, which makes sentences have an eventive interpretation (i.e., temporally bounded). Such an inclusive relation is reversed in the definition of Imperfective (23b) such that Imperfective sentences receive a stative interpretation (i.e., describing temporally unbounded eventualities). Hence, at the sentential level, the two-component-analysis generates the same interpretation as the analysis following the one-component approach.

¹⁰ I have omitted the world argument in Kratzer's definitions and adapted her notation for consistency (for example, I use Krifka's temporal trace function τ to replace Kratzer's *time* function). As stated in Section 2.2, the world argument is systematically ignored in the dissertation and only kept when it is relevant.

To sum up, languages vary in the grammaticalized aspectual distinctions they make. The Perfective/Imperfective distinction is found in Romance languages (e.g., French and Spanish) but not in Germanic languages (e.g., English and German). The Progressive/non-Progressive distinction is characteristic of English. Also, certain tense-aspect categories such as Perfect can have cross-linguistic semantic variation. Below, Table 4 summarizes the language-specific instances of the general tense-aspect categories that will be used in my later testing of hypotheses. I use the cover term tense-aspect categories to refer to categories having tense or/and aspect meaning, as well as categories debatable between tense and aspect, such as Perfect.

	Simple Past	(Past) Perfective	(Past) Imperfective	Progressive	Simple Present	(Present) Perfect
Fr	—	<i>passé simple</i>	<i>imparfait</i>	—	<i>présent</i>	<i>passé composé</i>
Sp	—	<i>pretérito indefinido</i>	<i>pretérito imperfecto</i>	—	<i>presente</i>	<i>pretérito perfecto compuesto</i>
Eg	<i>simple past</i>	—	—	<i>past/present /future continuous</i>	<i>simple present</i>	<i>present perfect</i>
Gr	<i>Präteritum</i>	—	—	—	<i>Präsens</i>	<i>Perfekt</i>

Table 4: European tense-aspect forms as instances of general tense-aspect categories (Fr: French, Sp: Spanish, Eg: English, Gr: German. The dash “—” indicates that no instance is found.)

Since grammatical aspect out-scopes eventuality description, grammatical aspect can override the aspectual class introduced by eventuality description, determining the aspectual interpretation of the entire sentence. Table 5 summarizes the aspectual interpretations of sentences given by the general tense-aspect categories that will be involved in my hypothesis testing.

	(Past) Perfective	(Past) Imperfective	Progressive	Simple Present	(Present) Perfect
Aspectual interpretation of sentence	eventive	stative	stative	stative	stative

Table 5: Aspectual interpretations of sentences that general tense-aspect categories give rise to

So far, Section 2.3 has thoroughly explained the compositionality of aspect within European languages. The introduction to compositionality of aspect equips me with the toolkit to introduce the background information of the Mandarin aspect system from a bottom-up perspective. The rest of the chapter will introduce Mandarin aspect in a syntactically bottom-up way, and by reviewing related studies, I will formulate a series of hypotheses on Mandarin tense-aspect forms.

2.4 Mandarin eventuality descriptions

This section introduces Mandarin eventuality descriptions. I first present descriptions of state/process/event in the form of simple verbs in Section 2.4.1. However, Mandarin is different from European languages such as English in the compositional way the aspectual class of event is built up: in English, the combination of creation/consumption verb and quantized argument obligatorily gives rise to an event (recall Section 2.3.1), but this is not attested in Mandarin. Rather, Mandarin systematically uses a particular type of verb compounds known as resultative verb compounds to describe events, which is introduced in Section 2.4.2.

2.4.1 Three-way classification of Mandarin eventuality descriptions

Simple verbs in Mandarin can be used as eventuality descriptions of states,

processes, or events. For example, Mandarin has verbal state descriptions such as *mingbai* ‘understand’, *ai* ‘love’ and *you* ‘have’, and the verbs can be used alone (without any markers) in sentences. See (24a), the verb *mingbai* ‘understand’ denotes a state of knowing, and the durativity of the state can be specified by adverbs such as *yizhi* ‘always’ (24b). The verb is atelic because it is incompatible with the Mandarin *in*-phrase *san-miao-nei* ‘in three seconds’ (see the *in*-phrase test introduced in Section 2.3.1).

- (24) a. Zhangsan mingbai zhe-jian shi.
Zhangsan understand this-CL matter
‘Zhangsan understands this matter.’
- b. Zhangsan yizhi mingbai zhe-jian shi.
Zhangsan always understand this-CL matter
‘Zhangsan always understands this matter.’
- c. *San miao nei Zhangsan mingbai zhe-jian shi.
three second in Zhangsan understand this-CL matter.
(Intended) ‘Zhangsan understood this matter in three seconds.’

Inspired by Carlson’s (1977: 448) individual-level/stage-level predicates that describe timeless/temporary properties of individuals, Xiao & McEnery (2004: 57–58, 189, 191) distinguish permanent states from temporary states. They subcategorize states into individual-level states, e.g., *shi* ‘be’, *dengyu* ‘equal’, and *xiang* ‘resemble’, and stage-level states, e.g., *bing* ‘be ill’, *tang* ‘lie’, and *chuan* ‘put on; wear’. For example, (25a) conveys a permanent state but (25b) describes a temporary state.

- (25) a. Shi shi oushu.
ten be even number
‘Ten is an even number.’
- b. Zuo-wan Zhangsan tang zai chuang-shang.
last night Zhangsan lie at bed-on
‘Last night Zhangsan lay in bed.’

Simple verbs in Mandarin can describe events, such as *si* ‘die’, *yin* ‘win’ and

dao ‘arrive’. They usually cannot be used alone in sentences in out-of-the-blue contexts. Take *si* ‘die’ as an example, a sentence using *si* ‘die’ alone cannot describe an episodic dying event (26a), but (26b) shows this is possible when *si* ‘die’ is marked by post-verbal *le* (remember Chapter 1 mentioned that post-verbal *le* conveys completion meaning, and I will discuss it in Section 2.5.1). A sentence using *si* ‘die’ with the modal verb *hui* ‘will’, the latter conveying future meaning, can also describe a future episodic dying event (26c). Additionally, *si* ‘die’ is a telic verb as it is compatible with the *in*-phrase *sanshi-fenzhong-nei* ‘thirty-minute-in’ (26d). Although *si* ‘die’ can also be modified by the *for*-phrase *sanshi fenzhong* ‘thirty minute’ (recall the *for*-phrase test in Section 2.3.1), (26e) means the consequent state of being dead, rather than the dying action, lasted for thirty minutes. Hence (26e) does not refute but confirms that *si* ‘die’ is telic (because the dead state resulted from the endpoint of the dying action).

- (26) a. *Zhangsan si.
Zhangsan die
- b. Zhangsan si-le.
Zhangsan die-LE
‘Zhangsan died.’
- c. Mingtian Zhangsan hui si.
tomorrow Zhangsan will die
‘Tomorrow, Zhangsan will die.’
- d. Sanshi fenzhong nei Zhangsan si-le.
thirty minute in Zhangsan die-LE
‘Zhangsan died in thirty minutes.’
- e. Zhangsan si-le sanshi fenzhong.
Zhangsan die-LE thirty minute
‘Zhangsan has been dead for thirty minutes.’

Furthermore, abundant simple Mandarin verbs are process descriptions, e.g., *xie* ‘write’, *chi* ‘eat’, and *zou* ‘walk’. Sentences using process verbs alone have a habitual interpretation. See the example of *xie* ‘write’ (27a). To describe an episodic writing event in an out-of-the-blue context, it is

ungrammatical to use the process verb *xie* ‘write’ (27b) alone but necessary to mark it with post-verbal *le* (27c) or the modal verb *hui* ‘will’ (27d), just as in the *si* ‘die’ cases (26b, c). Crucially, in an out-of-the-blue context, the verb-argument *xie yi-feng xin* ‘write one-CL letter’ in (27c) gives rise to the interpretation that a letter was completely written, as specified by the length information, but the interpretation is a conversational implicature that can be canceled (Grice 1975), see (27e).

- (27) a. Zhangsan xie xin.
Zhangsan write letter
‘Zhangsan writes letters.’
- b. *Zhangsan xie yi-feng xin.
Zhangsan write one-CL letter
- c. (Sanshi fenzhong nei,) Zhangsan xie-le yi-feng xin,
(thirty minute in) Zhangsan write-LE one-CL letter
(zheng-feng xin hen duan).
(whole-CL letter very short)
Zhangsan wrote a letter (in thirty minutes, and the whole letter was very short).
- d. Mingtian, Zhangsan hui xie yi-feng xin.
tomorrow, Zhangsan will write one-CL letter
‘Tomorrow, Zhangsan will write a letter.’
- e. Zhangsan xie-le yi-feng xin, keshi mei xie-wan.
Zhangsan write-LE one-CL letter but not write-finished
‘Zhangsan (partially) wrote a letter, but he didn’t finish it.’
- f. Zhangsan wrote a letter (* but he did not finish it).

The fact that Mandarin sentences using process verbs of creation meaning with quantized arguments can describe non-culminated events such as (27e) is well-known (Tai 1984; Smith 1997; Xiao & McEnery 2004; Lin 2017; among others). This distinguishes Mandarin from English-style languages. Remember Section 2.3.1 mentioned how the combination of creation/consumption verbs with quantized arguments (i.e., Vendlerian accomplishments) derives culminated events in English; e.g., *Zhangsan*

wrote a letter entails that a letter was fully written, and the inference cannot be canceled (27f). Hence, the compositional way building the aspectual class of event with verbs and arguments in Mandarin is different from that in English-style languages. To assert that a processual event reaches its culmination point, a kind of verb compounds known as resultative verb compounds is systematically used in Mandarin, as Section 2.4.2 will show.

2.4.2 Resultative verb compounds

A resultative verb compound consists of a simple verb plus a resultative verb complement (RVC) that “signals some result of the action or process [conveyed by the simple verb]” (Li & Thompson 1981: 54–55). An RVC is expressed by one or two adjectival or verbal morpheme(s). For example, the adjectival RVC *ping* ‘flat’ in (28a) indicates that the final state of the piece of iron was flat. RVCs are very productive in Mandarin. Many Mandarin verbs, typically process verbs (e.g., *da* ‘beat’), can combine with RVCs to form resultative verb compounds. Although traditional grammar usually analyzes RVCs at the verbal level, Smith (1997: 282) argues they contribute to situation type and viewpoint information. The literal meanings of RVCs are completely or partially grammaticalized (Sun 2014: 103) so as to mark the completion of the actions/processes described by the verbs they combine with. For instance, (28b) uses the resultative verb compound *xie-wan* ‘write-finished’ to describe a culminated event with a letter fully written. The culmination is an entailment, which cannot be overridden (28c). This is in contrast to (27e) where the simple verb *xie* ‘write’ marked by post-verbal *le* conveys a cancelable implicature that the letter was fully written.

- (28) a. Wo qiao-ping yi-kuai tie.
 I hammer-flat one-CL iron
 ‘I hammered a piece of iron flat.’
- b. Zhangsan xie-wan yi-feng xin,
 Zhangsan write-finished one-CL letter,
 (zheng-feng xin hen duan).
 (whole-CL letter very short)
 ‘Zhangsan wrote a letter (, and the whole letter was very short)’.

- c. *Zhangsan xie-wan yi-feng xin,
Zhangsan write-finished one-CL letter,
keshi xin neirong bu wanzheng.
but letter contents not complete
*‘Zhangsan wrote a letter but the contents of the letter were
incomplete.’

Therefore, I draw the following hypothesis on resultative verb compounds, which will be tested later in the dissertation:

Hypothesis 1: A resultative verb compound (V+RVC) denotes a culminated event plus result state (along the lines of Li & Thompson 1981).

Zooming into the interaction between the two components of resultative verb compounds, Sybesma (2013) and Sun (2014: 101) propose a syntactical analysis which adapts from Travis (2010) and Xuan (2008): the first component of a resultative verb compound projects VP and the second component, i.e., the RVC, projects Asp#P between AspP and VP. Sun (2014: 102) also notes that RVCs convey aspectual information because they change the event structure of the processes described by the verbs that they combine with. Unfortunately, Sun (2014) has not spelled out the semantic interaction between RVCs and the verbs they are attached to. Given that, I will tackle the issue with Ramchand’s (2008) post-Davidsonian event semantics after obtaining the empirical testing result of Hypothesis 1.

Up till now I have introduced all kinds of Mandarin eventuality descriptions which form the lower layer of the Mandarin aspect system. Next, I will move to the higher layer that operates on the eventuality description, i.e., the grammatical aspect, and formulate hypotheses of Mandarin tense-aspect markers at this layer based on reviews of previous studies. The hypotheses will be empirically tested in the next chapter.

2.5 Mandarin grammatical tense-aspect markers

Mandarin has rich grammatical tense-aspect markers, which have been extensively studied (Chao 1968; Henne *et al.* 1977; Chan 1980; Li & Thompson 1981; Christensen 1994; Dai 1997; Smith 1997; Klein *et al.* 2000; Xiao & McEnery 2004; Wu 2007; Lin 2006; Sun 2014; among others). Although most studies focus on one or more classical markers, i.e., *le*, *guo*, *zhe*, and *zai*, some researchers also propose other markers, such as verbal reduplication (Chao 1968; Li & Thompson 1981; Dai 1997; Smith 1997; Xiao & McEnery 2004) and the sentence-final particle *ne* (Lü 1999: 413). In fact, there is no universal agreement on an exhaustive inventory of Mandarin grammatical tense-aspect markers. Since my study is corpus-based, this section will only introduce grammatical tense-aspect markers appearing in my corpus.

The mostly studied markers *le* (specifically, post-verbal *le*) and *guo* are introduced in Section 2.5.1 and Section 2.5.2, respectively. Different views in the literature suggest that they convey Perfective or Perfect meanings. Then in Section 2.5.3, I will elaborate on *zhe* and *zai*, which are argued by the literature to convey Imperfective and Progressive meaning, respectively. Section 2.5.4 discusses the less studied form of verbal reduplication, which has been argued to be a Perfective marker in previous studies. The statement in Chapter 1 that Mandarin makes more complex aspectual distinctions than the Perfective/Imperfective or Progressive/non-Progressive dichotomy found in European languages (see also Section 2.3.2) will become clearer in this section.

2.5.1 Post-verbal *le*

The grammaticalized morpheme *le* can appear at verb-final position, and *le* in this use is called post-verbal *le*. For example, *le* is attached to the process verb *qu* ‘go’ in (29a), and the sentence means that a going event happened in the past. *Le* can also appear at the sentence-final position, see (29b). (29b) has a Perfect meaning that the going event happened before speech time, and the result state of having gone holds at speech time.

- (29) a. Zhangsan qu-le Beijing. (Post-verbal *le*)
 Zhangsan go-LE Beijing
 ‘Zhangsan went to Beijing.’
- b. Zhangsan qu Beijing le. (Sentence-final *le*)
 Zhangsan go Beijing LE
 ‘Zhangsan has gone to Beijing.’

(29a,b) indicate that *le* has different interpretations at different surface syntactical positions. Therefore, many studies argue that there are two *les* in Mandarin, namely post-verbal *le* and sentence-final *le*. It is controversial whether there is a unified analysis of *le* (Xiao & McEnery 2004: 3, 90). Due to my methodology choice (explained in Section 3.2 and Section 4.3.1), this dissertation will only study post-verbal *le* and leave sentence-final *le* open. See Li & Thompson (1981: 296), Smith (1997: 266) and Xiao & McEnery (2004: 90, 131 – 133) for more information about sentence-final *le*.

Besides applying to process verbs like *qu* ‘go’ (29a), post-verbal *le* can mark state verbs such as *zhidao* ‘know’; e.g., (30a) describes a past inchoative knowing event (i.e., the transition from not-knowing to knowing), and event verbs such as *yin* ‘win’; e.g., (30b) describes a past winning event.

- (30) a. Zhangsan shang ge yue zhidao-le zhe-jian shi.
 Zhangsan last CL month know-LE this-CL issue
 ‘Last month Zhangsan got to know the issue.’
- b. Zhangsan yin-le bisai.
 Zhangsan win-LE competition
 ‘Zhangsan won the competition.’

Although post-verbal *le* applies to all kinds of eventuality descriptions, as (29a) and (30a,b) demonstrate, it cannot apply to a limited group of individual-level state descriptions such as *dengyu* ‘equal’, *shuyu* ‘belong to’, *renwei* ‘think’, *xiwang* ‘hope’ (Lü 1999: 352), see (31a, b):

- (31) a. Er jia er dengyu (*le) si.
 two plus two equal (LE) four
 ‘Two plus two equals four.’

- b. Zhangsan xiwang (*le) Lisi hui chenggong.
 Zhangsan hope (LE) Lisi will succeed.
 ‘Zhangsan hopes that Lisi will succeed.’

Since sentences marked by post-verbal *le* can describe events as a whole without referring to their internal constituency, as (29a) and (30a,b) indicate, post-verbal *le* is extensively analyzed as a Perfective marker (Chao 1968: 246; Henne *et al.* 1977: 117; Chan 1980: 47–61; Li & Thompson 1981: 185; Christensen 1994: 33–65; Dai 1997: 35; Smith 1997: 263; Xiao & McEnery 2004: 171; Sun 2014: 75; to mention just a few).¹¹ I therefore formulate:

- Hypothesis 2a: Post-verbal *le* is a Perfective marker (along the lines of Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014; among others).

However, post-verbal *le* can also convey the meaning of Perfect of result. For example, (32a) from Chao (1968) conveys that a breaking event happened, and the result state, i.e., the leg being broken, holds at speech time. (32b) from Xiao & McEnery (2004: 107) expresses that the authorities got a conclusion, and the result state of authorities having the conclusion holds at speech time.

- (32) a. Wo shuaiduan-le tui.
 I break-LE leg.
 ‘I broke my leg (it’s still in a cast).’
 b. Quanwei-jiguan yi you-le mingque de jielun.¹²
 authorities already have-LE definite DE conclusion
 ‘The authorities have got a definite conclusion.’

¹¹ Sun (2014: 75) defines post-verbal *le* as: $\lambda P_{\langle v,t \rangle} \lambda t_{\text{Top}} \lambda t_0 \exists e [P(e) = 1 \ \& \ \tau(e) \subseteq t_{\text{Top}} \ \& \ \tau(e) < t_0]$. She argues that besides the Perfective meaning (“ $\tau(e) \subseteq t_{\text{Top}}$ ”), post-verbal *le* also denotes the run time of the eventuality (“ $\tau(e)$ ”) preceding the contextually determined evaluation time t_0 .

¹² Some glosses of examples quoted from previous studies are slightly revised so as to keep terminological and notational consistency in the dissertation. For space consideration, I will not indicate them hereafter.

The resultative Perfect use of post-verbal *le* is captured by Lin's (2006) proposal that post-verbal *le* is a tense-aspect marker with aspectual duality. Specifically, Lin argues that post-verbal *le* incorporates Perfective and Imperfective aspects with relative past tense. Lin's proposal follows the two-component approach to aspect: the Perfective component specifies the run time of the eventuality being included in the topic time of the sentence, and the Imperfective component specifies that the run time of the result state of the eventuality includes the topic time of the result state (speech time, as default). Moreover, the relative past tense restricts the run time of the eventuality to precede a local evaluation time (speech time, as default). Lin's proposal makes post-verbal *le* comparable with Perfect of result, since the latter asserts that an eventuality happened in the past and its result state holds at present (recall Section 2.3.2). Therefore, I formulate the second hypothesis for post-verbal *le*:

Hypothesis 2b: Post-verbal *le* is a resultative Perfect marker (along the lines of Lin 2006).

One issue mentioned in Section 2.4 is worth attention here, i.e.; the alternation between post-verbal *le* and RVCs in sentences describing events. Recall (27e) and (28b,c) in Section 2.4 (copied below) have indicated that post-verbal *le* gives rise to non-culminated events (33a) while RVCs make sentences denote culminated events (33b,c):

- (33) a. Zhangsan xie-le yi-feng xin, keshi mei xie-wan.
Zhangsan write-LE one-CL letter, but not write-finished
'Zhangsan (partially) wrote a letter, but he didn't finish it.'
- b. Zhangsan xie-wan yi-feng xin,
Zhangsan write-finished one-CL letter,
(zheng-feng xin hen duan).
(whole-CL letter very short)
'Zhangsan wrote a letter (, and the whole letter was very short).'

- c. * Zhangsan xie-wan yi-feng xin,
 Zhangsan write-finished one-CL letter,
 keshi xin neirong bu wanzheng.
 but letter contents not complete
 *‘Zhangsan wrote a letter but the contents of the letter were incomplete.’

The alternation between RVCs and post-verbal *le* urges me to spell out and compare the semantics of RVCs and post-verbal *le*. I will deal with the issue after obtaining the testing results of Hypotheses 1 (on RVCs), 2a, and 2b (on post-verbal *le*).

To sum up, post-verbal *le* applies to all kinds of eventualities (except a few individual-level states denoted by verbs such as *dengyu* ‘equal’ and *xiwang* ‘hope’). Its semantics is so controversial in the literature that I formulate two competing hypotheses: post-verbal *le* is a Perfective marker or a resultative Perfect marker. Besides this, it is an alternative to RVCs in terms of marking events.

Interestingly, Mandarin has another marker *guo*, which is also debatable as a marker of Perfective or Perfect. See the following Section 2.5.2.

2.5.2 *Guo*

Smith (1997: 266) defines *guo* as a Perfective marker that “presents a prior closed situation of any type, and conveys that its final state no longer obtains”, for example:

- (34) a. Tamen shang ge yue qu-guo Xiang Gang.
 they last CL month go-GUO Hong Kong
 ‘Last month they went to Hong Kong (they are no longer there).’
 (Smith 1997: 267)
- b. Wo ai-guo/yin-guo ni.
 I love-GUO/win-GUO you
 ‘I loved/won you before.’

Guo marks process verbs such as *qu* ‘go’ (34a). (34a) conveys a complete

going event in retrospect. *Guo* also applies to state verbs such as *ai* ‘love’ or event verbs such as *yin* ‘win’(34b), rendering an endpoint to the described loving state by asserting that it no longer holds at speech time, or expressing a retrospection of a complete action of winning. Lin (2006) agrees with Smith (1997) that *guo* conveys Perfective aspect (i.e., the topic time includes the run time of the described eventuality), and moreover, relative past tense (i.e., the described eventuality temporally precedes a local evaluation time). Given that the tense issue is left open in the dissertation (recall Section 2.1), I hence formulate the following hypothesis:

Hypothesis 3a: *Guo* is a Perfective marker (along the lines of Smith 1997; Lin 2006).

Although defining *guo* as a Perfective marker, Smith (1997: 266) notes that the Perfective aspect indicated by *guo* has “an experiential force” and thus has “the effect of a Perfect”. Xiao & McEnery (2004: 138) point out that *guo* just has one use of Perfect, i.e., the experiential Perfect (see Section 2.3.2), which indicates an eventuality occurring at least once in the past leading up to the present. This suggests the second hypothesis for *guo*:

Hypothesis 3b: *Guo* is an experiential Perfect marker (along the lines of Xiao & McEnery 2004).

Importantly, *guo* has the “discontinuity effect” (Smith 1997: 71, 266; Lin 2006) that the result state of the described eventuality no longer holds at speech time or a local evaluation time; e.g., the state that the people are in Hong Kong does not hold at the speech time of (34a). The “discontinuity effect” distinguishes *guo* from post-verbal *le*, because the latter lacks the effect (Smith 1997: 267). For example, (35) using post-verbal *le* can convey that the people are still in Hong Kong, which is a resultative Perfect interpretation.

- (35) Tamen shang ge yue qu-le Xiang Gang.
 they last CL month go-LE Hong Kong
 ‘Last month they went to Hong Kong (they may still be there).’
 (Smith 1997: 266)

The “discontinuity effect” of *guo* is derived from the restriction of *guo* that it only applies to repeatable eventualities (Smith 1997: 268; Lin 2006), no matter whether they are states, processes, or events. For instance, (36a) is ungrammatical because nobody can repeatedly die. In contrast, post-verbal *le* can mark unrepeatable eventualities (36b).

- (36) a. *Zhangsan shang ge yue si-guo.
 Zhangsan last CL month die-GUO
 b. Zhangsan shang ge yue si-le.
 Zhangsan last CL month die-LE
 ‘Last month Zhangsan died.’

To sum up, *guo* takes all kinds of eventualities as inputs except descriptions denoting unrepeatable eventualities. Its semantics is controversial, which raises the competing Hypotheses 3a (*guo* is a Perfective marker) and 3b (*guo* is an experiential Perfect marker).

So far, I have introduced post-verbal *le* and *guo*, both being controversial as a Perfective or a Perfect marker (with the minor distinction that they are argued to convey different uses of Perfect). Different views in previous studies drive me to formulate competing hypotheses for each marker. In Section 2.5.3, I will introduce and compare *zhe* and *zai*, which are argued by the literature to convey Imperfective aspect and its subdivision Progressive aspect, respectively.

2.5.3 *Zai & zhe*

Zai and *zhe* “signal the durative nature of an event[uality]” (Li & Thompson 1981: 217). See (37a,b), where *zai* and *zhe* indicate that the thinking is/was in progress:

- (37) a. Zhangsan zai sikao na-ge wenti.
Zhangsan ZAI think that-CL question
'Zhangsan is/was thinking that question.'
- b. Zhangsan sikao-zhe na-ge wenti.
Zhangsan think-ZHE that-CL question
'Zhangsan is/was thinking that question.'

(37a,b) demonstrate that *zai* and *zhe* both apply to process descriptions such as *sikao* 'think'. However, *zai* cannot mark state descriptions such as *you* 'have' (38a) but *zhe* can (38b). Neither of them apply to event descriptions such as *dao* 'arrive' (38c,d).

- (38) a. *Zhongguo zai you canlan de wenhua.
China ZAI have brilliant DE culture.
(Intended) 'China has a brilliant culture.'
- b. Zhongguo you-zhe canlan de wenhua.
China have-ZHE brilliant DE culture.
'China has a brilliant culture.'
- c. *Zhangsan dao-zhe Beijing.
Zhangsan arrive-ZHE Beijing
(Intended) 'Zhangsan is arriving in Beijing.'
- d. *Zhangsan zai dao Beijing.
Zhangsan ZAI arrive Beijing
(Intended) 'Zhangsan is arriving in Beijing.'

Therefore, *zai* only selects process descriptions but *zhe* selects state and process descriptions. Importantly, they give different interpretations when interacting with process descriptions of weak dynamicity, e.g., posture verbs (*zuo* 'sit', *tang* 'lie', *ting* 'stop', etc.) or positional verbs (*chuan* 'put on; wear', *na* 'take; hold', *fang* 'put', etc.).¹³ For instance, (39a) uses *zai* to describe that the carrying action was ongoing, but (39b) uses *zhe* to describe

¹³ Some processes with weak dynamicity are categorized as stage-level states in Xiao & McEnergy's (2004) analysis. I leave the blurred borderline between processes with weak dynamicity and stage-level states as an open issue.

a state that the bags were being carried.

- (39) a. Tamen dou zai-ti baodai.
 they all ZAI-carry bag
 ‘They were all picking up bags.’
- b. Tamen shou zhong dou ti-zhe chenzhong de baodai.
 they hand in all carry-ZHE heavy DE bag
 ‘Each of them was holding a heavy bag in hand.’
- (Xiao & McEnery 2004: 207)

In (37a) and (39a), the processes marked by *zai* constantly have an ongoing interpretation, which is in line with the consensus that *zai* is a Progressive marker (Smith 1997: 271; Xiao & McEnery 2004: 206; Lin 2006; Sun 2014: 69; among others).¹⁴ Therefore, I propose the following hypothesis for *zai*:

Hypothesis 4: *Zai* is a Progressive marker requiring a process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006; Sun 2014).

Section 2.3.2 has noted that Progressive aspect is a subcategory of Imperfective aspect, and the latter also renders sentences with stative and habitual interpretations. Since sentences marked by *zhe* have a Progressive interpretation (37b) or a stative interpretation (38b, 39b), *zhe* is usually analyzed as an Imperfective marker (Smith 1997: 273; Xiao & McEnery 2004: 182; Lin 2006). The stative interpretation given by *zhe* highlights the duration of the state, especially the state resulting from an event, presenting

¹⁴ Additionally, *zai* can be used as a locative preposition (i) or a locative verb (ii):

- (i) Zhangsan zai tushuguan xuexi.
 Zhangsan at library study
 ‘Zhangsan studies at the library.’
- (ii) Zhangsan zai tushuguan.
 Zhangsan be-at library
 ‘Zhangsan is at the library.’

For more discussion, see Xiao & McEnery (2004: 205).

a “resultative [I]mperfective viewpoint” (Smith 1997: 76, 273). This use is often found when *zhe* appears in the locative inversion construction (40).

- (40) Chuang-shang fang-zhe/-le yi-ben shu.
bed-on put-ZHE/-LE one-CL book
‘On the bed lay a book.’

(Du 1999)

Interestingly, post-verbal *le* can replace *zhe* in this use to highlight the duration of a result state, as (40) indicates. No matter whether the positional verb *fang* ‘put’ is marked by *zhe* or post-verbal *le*, both cases describe that the result state of putting, i.e., the book being placed on the bed, holds at speech time. The phenomenon is line with Lin’s (2006) proposal for post-verbal *le* that it imposes Imperfective aspect to the result state of an event, which leads to Hypothesis 2b. Based on the above studies, I propose:

Hypothesis 5: *Zhe* is an Imperfective marker requiring a state or process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006).

To sum up, *zai* is a Progressive marker taking processes as input (Hypothesis 4) while *zhe* is an Imperfective marker which makes sentences have stative or Progressive interpretations, taking processes or states as input (Hypothesis 5). Moreover, *zhe* is interchangeable with post-verbal *le* when it comes to asserting the Imperfectivity of a result state.

Given that I have introduced the four classical aspectual morphemes in Mandarin, Section 2.5.4 will move to verbal reduplication, which is less discussed in the literature.

2.5.4 Verbal reduplication

Verbs in Mandarin can be reduplicated to convey aspectual information, and the reduplication is limited to process verbs (cf. Li & Thompson 1981: 234–235; Xiao & McEnery 2004: 150). The basic form of Mandarin verbal

reduplication is V-V (41a). Some researchers also apply the label to complex forms such as V-*le* V (Wang 1963), V *yi* V (Smith 1997: 271), and V-*le yi* V (Li & Thompson 1981: 233), see (41b, c, d). The four sentences are very close in meaning: all describe a transient and mild smiling event in the past.

- (41) a. Zhangsan xiao-xiao, shuo [...]
 Zhangsan RED=smile say
 ‘Zhangsan smiled a little, and said [...]’
 b. Zhangsan xiao-le xiao, shuo [...]
 Zhangsan smile-LE smile say
 ‘Zhangsan smiled a little, and said [...]’
 c. Zhangsan xiao yi xiao, shuo [...]
 Zhangsan smile one smile say
 ‘Zhangsan smiled once and said [...]’
 d. Zhangsan xiao-le yi xiao, shuo [...]
 Zhangsan smile-LE one smile say
 ‘Zhangsan smiled once and said [...]’

Verbal reduplication also appears in imperative sentences to describe a future event with short duration:

- (42) (When taking a photo, the cameraman tells you)
 Xiao yi xiao.
 smile one smile
 ‘Show me a smile (or: Say cheese).’

(Xiao & McEnery 2004: 151)

Each of the sentences using verbal reduplication above describes an event as a whole, which supports the view that verbal reduplication is a Perfective marker (Smith 1997: 271; Dai 1997; Xiao & McEnery 2004: 157). Therefore, I formulate the following hypothesis:

Hypothesis 6: Verbal reduplication is a Perfective marker (along the lines of Smith 1997; Dai 1997; Xiao & McEnery 2004).

Up till now, this section has presented an overall introduction to Mandarin grammatical tense-aspect markers (post-verbal *le*, *guo*, *zhe*, *zai*, and verbal reduplication). The literature review on the markers indicates that Mandarin makes complex aspectual distinctions that do not fit into any grammatical aspectual dichotomies found in European languages, namely Perfective vs. Imperfective, or Progressive vs. non-Progressive (see Section 2.3.2). According to the literature, I have formulated Hypotheses 1–6 on the markers. Post-verbal *le* and *guo* are particularly controversial such that they each have two competing hypotheses. As promised in Chapter 1, the hypotheses will be tested later against more empirical data in the Camus corpus. The result will enable me to draw a more explicit division of labor between the grammatical tense-aspect markers.

Last but not least, since aspectual marking is optional in Mandarin (recall Chapter 1), Section 2.6 will discuss aspectually unmarked sentences and their aspectual interpretations.

2.6 Aspectually unmarked sentences

Although tense-aspect markers are pervasively used in Mandarin sentences, not all Mandarin sentences use the markers. For example, a small group of state verbs obligatorily stay unmarked in sentences, including stage-level state verbs such as *renwei* ‘think’ and *xiwang* ‘hope’, or individual-level state verbs such as *dengyu* ‘equal’ and *shuyu* ‘belong to’, see (43a,b). Also, the dynamic descriptions *chuangru* ‘rush-into’, *yong* ‘use’ and *saoshe* ‘strafe’ can be unmarked in discourse (43c).

- (43) a. Zhangsan (*zai) renwei (*le/*guo/*zhe) Lisi hen congming.
 Zhangsan (ZAI) think (LE/GUO/ZHE) Lisi very smart.
 ‘Zhangsan thinks that Lisi is smart.’
- b. Er jia er (*zai) dengyu (*le/*guo/*zhe) si.
 two plus two (ZAI) equal (LE/GUO/ZHE) four
 ‘Two plus two equals four.’

- c. Yi-ge [...] bairen qingnian chuangu [...]
 one-CL white youngster rush-into
 yi-ge jiaji zhensuo,
 one-CL family-planning clinic
 yong buqiang xiang limian de ren
 use rifle at inside DE people
 saoshe, ranhou taozou-le.
 strafe then escape-LE
 ‘A white youngster rushed into a family-planning clinic, and
 strafed people there with his rifle, and then ran away.’

Xiao & McEnergy (2004: 237)

According to the one-component approach to aspect (de Swart 1998), the aspectual class of sentences without grammatical aspectual markers is determined by the aspectual class of the underlying eventuality description: aspectually unmarked sentences denote events, states, or processes if they are predicated by event, state, or process descriptions, respectively. This view has cross-linguistic evidence: Bohmeyer & Swift (2004) find that in German, Russian, and Inuktitut, the aspectual reference of clauses without grammatical aspectual markers depends on the telicity of the eventuality description, i.e., clauses predicated by telic eventuality descriptions have Perfective aspect as the default and by atelic eventuality descriptions, Imperfective aspect. According to the one-component approach, I propose:

- Hypothesis 7a: Mandarin aspectually unmarked sentences are aspectually transparent (i.e., they have an eventive interpretation if the underlying eventuality description is quantized and have a stative interpretation if the eventuality description is homogeneous, along the lines of de Swart 1998).

This hypothesis accounts for (43a,b): the sentences use the state verbs *renwei* ‘think’ and *dengyu* ‘equal’, respectively, and they have a stative interpretation. It also accounts for the use of the event description *chuangu* ‘rush-into’ in (43c): the clause using *chuangu* ‘rush-into’ is eventive.

However, Smith (1997: 278) proposes that Mandarin sentences without grammatical aspectual morphemes have neutral viewpoint aspect which is “neither [P]erfective nor [I]mperfective”. The aspect spans the initial point and at least one internal stage of a situation, if the situation is durative (Smith 1997: 81, 277). The interpretation of neutral aspect is vague and flexible, as long as it includes the initial point of a situation, in contrast to Perfective aspect, which includes both initial and final points, and Imperfective, which includes neither (Smith 1997: 81). For example, the interpretation of (44) is vague and the situation may be in progress, or stop without culmination, or culminate with the tape recorder completely repaired.

- (44) Zhangsan xiuli yi-tai luyinji.
Zhangsan repair one-CL tape recorder.
‘Zhangsan repaired/is repairing a tape recorder.’

Smith (1997: 277)

Smith’s proposal gives rise to the second hypothesis:

- Hypothesis 7b: Mandarin aspectually unmarked sentences have neutral aspect (i.e., neither Perfective nor Imperfective, along the lines of Smith 1997).

Smith’s (1997) proposal is rejected by Xiao & McEnery (2004: 236, 240), who argue there is no need to assume an independent neutral aspect. They point out that Smith’s analysis is limited to single sentences such that the flexibility of interpretation is caused by lacking contextual information. They propose that if using dynamic eventuality descriptions, aspectually unmarked sentences are underspecified for aspect in out-of-the-blue contexts, while they obtain either Perfective or Imperfective interpretation in discourse, depending on contexts; if using non-dynamic eventuality descriptions, aspectually unmarked sentences have a stative interpretation (Xiao & McEnery 2004: 239–240). Their proposal motivates the third hypothesis:

Hypothesis 7c: Mandarin aspectually unmarked sentences using non-dynamic eventuality descriptions have a stative interpretation whereas those using dynamic eventuality descriptions are underspecified for aspect (they receive a Perfective or an Imperfective interpretation depending on the discourse context, along the lines of Xiao & McEnery 2004).

The differences between Hypotheses 7a–7c are as follows: 7a claims that aspectually unmarked sentences do not have a grammatical aspect and their interpretations are determined by the aspectual classes of underlying eventuality descriptions; 7b asserts that the unmarked sentences have a grammatically neutral aspect that makes the initial point and the early stage (if any) of a situation visible but says nothing about the final point of the situation; 7c argues that aspectually unmarked sentences are stative if using non-dynamic eventuality descriptions; those using dynamic eventuality descriptions are ambiguous if used in isolation but in discourse context, they obtain disambiguation and have either Perfective or Imperfective aspect.

Last but not least, based on Mandarin aspectually unmarked sentences used in out-of-the-blue contexts, Sun (2014: 104, 105, 226) makes the generalizations that unmarked state descriptions (her stative bare predicates) yield stative readings at the sentential level; unmarked process/event descriptions (her eventive bare predicates) yield generic readings at the sentential level; sentences denoting episodic events must be aspectually marked. Based on Sun's generalizations, I formulate the fourth hypothesis:

Hypothesis 7d: Mandarin aspectually unmarked sentences have a stative interpretation (denoting lexical states or generics, along the lines of Sun 2014).

Hypothesis 7d correctly predicts the interpretation of (43a,b) that are cases of lexical states (*renwei* 'think' and *dengyu* 'equal') and the generic interpretation of (27a) that uses the unmarked process verb *xie* 'write' in Section 2.4.1, copied in (45).

- (45) Zhangsān xiě xìn.
Zhangsan write letter
'Zhangsan writes letters.'

Just like Smith (1997), Sun restricts her study to single sentences, and the markers she investigates only include the classical ones (post-verbal *le*, *guo*, *zhe* and *zai*). Whether Hypothesis 7d can be extended to discourse data such as that in the Camus corpus is still a question. For example, (43c) narrates a sequence of events where all the verbs are unmarked except the last one *taozou* 'escape', which (as Sun would expect) is marked by post-verbal *le* that can make sentences denote events (recall Section 2.5.1). (43c) indicates that in narrative discourse episodic events can be told by unmarked verbs. Such a phenomenon has already been reported by Chang (1986: 265), who studies newspaper articles and editorials as well as stories and then claims that post-verbal *le* often only marks the "peak event" in a discourse segment presenting a series of events, although the marker could be applied to the whole series of events. Moreover, Christensen (1994) also finds that aspectually unmarked sentences in narrative discourse commonly have the Perfective aspect. It seems that in narrative discourse, it is not uncommon that sentences predicated by aspectually unmarked verbs denote events. Therefore, the use of unmarked sentences requires more investigation in narrative discourse. To accomplish the task, I will test Hypotheses 7a–7d against the narrative discourse data in the Camus corpus.

2.7 Conclusions

This chapter began with an introduction to the one- or two-component approach to aspect and the standard theory on tense. Then the fundamental formal toolkit used in the dissertation was introduced, i.e., neo-Davidsonian event semantics. Specifically, I have assumed that aspect compositionally consists of two layers, i.e., the eventuality description and (optional) grammatical aspect, and the tense operator applies to the output of the aspectual operator, anchoring the eventuality denoted by a sentence to the time axis. Verbs or verb phrases are eventuality descriptions. The semantic

nature of the verb and its argument co-determine the aspectual class of the description, namely whether it introduces a state, a process, or an event to the sentence. Associated with AspP, grammatical aspect operates on eventuality description and can override the aspectual class of the latter, determining the eventive/stative interpretation of sentence.

With the theoretical background in place, I introduced the specificities of Mandarin aspect in a syntactically bottom-up way. I have shown that although Mandarin uses simple verbs as eventuality descriptions, it has a large group of resultative verb compounds whose internal complexity shows another way of building up events differently from English-style languages. The literature suggests that the resultative verb complement (RVC), the second component of the compound, conveys aspectual information by encoding the result state of event. Therefore, I formulated the following hypothesis:

Hypothesis 1: A resultative verb compound (V+RVC) denotes a culminated event plus result state (along the lines of Li & Thompson 1981).

As for the Mandarin grammatical tense-aspect markers, previous theory-driven studies have left two issues waiting to be tackled. First, controversy remains about the semantics of post-verbal *le* and *guo*, raising the competing Hypotheses 2a and 2b, 3a and 3b. Second, although the literature reaches general agreements on the semantics of *zai*, *zhe*, and verbal reduplication, the agreements need to be empirically tested. To test them, I formulated hypotheses 4–6 accordingly.

Hypothesis 2a: Post-verbal *le* is a Perfective marker (along the lines of Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014).

Hypothesis 2b: Post-verbal *le* is a resultative Perfect marker (along the lines of Lin 2006).

Hypothesis 3a: *Guo* is a Perfective marker (along the lines of Smith 1997; Lin 2006).

- Hypothesis 3b: *Guo* is an experiential Perfect marker (along the lines of Xiao & McEnery 2004).
- Hypothesis 4: *Zai* is a Progressive marker requiring a process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006; Sun 2014).
- Hypothesis 5: *Zhe* is an Imperfective marker requiring a state or process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006).
- Hypothesis 6: Verbal reduplication is a Perfective marker (along the lines of Smith 1997; Dai 1997; Xiao & McEnery 2004).

Last but not least, Mandarin allows aspectually unmarked sentences. I thus reviewed studies on the interpretations of aspectually unmarked sentences and proposed four competing hypotheses:

- Hypothesis 7a: Mandarin aspectually unmarked sentences are aspectually transparent (i.e., they have an eventive interpretation if the underlying eventuality description is quantized and have a stative interpretation if the eventuality description is homogeneous, along the lines of de Swart 1998).
- Hypothesis 7b: Mandarin aspectually unmarked sentences have neutral aspect (i.e., neither Perfective nor Imperfective, along the lines of Smith 1997).
- Hypothesis 7c: Mandarin aspectually unmarked sentences using non-dynamic eventuality descriptions have a stative interpretation whereas those using dynamic eventuality descriptions are underspecified for aspect (they receive a Perfective or an Imperfective interpretation depending on the discourse context, along the lines of Xiao & McEnery 2004).
- Hypothesis 7d: Mandarin aspectually unmarked sentences have a stative interpretation (denoting lexical states or generics, along the lines of Sun 2014).

The next chapter will conduct a preliminary study by using the Camus corpus, which takes French as its source language, to empirically test the hypotheses (as promised in Chapter 1) so as to solve the remaining controversy and to examine the validity of the theoretical consensus. To deductively operationalize the hypotheses, I will exploit concrete French tense-aspect forms (illustrated in Section 2.3.2) to represent the abstract general tense-aspect categories (Perfect, Perfective, etc.) and aspectual notions (stative/eventive) involved in the hypotheses. This enables me to do a cross-linguistic study between Mandarin and French. The results of the preliminary study raise the question of whether parallel corpora are qualified tools for the testing. To answer the question, I will investigate three traditions applying parallel corpora to cross-linguistic studies and finally argue that parallel corpora are qualified. Moreover, I will compare the traditions and find out which matches my testing best.

Chapter 3

Choosing *Translation Mining* for cross-linguistic study in parallel corpus research¹

3.1 Introduction

Chapter 2 ended with Hypotheses 1–7 (copied below) drawn from the literature:

Hypothesis 1: A resultative verb compound (V+RVC) denotes a culminated event plus result state (along the lines of Li & Thompson 1981).

Hypothesis 2a: Post-verbal *le* is a Perfective marker (along the lines of Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014).

¹ This chapter is adapted from Le Bruyn *et. al* (2022) “Parallel Corpus Research and Target Language Representativeness: the Contrastive, Typological and *Translation Mining* Traditions”. In view of the joint authorship, this chapter uses the first-person plural pronoun “we”. To embed the paper in the dissertation, I added Section 3.1 (Introduction) and Section 3.7 (From standard *Translation Mining* to *Aggregated Translation Mining*).

- Hypothesis 2b: Post-verbal *le* is a resultative Perfect marker (along the lines of Lin 2006).
- Hypothesis 3a: *Guo* is a Perfective marker (along the lines of Smith 1997; Lin 2006).
- Hypothesis 3b: *Guo* is an experiential Perfect marker (along the lines of Xiao & McEnery 2004).
- Hypothesis 4: *Zai* is a Progressive marker requiring a process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006; Sun 2014).
- Hypothesis 5: *Zhe* is an Imperfective marker requiring a state or process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006).
- Hypothesis 6: Verbal reduplication is a Perfective marker (along the lines of Smith 1997; Dai 1997; Xiao & McEnery 2004).
- Hypothesis 7a: Mandarin aspectually unmarked sentences are aspectually transparent (i.e., they have an eventive interpretation if the underlying eventuality description is quantized and have a stative interpretation if the eventuality description is homogeneous, along the lines of de Swart 1998).
- Hypothesis 7b: Mandarin aspectually unmarked sentences have neutral aspect (i.e., neither Perfective nor Imperfective, along the lines of Smith 1997).
- Hypothesis 7c: Mandarin aspectually unmarked sentences using non-dynamic eventuality descriptions have a stative interpretation whereas those using dynamic eventuality descriptions are underspecified for aspect (they receive a Perfective or an Imperfective interpretation depending on the discourse context, along the lines of Xiao & McEnery 2004).
- Hypothesis 7d: Mandarin aspectually unmarked sentences have a stative interpretation (denoting lexical states or generics, along the lines of Sun 2014).

This chapter attempts to empirically test the hypotheses against corpus data, as announced in Chapter 1. Since the hypotheses focus on Mandarin, the testing could be implemented in a monolingual Mandarin corpus that contains sentences using the tense-aspect markers and aspectually unmarked sentences. To operationalize the hypotheses, we need to convert the abstract notions in the hypotheses into countable variables and then annotate the variables in the corpus. On top of that, we can use statistical tools (e.g., frequency) to evaluate whether the hypotheses predict well the behaviors of annotated variables in the corpus. Since the Mandarin tense-aspect markers/aspectually unmarked sentences are morphologically explicit and countable, they can be straightforwardly annotated. For brevity, this chapter will refer to the tense-aspect markers and aspectually unmarked sentences as Mandarin tense-aspect forms.

However, the caveat of circular reasoning arises when we try to convert the general tense-aspect categories (Perfective, Imperfective, etc.) into countable variables. Since Mandarin does not use explicit forms other than the tense-aspect forms argued in the aforementioned hypotheses to indicate the categories, to reach our testing goal in a Mandarin corpus, we have to rely on intuition to judge (and then annotate) whether a sentence, which contains any tense-aspect marker in question, has a Perfective/Imperfective etc., interpretation. In such a monolingual corpus, the categories can only be converted into intuition-based annotations of Mandarin sentences. Given that the sentences needing annotation have to contain the tense-aspect markers in question, our intuition must take into consideration the meanings of the tense-aspect markers. This could lead to circular reasoning: we cannot control our language processing in introspection-driven research so we are hard pressed to keep neutral about the contribution of the tense-aspect markers when we already know the hypotheses. Besides, our intuition could be influenced by our dialect or sociolect (Xiao & McEnery 2004: 4). Just as Xiao & McEnery (2004: 5) point out that introspection is not observable and results based on introspection alone are hard to verify, using the intuition-based annotations would weaken the reliability of our testing.

To avoid using intuition-based annotations as instances of the general tense-aspect categories, we need to find alternative representations for them.

Recall Section 2.3.2 has noted that Perfective, Imperfective, Perfect, and Progressive, as general notions abstracting over languages, can be instantiated by tense-aspect forms in specific European languages. We thus obtain the idea that European tense-aspect forms can function as representations of general tense-aspect categories, given that the forms can be straightforwardly annotated and counted in a corpus. Implementing the idea requires a multilingual corpus involving data from Mandarin and at least one European language. We particularly opt for a parallel corpus which aligns Mandarin sentences with their European translation equivalents. Here is our motivation: such a corpus provides aligned translation equivalents whose syntactic elements can be compared with the meanings of sentences controlled to be the same. Once we pick a European language, according to Hypotheses 1–7 we can predict which Mandarin tense-aspect forms occur as the translations of which tense-aspect forms in that European language based on the instantiating relations between the European tense-aspect forms and general tense-aspect categories. Then the predictions can be statistically tested by the corpus data.

In fact, the idea of using parallel corpora to investigate Mandarin aspect through contrastive study is not new, as Xiao & McEnery (2004) have exploited a parallel corpus to investigate the Mandarin translations of aspectual meanings encoded by English tense-aspect forms so as to find out the relations between tense-aspect forms in both languages. Similar to Xiao & McEnery (2004), we also use a parallel corpus to investigate the semantics of Mandarin tense-aspect forms through a contrastive study. Since our study is embedded in the *Time in Translation* project (see Chapter 1), we will use the Camus Corpus, a small-size multilingual parallel corpus created by the project. The corpus contains texts from the French novel *L'Étranger* (written by Camus) and their translations in Mandarin and European languages. We will start with a preliminary test that chooses the source language French to provide the European tense-aspect forms.

The chapter is structured as follows. Section 3.2 conducts the preliminary testing in the Camus corpus that investigates how Mandarin tense-aspect forms are used to translate French tense-aspect forms. The test makes a cross-linguistic variation study that contrasts Mandarin against

French so as to investigate the Mandarin variation of general tense-aspect categories. The test assumes that (i) the translated Mandarin data can represent Mandarin and (ii) French tense-aspect forms can approximate general tense-aspect categories. Partial findings of the test, as we will show, are in line with Hypotheses 4 and 6. However, there are unexpected findings which challenge the other hypotheses. To properly interpret the unexpected findings, we reflect on the test design and find that assumption (i) requires a defense, given that McEnery *et al.* (2006: 93) argue that translation texts cannot adequately represent target languages due to translation biases. This leads to the question of *whether* parallel corpora fit in the toolbox of linguists who are interested in studying cross-linguistic variation.

To address the question, we investigate three traditions of using parallel corpora for cross-linguistic variation studies: the contrastive tradition (Section 3.3), the typological tradition (Section 3.4), and the *Translation Mining* tradition (Section 3.5). The different ways they control for translation biases are *a priori* available. To properly ground the characterizations of the traditions, we will discuss the parallel corpus architecture each of them relies on as well as the way they exploit it, building on datasets and analyses from their respective literatures. At the end of Section 3.5, we will conclude that there are multiple methodologically sound ways of exploiting parallel corpora, and we will affirmatively answer the *whether* question: parallel corpora fit in the toolbox of linguists studying cross-linguistic variation.

To find out which tradition suits our testing goal best, in Section 3.6 we discuss *how* parallel corpora are best exploited. Rather than offering a definitive answer to this question, we will lay the foundations for future research to systematically explore the differences between the traditions for a range of phenomena and point out what we think are relevant considerations. We then circle back to our testing in Section 3.2, arguing that the *Translation Mining* tradition suits our research goal best. Moreover, we point out that the translated Mandarin data in the corpus are qualified to represent Mandarin. Since assumption (i) is assured, Section 3.7 reflects on the validity of assumption (ii). We find that French does not have the full inventory of typical instances of general tense-aspect categories such that

assumption (ii) is not solid. Moving beyond French, we further argue that other European languages in the Camus corpus lack such an inventory. Given that any single language in the corpus is insufficient to provide the good representations we need, we propose the idea to aggregate multiple languages in the corpus to obtain the representations by abstracting over tense-aspect forms cross-linguistically. The idea, however, cannot be implemented following the standard *Translation Mining* tradition. To implement the idea, we develop a variant version, i.e., *Aggregated Translation Mining*, which will be introduced in Chapter 4. Finally, Section 3.8 concludes the chapter.

3.2 A preliminary test based on a contrastive study of Mandarin and French tense-aspect forms

As mentioned in Section 3.1, the Camus corpus is a multilingual parallel corpus. The source texts come from the first three chapters of the French novel *L'Étranger* (N=509). The target texts are the translations of the source texts in Mandarin and in multiple European languages (English, German, Dutch, Spanish, Italian and Greek).² The European and Mandarin tense-aspect forms (which apply to verbs) in the corpus data are annotated. The annotation is form-based and adopts the standard labels in the literature for the European languages and Mandarin. The only exception is the use of *le1* and *le12*. Section 2.5.1 has mentioned that the grammaticalized morpheme *le* can appear in two positions, *viz.* in post-verbal and in sentence-final position (Li & Thompson 1981; Smith 1997), and it is controversial whether the two can be uniformly analyzed. We thus label the former as *le1* and the latter as *le12* (rather than *le2*) to indicate the possibility that they could be theoretically unified. The labeling also has an empirical consideration: in cases where the post-verbal and the sentence-final positions coincide, there is no corpus-based criterion to distinguish between them, and we annotate *le* in such a case as *le12*. As a form-based study, this dissertation only investigates occurrences of *le1* because their identity as post-verbal *le* is

² See Appendix for the publication information of the source texts and translation texts.

clear, and leaves *le12* (including sentence-final *le*) open, as mentioned in Section 2.5.1 (annotation details see Section 4.3.1).

As described in Section 3.1, our preliminary testing uses the French data and their Mandarin translations. (1) is a datapoint from the corpus (each datapoint has a unique source ID, consisting of a source clause and its translations in different languages. The irrelevant non-French European languages are ignored here). (1a) and (1b) are translation equivalents. As the annotations in the brackets indicate, the French tense-aspect form *imparfait* (1a) is translated by the Mandarin tense-aspect form *zhe* (1b).

(1) ID 32236³

- a. Je regardais la campagne autour de moi. [French: *imparfait*]
b. Wo wang-zhe zhouwei de tianye. [Mandarin: *zhe*]
I look-ZHE surrounding DE field.
'I was looking at the countryside around me.'⁴

Given that some French tense-aspect forms instantiate general tense-aspect categories (recall Section 2.3.2.), we use them as representations of the categories. The tense-aspect forms are summarized below, along with the aspectual interpretations they contribute to sentences. As we will show immediately, the aspectual interpretations are useful for predicting the relations between Mandarin sentences without grammatical tense-aspect markers (concerning Hypotheses 1, 7a–7d) and French sentences bearing tense-aspect forms.

- (i) French *passé simple* instantiates Perfective, making sentences have an eventive interpretation;
(ii) French *imparfait* instantiates Imperfective (including its subcategory Progressive), making sentences have a stative interpretation;

³ In this dissertation, examples with ID numbers are taken from the Camus corpus.

⁴ Throughout the dissertation, the English translations of Mandarin data are copied from the English translation equivalents aligned with the Mandarin data in the corpus, in line with the general strategy of parallel corpus. I only produced my own translations with notification when the Mandarin data involve freedom of translation. The notification is made when the first time my translations appear.

(iii) French *passé composé* instantiates Perfect that denotes result states, making sentences have a stative interpretation. It replaces *passé simple* in spoken French and in this case, it makes sentences have an eventive interpretation;

(iv) French *présent* instantiates the simple present tense, making sentences have a stative interpretation.

Below we will apply (i)–(iv) to operationalize Hypotheses 1–7, particularly by drawing predictions for our data. Since the novel is written in diary style with spoken French, the author systematically uses *passé composé* to replace *passé simple*. Our predictions indicate the replacement with brackets, i.e., *passé simple* (or *passé composé*). Below are the operationalization details:

According to Hypothesis 1 that a resultative verb compound (V+RVC) denotes a culminated event plus a result state (Li & Thompson 1981), resultative verb compounds should be able to translate French sentences denoting events with inherent results (e.g., arriving events) or states resulted from events. Therefore, they are expected to translate *passé simple* (i), which makes sentences have an eventive interpretation or *passé composé* (iii), which makes sentences denote result states. Hence, we propose:

Prediction 1: A resultative verb compound (V+RVC) typically occurs as the translation of *passé simple* or *passé composé*.

Hypothesis 2a claims that post-verbal *le* is a Perfective marker (along the lines of Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014). Since *passé simple* instantiates Perfective (i) and it is replaced by *passé composé* in spoken French (iii), apply (i) and (iii) to Hypothesis 2a giving:

Prediction 2a: Post-verbal *le* (*le1*) typically occurs as the translation of *passé simple* (or *passé composé*).

Moreover, since *passé composé* instantiates Perfect, applying (iii) to Hypothesis 2b, that post-verbal *le* is a resultative Perfect marker (along the lines of Lin 2006), we obtain:

Prediction 2b: Post-verbal *le* (*le1*) typically occurs as the translation of *passé composé*.

Similar to post-verbal *le* (*le1*), *guo* receives the following two predictions:

Prediction 3a: *Guo* typically occurs as the translation of *passé simple* (or *passé composé*).

Prediction 3b: *Guo* typically occurs as the translation of *passé composé*.

Since *imparfait* instantiates Imperfective, which includes the subcategory Progressive (ii), applying it to Hypothesis 4, that *zai* is a Progressive marker requiring a process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006; Sun 2014), we propose:

Prediction 4: *Zai* typically occurs as the translation of *imparfait*.

Similarly, applying (ii) to Hypothesis 5, that *zhe* is an Imperfective marker requiring a state or process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006), we propose:

Prediction 5: *Zhe* typically occurs as the translation of *imparfait*.

Since Hypothesis 6 argues that verbal reduplication is a Perfective marker (along the lines of Smith 1997; Dai 1997; Xiao & McEnery 2004), we apply (i) and (iii) to the hypothesis and then obtain:

Prediction 6: Verbal reduplication typically occurs as the translation of *passé simple* (or *passé composé*).

Hypothesis 7a is complex as it claims that Mandarin aspectually unmarked sentences are aspectually transparent: they have an eventive interpretation if the underlying eventuality description is quantized and have a stative interpretation if the eventuality description is homogeneous (along the lines of de Swart 1998). With a quick examination of our aspectually unmarked

Mandarin data, we find both quantized (e.g., *si* ‘die’) and homogeneous eventuality descriptions (e.g., *xiao* ‘smile’) there. Hence, we predict that unmarked sentences occurring as translations of French sentences have an eventive or a stative interpretation. Applying (i)–(iv) to the hypothesis, we propose:

Prediction 7a: Aspectually unmarked sentences typically occur as translations of French sentences using *passé simple* (or *passé composé*), *imparfait* or *présent*.

Hypothesis 7b states that Mandarin aspectually unmarked sentences have neutral aspect which is neither Perfective nor Imperfective (along the lines of Smith 1997). Since the neutral aspect has a vague interpretation (recall Section 2.6) defined in such a negative way, we accordingly propose a prediction in a negative way by applying (i), (ii), and (iii):

Prediction 7b: Aspectually unmarked sentences do not occur as translations of French sentences using *passé simple* (or *passé composé*) or *imparfait*.

Hypothesis 7c however, argues that Mandarin aspectually unmarked sentences using dynamic eventuality descriptions obtain a Perfective or an Imperfective interpretation in the discourse context while those using non-dynamic eventuality descriptions have a stative interpretation (along the lines of Xiao & McEnery 2004). Having quickly examined our aspectually unmarked Mandarin data, we find both dynamic (e.g., *ku* ‘cry’) and non-dynamic eventuality descriptions (e.g., *renshi* ‘know’). Hence, we predict that unmarked sentences can translate French sentences having a stative interpretation (including those using Imperfective aspect) or using Perfective aspect. Applying (i)–(iv) to Hypothesis 7c gives the following prediction:

Prediction 7c: Aspectually unmarked sentences typically occur as translations of French sentences using *passé simple* (or *passé composé*), *imparfait* or *présent*.

Finally, Hypothesis 7d claims that Mandarin aspectually unmarked sentences have a stative interpretation (denoting lexical states or generics, along the lines of Sun 2014). This means unmarked sentences can be used to translate French sentences bearing tense-aspect forms that render the sentences with a stative interpretation. Applying (ii) and (iv) to the hypothesis, we propose Prediction 7d. Prediction 7d does not include *passé composé* because this form denotes states resulting from events rather than lexical states or generics.

Prediction 7d: Aspectually unmarked sentences typically occur as translations of French sentences using *imparfait* or *présent*.

With the predictions in place, we count the absolute frequencies of tense-aspect forms in French data (Table 1a) and in Mandarin data (Table 1b), and the absolute frequency of Mandarin tense-aspect forms occurring in the translations of sentences using French tense-aspect forms (Table 1c).

(a) French tense-aspect forms	#	(b) Mandarin tense-aspect forms	#
Passé composé	310	Aspectually unmarked sentences	265
Imparfait	128	R(esultative) V(erb) C(omplement)	65
Présent	37	<i>Le1</i>	59
Passé simple	2	<i>Le12</i>	46
Other	32	<i>Zhe</i>	19
		<i>Zai</i>	6
		<i>Guo</i>	5
		Verbal reduplication	12
		Other	32

(c) The absolute frequency of Mandarin tense-aspect forms occurring in the translations of sentences using French tense-aspect forms

	∅	RVC	<i>Le1</i>	<i>Le12</i>	<i>Zhe</i>	<i>Zai</i>	<i>Guo</i>	RED	Other	Total
Passé composé	155	50	48	29	9	1	2	11	5	310
Imparfait	65	10	6	9	9	5	0	1	23	128
Présent	28	1	1	4	0	0	0	0	3	37
Passé simple	0	0	2	0	0	0	0	0	0	2
Other	17	4	2	4	1	0	3	0	1	32
Total	265	65	59	46	19	6	5	12	32	509

Table 1: French and Mandarin tense-aspect form uses in the Camus corpus (∅: aspectually unmarked sentences, RED: verbal reduplication)

Some tendencies shown in Table 1c are in line with particular aforementioned predictions. The tendency in the use of *zai* is straightforwardly in line with Prediction 4: *zai* almost exclusively occurs as the translation of *imparfait* (5 out of 6 times). This supports Hypothesis 4. The use of verbal reduplication is also very much in line with Prediction 6, as 11 out of 12 verbal reduplications occur as translations of *passé composé*. This supports Hypothesis 6. What these data seem to show, then, is that parallel corpora can help us find statistical evidence for hypotheses drawn from the literature.

However, unexpected findings also appear and challenge the other hypotheses. Predictions 1, 2a and 2b, and 5 are not straightforwardly supported by the data: although around half (or more) occurrences of RVCs, *le1*, and *zhe* are used to translate the predicted French tense-aspect forms, the three each have a number of occurrences used to translate other French tense-aspect forms (e.g., *imparfait* for RVCs and *le1*, *passé composé* for *zhe*). Additionally, since Predictions 3a and 3b each are only supported by 2 cases (where *guo* occurs as the translation of *passé composé*), no conclusion can be convincingly drawn on *guo*. As for aspectually unmarked sentences, the picture is complex. Prediction 7b is not in line with the data because unmarked sentences are used to translate French sentences using *passé composé* or *imparfait*. The alternative Prediction 7d is also challenged because unmarked sentences are used to translate French sentences bearing not only the tense-aspect forms predicted, but also non-predicted form (*passé composé*). Predictions 7a and 7c receive stronger support than Predictions 7b and 7d, with only one unfulfilled expectation: no unmarked sentences are attested to translate French sentences using *passé simple*. This can be explained by the small size of our corpus: *passé simple* is rare in our data (only 2 cases). Despite that, both hypotheses need more fine-grained testing that zooms into the relation between the aspectual class of eventuality description and the aspectual interpretation of unmarked sentences.

Since our testing received a series of unexpected findings, the question that imposes itself is how to interpret them. Before jumping to the conclusion that the hypotheses whose predictions are not in line with our data are invalid, it is necessary to take a step back to reflect on the testing

design, which aims to uncover the relations between Mandarin tense-aspect forms with general tense-aspect categories, i.e., to uncover the Mandarin variations in the general categories. To reach this goal, we exploited French tense-aspect forms as probes, which are assumed as representations of the general categories, and investigated how Mandarin tense-aspect forms are related to the French ones. Our test essentially made a contrastive variation study between Mandarin and French, with two assumptions: (i) our translated Mandarin data are qualified to represent Mandarin; (ii) the French tense-aspect forms approximately represent general tense-aspect categories.

However, assumption (i) is not universally accepted. Parallel corpus data are different from monolingual corpus data because they are indirect, in the sense that there is a process of translation that intervenes – at least for the translated parts of the data. When we are confronted with an unexpected finding, we should consequently always acknowledge the possibility that this might be an effect of translation. McEnery & Xiao (1999) have argued that the translation process leads to lower frequencies of tense-aspect forms in Mandarin translated texts. They compare a corpus of English-to-Mandarin translated health care texts to a corpus of untranslated Mandarin health care texts, each comprising about 35k words. They find that the joint frequency of *le* and *guo* is twice higher in untranslated texts (N=213) than in translated texts (N=98). They further use a log-likelihood test to argue that this difference is significant (LL value = 49.11 ($p < .001$)), and they hypothesize that the difference originates in the translation process.

Studies like that of McEnery & Xiao (1999) have led to the claim that “translated language is at best an unrepresentative special variant of the target language” (McEnery *et al.* 2006: 93). This claim echoes the earlier characterization of translated texts as displaying *translationese* (Gellerstam 1996). If correct, it entails that there is little to no value in observations based on translation corpora: any result based on the translated parts of these corpora would have little bearing on the languages involved and – by extension – on relations between these languages. In our case, the unexpected finding would have little or nothing to say about the relation between the tense-aspect systems of French and Mandarin. Rather, the unexpected finding is caused by the effect of translation. More generally, the

conclusion that would follow from McEnery *et al.*'s claim is that parallel corpora should be reserved to the study of translation and have no place in the toolbox of linguists interested in studying cross-linguistic variation (Lauridsen 1996).

Not everyone agrees with McEnery *et al.*'s claim, and the literature of the past two decades shows that several research traditions have insightfully used parallel corpora for the study of cross-linguistic variation. To address the question *whether* parallel corpora fit in the toolbox of linguists who are interested in studying cross-linguistic variation, we will investigate three traditions of using parallel corpora for cross-linguistic variation studies. We are the first to bring together three of these traditions in a bigger methodological comparison and we will argue that each of them has found its own ways of dealing with Gellerstam's, Lauridsen's and McEnery *et al.*'s *caveats* against translation biases in parallel corpus studies.

The first tradition dates back to Johansson (1998a, 2007) and we will refer to it as the *corpus-based contrastive linguistics tradition* or *contrastive tradition* for short (Granger & Lefer 2020). In Section 3.3, we will see that the strategy researchers in this tradition rely on, is to complement every study based on parallel corpora with a study based on monolingual corpora. The latter then function as a control on translation biases in the former. The second tradition started with Wälchli (2010) and Wälchli & Cysouw (2012), and we refer to it as the *typological tradition* (see – among others – Dahl & Wälchli (2016), Beekhuizen *et al.* (2017), Levshina (2022)). In Section 3.4, we will see that, differently from the contrastive tradition, researchers within the typological tradition do not rely on monolingual control corpora. At the same time, we will however show that the typological tradition does implement an implicit control mechanism in that the questions it asks are not geared towards the analysis of individual items in individual languages, but rather towards higher-level generalizations that hold across a high number of languages and are unlikely to be sensitive to translation biases. The third and final tradition we discuss is a tradition in the making and originates in recent publications by the Utrecht-based *Translation Mining* group, who have applied parallel corpus research in contrastive and comparative linguistics (see – among others – van der Klis *et al.* (2017, 2021a); Le Bruyn *et al.*

(2019); Bremmers *et al.* (2021)). We refer to it as the *Translation Mining* tradition. In Section 3.5, we start by observing that researchers within this tradition do not rely on monolingual control corpora but that they are nevertheless interested in the analysis of individual items in individual languages. What sets this tradition apart is that it aims for replication across different parallel corpora with different source languages, allowing it to mimic the monolingual control mechanism from the contrastive tradition across complementary parallel corpus studies.

The rationale behind our selection of parallel corpus traditions is that they represent the three strategies that are *a priori* available to control for translation biases within corpus research: the typological tradition restricts the scope of the questions that can be asked, and the contrastive and *Translation Mining* traditions rely on monolingual and parallel control corpora, respectively. We are confident that other traditions, like Multiple Parallel Text Analysis (Lu & Verhagen 2016; Lu *et al.* 2018), Heuristic Translation Mining (Bogaards 2019), etc. can insightfully be related to one of the traditions discussed here.⁵

3.3 The contrastive tradition

In this section, we discuss the contrastive tradition in parallel corpus research. This tradition is the most influential one to date and can best be characterized by the architecture of the parallel corpora it relies on (Section 3.3.1) and the measures that are used to analyze them (Section 3.3.2). Most major parallel corpus compilation projects originate in this tradition. These projects have led to the English Norwegian Parallel Corpus (Johansson 2007), the Oslo Multilingual Corpus (Johansson 2007), the English-Swedish Parallel Corpus (Altenberg & Aijmer 2000), the English-Portuguese COMPARA corpus (Frankenberg-Garcia & Santos 2003), the English-German CroCo corpus (Hansen-Schirra *et al.* 2013) and the Dutch Parallel Corpus (Macken *et al.* 2011).

⁵ We note that there is also a vibrant literature on the use of parallel corpora in natural language processing. Working out how this literature relates to the different traditions that are more geared towards linguistic analysis lies beyond the scope of the chapter though.

3.3.1 The contrastive parallel corpus architecture

Parallel corpora in the contrastive tradition all have a similar architecture, including source texts for each of the languages represented in the corpus and translations of these texts to the other languages. This is worked out in Figure 1 for a corpus with two languages.

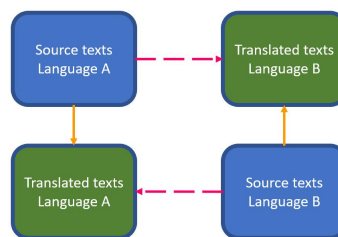


Figure 1: The contrastive parallel corpus architecture (illustrated for two languages)

The architecture in Figure 1 reflects the way researchers in the contrastive tradition deal with the *caveats* about the use of parallel corpora in cross-linguistic variation research. By comparing source and translated texts *between* languages (the dashed pink arrows in Figure 1), researchers can come to hypotheses about how languages relate to one another. These hypotheses are however explicitly treated as translation-based, and they are maintained, adjusted, or discarded on the basis of comparisons between source and translated texts *within* each language (the full orange arrows in Figure 1). In Section 3.3.2, we go over each of these comparisons and illustrate them on the basis of two datasets.

3.3.2 Putting the contrastive parallel corpus architecture to use

3.3.2.1 Comparisons *between* languages

We start with the comparison of source and translated texts *between* two languages. The basic measures in this comparison are measures of translation equivalence. To illustrate, Table 2 provides data about the translation of English *talk* to Norwegian and about the translation of Norwegian *snakke* to English (Hasselgård 2020). These data respect translation direction: the data in the left part of Table 2 are only concerned

with English source texts and their translations to Norwegian and not with translated texts in English and their original Norwegian counterparts. *Mutatis mutandis*, the same holds for the right part of Table 2.

English > Norwegian			Norwegian > English		
talk	<i>snakke</i>	204	snakke	<i>talk</i>	313
	<i>prate</i>	14		<i>speak</i>	80
	<i>fortelle</i>	4		<i>say</i>	13
	<i>si</i>	3		<i>mention</i>	9
	<i>other</i>	34		<i>other</i>	61
	Ø	9		Ø	8
	total	268		total	484

Table 2: Talk and Snakke in English<>Norwegian translations

The data in Table 2 show that *talk* is translated as *snakke* in 204 out of 268 cases. This means that 76% of the time *snakke* is used as a translation equivalent of *talk*. The data also show that in 313 out of 484 cases Norwegian *snakke* is translated as *talk*, meaning that approximately 65% of the time English *talk* is used as a translation equivalent of *snakke*. The formulas underlying these two measures of translation equivalence are given in (2) and (3).

$$(2) \frac{C'^{T\beta} \times 100}{C^{S\alpha}} \quad (3) \frac{C'^{T\alpha} \times 100}{C^{S\beta}} \quad (4) \frac{(C'^{T\beta} + C'^{T\alpha}) \times 100}{C^{S\alpha} + C^{S\beta}} \quad (5) \frac{(204 + 313) \times 100}{268 + 484} = 69\%$$

(Where $C^{S\alpha/\beta}$ stands for the number of times a construction C occurs in Source Texts in language α/β and $C'^{T\alpha/\beta}$ stands for the number of times constructions C' occurs in Translated Texts in language α/β as the translation of construction C.)

Next to the strictly uni-directional measures in (2) and (3), researchers in the contrastive tradition also use the bi-directional measure presented in (4) and applied to the *talk*<>*snakke* data in (5). This bi-directional measure is known as *mutual correspondence* and measures how often two constructions

occur as translations of one another (Altenberg 1999). In the case of *talk* and *snakke*, this is 69% of the time. We note that the bi-directional nature of mutual correspondence still respects the uni-directionality of the data in Table 2 in the sense that it only looks at how translations relate to source texts and not *vice versa*: in the same way as in (2) and (3), translated texts only appear in the numerator and not in the denominator. In Section 3.6.1, we will come back to mutual correspondence and propose a more general bi-directional measure, *viz.* Normalized Pointwise Mutual Information (Bouma 2009). The advantage of this more general measure is that, unlike mutual correspondence, it can be applied across the different parallel corpus traditions presented in this paper and thus allows for an easy comparison of their respective results.

3.3.2.2 From comparisons *between* languages to comparisons *within* each language

As we indicated before, the comparison of source and translated texts *between* languages leads to hypotheses about how languages relate to one another. However, these hypotheses are primarily hypotheses about translation equivalence, and researchers working in the contrastive tradition rely on the comparison of source and translated texts *within* each language to maintain, adjust or discard these hypotheses in their move to hypotheses about cross-linguistic similarity. In this additional comparison, the source texts in the corpus are used as monolingual control corpora to filter out the effects of translation in translated texts.

We discuss the move from hypotheses about translation equivalence to hypotheses about cross-linguistic similarity on the basis of the dataset in Table 3 and the way it is discussed in Johansson (1998b, 2007). The dataset is concerned with the Norwegian verbs *hate* ('hate') and *elske* ('love') and the English verbs *hate* and *love* in the English Norwegian Parallel Corpus (ENPC).

	Source texts	Translated texts
Norwegian		
<i>hate</i>	23	34
<i>elske</i>	36	90
English		
<i>hate</i>	67	25
<i>love</i>	100	62

Table 3: (Absolute) frequencies of “hate” and “love” verbs in Norwegian and English translated and untranslated texts

With Johansson, we observe that English *hate* and *love* are almost three times as frequent as Norwegian *hate* and *elske* in source texts but that this difference in frequency is smaller in translations. For Johansson, this leads to two conclusions. The first is based on the comparison of source and translated texts *between* the two languages: the Norwegian verbs have a smaller semantic range than the English verbs. Had their semantic range been identical, the frequencies of Norwegian *hate* and *elske* in translated texts should be practically identical to those of English *hate* and *love* in source texts and *vice versa*. The second conclusion Johansson draws is based on the comparison of source and translated texts *within* each language: through the influence of translation, the semantic range of Norwegian *hate* and *elske* is broader in translated texts than in the standard language and the semantic range of English *hate* and *love* is smaller. Had they had a constant semantic range – Johansson’s reasoning goes – their frequencies in source and translated texts *within* each language should have been closer to one another. Combining the two conclusions, Johansson argues that the English verbs have a broader semantic range than the Norwegian ones and that this difference in range is bigger than the comparison of source and translated texts *between* the two languages suggests.

We will probe the two assumptions that underlie Johansson’s conclusions in more detail in Section 3.6.2. For now, we suffice by mentioning them and relating them to the assumptions that underlie the argumentation behind McEnery *et al.*’s claim that translated language is an unrepresentative special variant of the target language. The first assumption

is that source texts are representative of the target language, the second is that differences between source and translated texts are to be related to the influence of translation. It is these assumptions that lead McEnery & Xiao (1999) to compare translated to untranslated texts and argue that translations provide a distorted view of the target language. For Johansson and other researchers in the contrastive tradition, these assumptions lead them to a corpus architecture that includes source and translated texts for the different languages in the corpus and enables them to tease apart cross-linguistic variation from variation induced by translation.

3.3.3 The contrastive tradition: conclusion

In this section, we have presented the parallel corpus architecture used in the contrastive tradition, and we have worked out the two types of comparisons that are typically performed on the data. We conclude that both the architecture and the comparisons bear witness to the desire of researchers in the contrastive tradition to exploit the comparative potential of parallel corpora while acknowledging the potential biases of working with translated texts. To counterbalance these biases, researchers in this tradition rely on the comparison of source and translated texts *within* each language to filter out the influence of translation in the tendencies that are observed in the comparison of source and translated texts *between* languages.

3.4 The typological tradition

We now move to the second parallel corpus tradition: the typological one (Wälchli 2010; Wälchli & Cysouw 2012; Dahl & Wälchli 2016; Beekhuizen *et al.* 2017; Levshina 2022). This tradition is radically different from the contrastive one and this might explain why it is not included in the recent overview of parallel corpus research in Granger & Lefer (2020). A striking feature of this tradition is that it acknowledges the potential biases of translation in parallel corpora but – at the surface – does not seem to actively counterbalance them. We will argue that the typological tradition does come with safeguards against the influences of translation but that these reside in the details of how it puts parallel corpora to work. To get to the relevant

level of detail, we zoom in on one specific study (Section 3.4.1) and characterize its parallel corpus architecture (Section 3.4.2) as well as the way it puts it to use (Section 3.4.3). The study we select is Wälchli & Cysouw (2012), one of the founding studies of the typological tradition.

3.4.1 Wälchli & Cysouw (2012)

Wälchli & Cysouw (2012) is a lexical typology study of motion verbs. Their empirical basis is a selection of 360 motion verb contexts from the gospel by Mark and the verbs that are used to render them in a typologically diverse sample of about 100 languages. To be able to interpret the resulting dataset of over 30k datapoints, the authors transform it into a dissimilarity matrix in which the differences in verb choice between pairs of contexts are quantified according to a verb-level version of the Hamming Distance. This dissimilarity matrix is then used as input for Multi-Dimensional Scaling (MDS), which, in turn, constitutes the basis for the interpretation of the dataset. We first introduce the way the dissimilarity matrix is set up and then move to the way Wälchli & Cysouw interpret it and use MDS to help them do so.

3.4.1.1 The dissimilarity matrix

We illustrate the transformation of the initial dataset into a dissimilarity matrix with the sample dataset in Table 4. For convenience, we follow Wälchli & Cysouw in referring to the different motion verb contexts with verse numbers.

Motion verb context (verse)	English	French	Hungarian	Mapudungun
4:4	come	venir	jön	aku
5:1	come	arriver	ér	puw
9:33	come	arriver	ér	puw
14:3	come	entrer	lép	aku

Table 4: Sample dataset from Wälchli & Cysouw (2012)

As can easily be established, the motion verbs used in verses 5:1 and 9:33 are identical. If we conceive of differences between contexts in terms of distance, this means that the distance between the two verses is 0. The motion verbs in verses 5:1 and 9:33 do differ from the motion verbs in 4:4 and 14:3, and those, in turn, also differ from each other. The verb-level Hamming Distance between the different contexts is calculated on the basis of a pairwise comparison of their corresponding verb tuples (e.g., <come, venir, jön, aku>). Each position in the tuples that contains a different verb (e.g., *venir* vs. *arriver* in the second position of the tuples corresponding to verses 4:4 and 5:1) adds 0.25 (1/#languages) to the distance between pairs of contexts. When we add up these distances, the dataset in Table 4 can be summarized by the dissimilarity matrix in Table 5:

	4:4	5:1	9:33	14:3
4:4	0	0.75	0.75	0.5
5:1	0.75	0	0	0.75
9:33	0.75	0	0	0.75
14:3	0.5	0.75	0.75	0

Table 5: Dissimilarity matrix corresponding of the sample dataset in Table 4

The distance between verses 4:4 and 5:1 is 0.75. This means that only one language makes the same choice of lexical verb in these verses whereas all other languages make a different choice. The distance between verses 4:4 and 14:3 is 0.5, reflecting the fact that two languages select the same verb whereas the other two select different verbs.

3.4.1.2 Interpreting the dissimilarity matrix and MDS

Wälchli & Cysouw’s interpretation of the dissimilarity matrix is grounded in the assumption that differences in verb choice across contexts reflect differences in meaning between contexts. The dissimilarity matrix then gives us a fine-grained overview of semantic differences between motion verb contexts. In this sense, it identifies “typologically relevant features in the grammatical structure of the lexicon”, in line with Lehmann’s view on lexical typology (Lehmann 1990: 163). We note that we use the term *feature*

rather loosely here, as Wälchli & Cysouw insist on the fact that they do not identify features but rather category types. The difference in terminology is connected with the similarity-based nature of category types that will become clear in the remainder of this section. What is important for now is that the identification of category types is central to the approach and that “the semantics of individual lexical items, their configurations in lexical field or individual processes of word formation” are less central (Lehmann 1990: 165).

Interpreting a dissimilarity matrix is not an easy feat and it helps to visualize it by plotting the distances between the verses as we do in Figure 2 for the sample dissimilarity matrix in Table 5:

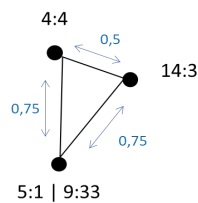


Figure 2: Visual rendition of the distances in the sample dissimilarity matrix in Table 5

Figure 2 is a visual rendition of the distances in the dissimilarity matrix in Table 5. Verses 5:1 and 9:33 occupy the same position and are at an equal distance from verses 4:4 and 14:3. The latter two verses are at different positions and the distance between them is two thirds of the distance between each of them and verses 5:1 and 9:33. A visual rendition of the full dissimilarity matrix of Wälchli & Cysouw can be thought of as a corpus-based representation of the semantic space of motion verbs. In line with the assumption that differences in verb choice across contexts reflect differences in meaning, we can assume that the more distant verses are in this semantic space, the likelier they are to differ in their semantics. Conversely, the closer verses are positioned to one another, the likelier they are to have a similar semantics.

We generated Figure 2 by hand, but this is not possible for Wälchli & Cysouw’s full dataset. Setting aside the labor intensity it requires, the bigger

challenge is that a two-dimensional space like that in Figure 2 does not allow us to faithfully render all the distances in Wälchli & Cysouw's full dissimilarity matrix. This already becomes clear when we try to add verse 1:31:

(6) 1:31 <come, s'approcher, megy, fülkon>

Verse 1:31 turns out to be at a distance of 0.75 from each of the four verses in Table 4. Within a two-dimensional space, there is no way to faithfully render the respective distances between all five verses. The only way to do so is to add an extra dimension. With 360 verses in total and distances that vary between 0 and 1 with increments of about 0.01, it is likely that we would need many more dimensions than we can easily draw by hand or even conceptualize. Identifying the relevant dimensions can however be important from a semantic perspective. Indeed, dimensions generalize over distances between verses and can consequently be thought of as reflecting higher-order differences in meaning. In a highly variable semantic domain like that of motion verbs, dimensions are then likely to allow us to identify the typologically most relevant features that are at play. Accepting the limitations of the human brain, Wälchli & Cysouw turn to MDS to help them identify dimensions and interpret the semantic distinctions they make.

MDS allows researchers to take a dissimilarity matrix and automatically generate a visualization in a high-dimensional space. For Wälchli & Cysouw's dataset, it thus gives a full representation of the semantic space of motion verbs in the corpus. At the same time, MDS also allows researchers to limit the proliferation of dimensions by weighing the addition of a dimension against the contribution it makes to the faithfulness of the distances in the dissimilarity matrix. From a semantic point of view, it thus allows researchers to statistically evaluate how many and which dimensions are likely to be active in a specific semantic domain. For the domain of motion verbs, Wälchli & Cysouw use the eigenvalues of dimensions to argue that at least the first 30 dimensions are statistically relevant in rendering the distances in the dissimilarity matrix. They also propose an analysis of the 12 statistically most important dimensions. For example, the first would oppose

COME verbs to GO verbs. The tenth dimension would further oppose COME verbs to ARRIVE verbs. These verb types correspond to category types in Wälchli & Cysouw’s terminology. As the reader will have noticed, these category types are not discrete but similarity-based: verbs can be more or less COME, GO or ARRIVE-like but there is no real cut-off point between the different category types.

To give an idea of what the actual output of MDS looks like, we present the way it maps the different motion verb contexts of Wälchli & Cysouw in Figure 3. The dimensions we selected are the ones we discussed above: Dimension 1 – opposing the COME and GO category types – and Dimension 10 – opposing the COME and ARRIVE category types. For concreteness, we have overlaid this visualization with markup identifying individual verbs in English. The blue rectangles stand for motion contexts that take English *come*, the green triangles for motion contexts that take English *go* and the black dots for motion contexts rendered with a different verb in English.

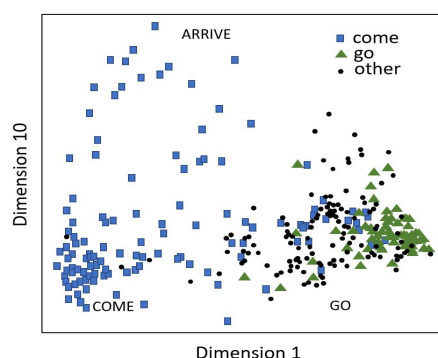


Figure 3: Impression of dimensions 1 and 10 from Wälchli & Cysouw (2012) with markup based on the English version of the gospel by Mark (see also Figure 3 in Wälchli & Cysouw (2012))

Figure 3 shows how the opposition between English *come* and *go* neatly reflects the opposition between the category types COME and GO in dimension 1. The opposition between the category types COME and ARRIVE in dimension 10 is less pronounced in English: the core of the ARRIVE category type is lexicalized as *come* in the same way as the core of the COME category type.

3.4.1.3 *Summary*

This section has shown how Wälchli & Cysouw (2012) use a selection of 360 motion verb contexts from the gospel by Mark to identify typologically relevant category types in the lexical domain of motion verbs. Their approach starts from an inventory of the verbs that are used in these contexts across a typologically diverse sample of about 100 languages. This inventory is then transformed into a dissimilarity matrix quantifying over the differences in lexicalization in the different contexts. The interpretation of this dissimilarity matrix relies on the assumption that differences in lexicalization reflect differences in meaning: contexts that are closer to one another are assumed to be more similar than those that are further away from each other. The authors rely on MDS to help out in the interpretation of the dissimilarity matrix. MDS visualizes the corresponding high-dimensional semantic space. Also, it helps identifying the statistically relevant dimensions. Wälchli & Cysouw relate these to category types, a similarity-based version of the classical (discrete) features in lexical typology.

3.4.2 *The typological parallel corpus architecture*

The way Wälchli & Cysouw put parallel texts to use is different from the way they are put to use in the contrastive tradition. Literature following in their footsteps varies (see – among others – Dahl & Wälchli (2016), Beekhuizen *et al.* (2017), Levshina (2022)), but many methodological choices align. In this subsection and the next, we characterize the parallel corpus architecture underlying this tradition and the way it is put to use. In parallel, we make a comparison with the contrastive tradition.

Two design features of the parallel corpus architecture in the typological tradition stand out when compared to that in the contrastive tradition. The first is that the typological parallel corpus architecture comes with a far higher number of languages. Even though we did not draw attention to the number of languages in the contrastive tradition, we typically find that parallel corpora there are limited to two or three languages (e.g., respectively, the English-Norwegian Parallel Corpus and the Dutch Parallel Corpus). As we saw in Section 3.4.1, Wälchli & Cysouw (2012) rely on a corpus with around 100 languages. Other studies in the typological tradition

rely on corpora with tens of languages (e.g., Levshina 2022) to hundreds of languages (Dahl & Wälchli 2016). This difference with the contrastive tradition is in line with the respective domains of linguistic research the traditions originate in. Contrastive linguistics is typically concerned with a small number of languages whereas typology traditionally builds on far bigger samples.

The second design feature that radically opposes the typological parallel corpus architecture to the contrastive one is that it does not come with source texts in all languages. The upshot of this is that no comparison can be made between source and translated texts *within* each language. In Section 3.3, we argued that this comparison is the foundation of the contrastive tradition’s way of controlling for translation biases. No such control is possible in the typological tradition. What we find then is that translation data in the typological tradition are put at the same level as untranslated data and are taken to be directly representative of the languages they are written in. The parallel corpus architecture of the typological tradition can thus be represented as follows:

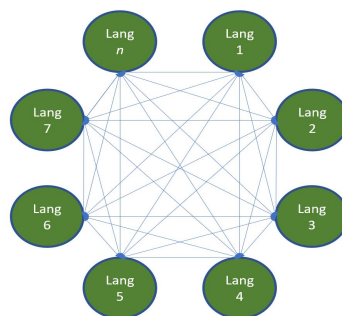


Figure 4: The typological parallel corpus architecture (illustrated for n languages)

In this architecture, no distinction is made between translated and untranslated texts, and comparisons are directly undertaken for all data in all languages. Judging by this parallel corpus architecture, we would thus have to conclude that the methodological reservations that have been leveled against the use of parallel corpora (see Section 3.2), are not taken into

consideration in the typological tradition. This conclusion is correct insofar as research in the typological tradition does not actively control for translation biases. In the next subsection, we will however argue that McEnery *et al.*'s reservations do not apply to the use of translation data in the typological tradition in the same way as they do to the use of translation data in the contrastive tradition.

3.4.3 Putting the typological parallel corpus architecture to use

Based on the discussion in Section 3.4.2, one might assume that the fact that no safeguard against the influence of translation is built into the typological parallel corpus architecture is a trade-off between coverage on the one hand and control over the data on the other. This would make sense, as the contrastive parallel corpus architecture is very demanding. Indeed, the fact that contrastive corpora typically are restricted to two or three languages is not an accident, and researchers like Johansson have indicated that their attempts at consistently implementing the contrastive parallel corpus architecture for more than three languages have led to mixed results (Johansson 2007). Challenges include copyright issues but also availability of comparable texts and translations in the different languages. These issues also explain why parallel corpora within the contrastive tradition are fairly small. For example, the number of words of the English-Norwegian parallel corpus is expressed in the hundreds of thousands of words, a far cry away from the millions and billions of words that are becoming standard practice in monolingual corpus studies. Moving from contrastive to typological research, there is thus simply no way to build a parallel corpus while respecting the demanding architecture of the contrastive tradition. The typological parallel corpus architecture could then be seen as the only way of using parallel corpora in typological research.

The practical limitations of parallel corpora for typological studies are obvious. One might then argue – following Lauridsen (1996) – that it would be better not to use them at all rather than to build analyses on unreliable data. However, next to the practical considerations, there is an arguably more fundamental reason for the more relaxed way researchers in Wälchli & Cysouw's tradition deal with translated texts. This reason is not made

explicit in this tradition but relates to the way translation data are put to use. In the contrastive tradition, researchers compare individual lexical items or constructions at the level of individual languages. This is reflected in the basic correspondence measures they use (see (2) to (4)). In the typological tradition, the researchers' interest is not in the comparison of individual lexical items or constructions *per se*. Rather, they use these as a probe into typologically relevant features or category types. This is reflected in the fact that the dissimilarity matrix in Wälchli & Cysouw (2012) compares contexts and not individual expressions. Due to the high number of languages, the influence of each translation on the distances between different contexts is extremely small. Given that the interpretation of the dissimilarity matrix is furthermore statistically driven, and its analysis is limited to the statistically most important dimensions, it is highly unlikely that translation biases in individual translations have a traceable effect on the typological generalizations researchers within Wälchli & Cysouw's tradition arrive at. Therefore, the use of parallel corpora in the typological tradition is not *a priori* methodologically less sound than that in the contrastive tradition, provided the focus is on identifying typologically relevant features or category types rather than providing a full analysis of all lexical items included in the corpus.

3.4.4 The typological tradition: conclusion

In this section, we have presented the typological parallel corpus tradition. After a detailed presentation of one of the foundational studies (Section 3.4.1), we discussed the typological parallel corpus architecture and the way it is put to use. We showed how the architecture differs from the one in the contrastive tradition in the number of languages that are represented and in the fact that translated texts get the same status as untranslated texts (Section 3.4.2). We further argued that these differences do not entail that the typological tradition is methodologically unsound (Section 3.4.3). Our argumentation was based on the fact that the typological tradition does not make claims about individual lexical items, limits the influence of individual translations on the data, and focuses in its analysis on the statistically most important tendencies. We conclude that the typological tradition is

fundamentally different from the contrastive one but that – through the questions it asks to parallel corpora – it counterbalances the influence of translation in an equally justifiable way.

3.5 The *Translation Mining* tradition

In this section, we turn from the well-established contrastive and typological traditions to a tradition in the making. In a number of recent papers, the Utrecht-based *Translation Mining* group has used parallel corpora in a way that presents an interesting mix between the contrastive and the typological tradition. On the one hand, we will see that it relies on the typological parallel corpus architecture in putting translated and untranslated texts at the same level. On the other hand, we will see that the questions it asks are the same as in the contrastive tradition and concern the analysis of individual items in individual languages. From our discussion in Section 3.4, it follows that this particular combination is not *a priori* without problems. In this section, we will however argue that the *Translation Mining* group still succeeds in observing the *caveats* that have been levelled against the use of parallel corpora. Where the contrastive tradition does so with a check on translation influence at the level of the corpus itself, we will see that this check comes back in an extended research design in the work of the *Translation Mining* group. At the end of this section, we will conclude that the *Translation Mining* tradition – despite initial indications to the contrary – is as methodologically sound as the contrastive and the typological traditions. The upshot of this is that we have no less than three ways of implementing parallel corpora in a methodologically justifiable way, leading us to an affirmative answer to the *whether* question: parallel corpora do belong in the toolbox of linguists studying cross-linguistic variation.

Parallel to our discussion of the two other traditions, we present the *Translation Mining* tradition by discussing its parallel corpus architecture (Section 3.5.1) and the way it puts it to use (Section 3.5.2). For concreteness, we take van der Klis *et al.* (2021a) as our starting point.

3.5.1 The *Translation Mining* parallel corpus architecture

Van der Klis *et al.* (2021a) study the cross-linguistic variation in the use of a specific verb form, *viz.* the combination of *have* (or its counterparts) and a past participle. They refer to this form as the *HAVE*-perfect (Dahl & Velupillai 2013). Van der Klis *et al.* take a form-based perspective to cross-linguistic variation and look at how the same form is used in different languages. The languages they look into are French, Italian, German, Dutch, Spanish, English and (Modern) Greek. The *HAVE*-perfect form in these languages has received different names, like *passé composé* in French, *voltooid tegenwoordige tijd* in Dutch and *parakimenos* in Greek. In the current chapter, we will stick to the more general *HAVE*-perfect label.

The corpus van der Klis *et al.* use consists of all the contexts in which French uses a *HAVE*-perfect in the first three chapters of Camus' *L'Étranger* (N=348). In the same way as Wälchli & Cysouw (2012) use MDS to map out distances between contexts based on lexical choices (Section 3.4.1), van der Klis *et al.* use it to map out distances based on choices of tense-aspect form. Figure 5 presents the MDS outcomes.

The grey dots in Figures 5a to 5g stand for contexts from the corpus. The dots are organized in the same way in the different figures and their organization is based on the first two MDS dimensions. The markup is language-specific and reflects the use of tense-aspect form in the contexts. The blue shapes (full lines) cover contexts with a *HAVE*-perfect and the green shapes (dotted lines) contexts with other tense-aspect forms of past meaning (*Präteritum*, *onvoltooid verleden tijd*, etc.). The picture that can be read off these maps, is that the French and Italian *HAVE*-perfects have the most extensive use, and that other tense-aspect forms of past meaning systematically take over more and more contexts from one language to the next, leading to the implicational hierarchy in (7):

(7) *Implicational hierarchy of HAVE-perfect use*

French|Italian > German > Dutch > Spanish > English > Greek

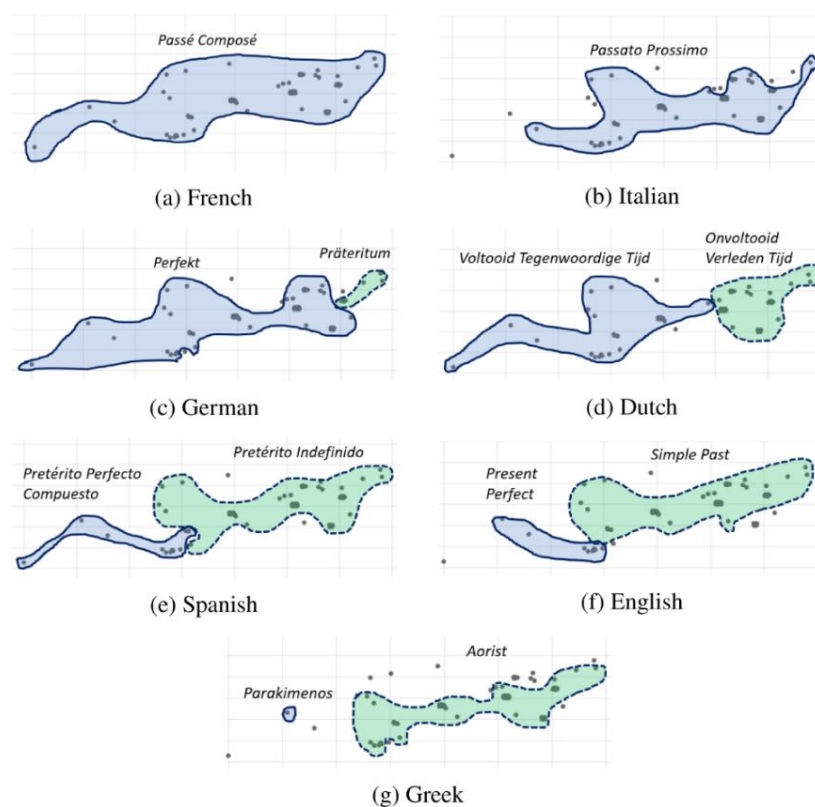


Figure 5: MDS representations of the use of the *HAVE*-perfect in the different languages included in the corpus of van der Klis *et al.* (2021a) (see Figure 3 in van der Klis *et al.* (2021a))

We note, with van der Klis *et al.*, that the choice of corpus makes it impossible to check whether there are languages with *HAVE*-perfects that are not rendered as a *HAVE*-perfect in French. This issue is picked up by Le Bruyn, van der Klis & de Swart (2022), who show that none of these languages uses a *HAVE*-perfect in contexts in which French relies on a tense-aspect form of past meaning. Figures 5a to 5g and the hierarchy in (7) thus give a fair idea of how the *HAVE*-perfect competes with tense-aspect forms of past meaning in these different languages.

In van der Klis *et al.* (2021a), the MDS representations in Figure 5 and the implicational hierarchy in (7) are the basis for the interpretation of the data in the corpus. As such, translated data are taken at face value and the

parallel corpus architecture is thus the same as that in the typological tradition, where translated and untranslated data are put at the same level (see Figure 4).

3.5.2 The *Translation Mining* interpretation of the typological corpus architecture

The *Translation Mining* tradition uses MDS in the same way as the typological tradition. This might seem to suggest that its aim is to focus on major cross-linguistic tendencies. Even though this is not excluded *per se*, the type of variation van der Klis *et al.* (2021a) look into is far less complex than that in studies like Wälchli & Cysouw (2012). To give an idea of the difference in complexity, we ran Wälchli & Cysouw's eigenvalue analysis on the datasets of Wälchli & Cysouw and of van der Klis *et al.* (2021a) with the dimensions generated by the MDS algorithm used by van der Klis *et al.* (2021a). The result of this analysis is that only 2 dimensions are required as opposed to the 54 for Wälchli & Cysouw's data. For completeness, we also checked whether the difference in complexity was based on the number of languages or on the difference between lexical and grammatical variation. To do so, we ran the eigenvalue analysis on a subset of the languages in Wälchli & Cysouw's data, trying to stay as close as possible to the seven languages included in van der Klis *et al.*'s study. The languages we included were French, Italian, (Bernese Swiss) German, Swedish (instead of Dutch), Spanish, English and (Modern) Greek. The result of the analysis is that 24 dimensions are required for a faithful rendition of the dissimilarity matrix data. What this shows is that both the number of languages and the type of variation (lexical vs. grammatical) influence the difference in complexity between the data in van der Klis *et al.* and those in Wälchli & Cysouw. We note that the number of contexts included in both data sets is close enough (348 in van der Klis *et al.* vs. 360 in Wälchli & Cysouw) to have had little impact on the difference in the number of statistically relevant dimensions.

Wälchli & Cysouw do not present a full interpretation of their dataset but limit themselves to an interpretation of the twelve statistically most relevant dimensions. As such, they solely focus on major cross-linguistic tendencies that are unlikely to be subject to translation biases. Van der Klis

et al.'s study is different in that the authors move along the hierarchy in (7) and present detailed analyses of every group of contexts that gets subtracted from the distribution of the *HAVE*-perfect.⁶ Their main claim is that the analysis of these groups of contexts allows them to determine and oppose the relevant semantic ingredients of the *HAVE*-perfects of the individual languages represented in their corpus. Differently from Wälchli & Cysouw, the final aim of van der Klis *et al.* is thus a full analysis of individual forms in individual languages. In this sense, the *Translation Mining* tradition differs from the typological tradition and joins the aims of the contrastive tradition.

In Section 3.5.1, we concluded that the *Translation Mining* tradition relies on the same parallel corpus architecture as the typological tradition. In this subsection, we have established that the final aim of the *Translation Mining* tradition is however more in line with that of the contrastive tradition in that it does not look for major cross-linguistic tendencies but tries to get a grip on the analysis of individual forms in individual languages. We thus find that the *Translation Mining* tradition presents a mix of the two other traditions: in its parallel corpus architecture, it sides with the typological tradition and in its aims, it sides with the contrastive tradition. From our discussion in Section 3.4, it follows that this particular mix might present some problems: the analysis relies on the details of the data, but the architecture prevents researchers from evaluating to what extent these details are sensitive to translation biases. The question that imposes itself then is whether the *Translation Mining* tradition still takes into account earlier criticisms on the use of parallel corpora in cross-linguistic variation research.

The answer to the preceding question is affirmative. To see why, it is important to understand that a parallel corpus study within the *Translation Mining* tradition does not stand on its own. Where the contrastive tradition builds safeguards against translation biases into its parallel corpus architecture and includes the analysis of parallel and monolingual corpus data in a single study, the *Translation Mining* tradition has a more sequential

⁶ We use the term *group of contexts* deliberately here as van der Klis *et al.* do not run cluster analyses on their data. We refer to van der Klis & Tellings (2022) for an overview of the different ways of running cluster analyses independently or alongside MDS.

way of proceeding. As a preliminary safeguard, the *Translation Mining* tradition relies on native speaker judgments to check the acceptability and naturalness of the parallel corpus data (see, e.g., Bremmers *et al.* (2021)). A special variant of this method includes comparisons between different translations of the same source text in a single language and preferences by native speakers (see, e.g., Bogaart & Jager (2020)). The *Translation Mining* tradition further studies the same phenomenon from the perspective of different parallel corpora with different source languages (compare, e.g., van der Klis *et al.* (2021a) and Le Bruyn *et al.* (2019)). In this sense, it replicates the parallel vs. monolingual perspective from the contrastive tradition across different studies. Finally, it comes with experiments that test newly found generalizations, allowing researchers not only to go beyond the limitations of parallel corpora but also beyond the limitations of corpora in general (see, e.g., Tellings & Fuchs (2021)).

3.5.3 The *Translation Mining* tradition: conclusion

In this section, we have presented the *Translation Mining* parallel corpus tradition, zooming in on the parallel corpus architecture in van der Klis *et al.* (2021a) and the way the authors put it to use. We showed how this tradition adopts the parallel corpus architecture of the typological tradition while sharing the goals of the contrastive tradition. We further argued that this mix of the two traditions does not pose a methodological problem in view of the fact that the *Translation Mining* tradition covers the same safeguards against the influence of translation as the contrastive tradition, be it across complementary studies. We conclude that – next to the contrastive and the typological traditions – the *Translation Mining* tradition presents a methodologically sound way of implementing parallel corpus research in the study of cross-linguistic variation.

Going back to the *whether* question triggered by the preliminary testing of Hypotheses 1–7 in Section 3.2, we now have an affirmative answer to it: parallel corpora do belong in the toolbox of researchers studying cross-linguistic variation. In fact, we found that there are at least three ways of implementing parallel corpora for cross-linguistic variation studies and it might thus seem that we are spoiled for choice. However, in our discussions

in Section 3.3 to 3.5, our main concern was to find out whether the different traditions come with relevant safeguards against translation biases, and we did not go into the question of when we should rely on one or the other. In Section 3.6 we will turn to the question of *how* parallel corpora should be implemented in cross-linguistic variation studies so as to find which tradition suits our testing best.

3.6 Choosing a tradition: some preliminaries

In this section we present a preliminary discussion on the choice among the three traditions so as to find the most suitable one for our testing task (recall Section 3.2). For studies interested in analyzing broad typological generalizations, the typological tradition is the only one available and – by default – the most appropriate one. A similar reasoning applies to studies that want to compare individual items/constructions across multiple languages: we have seen that the contrastive parallel corpus architecture cannot easily be generalized beyond three languages and researchers with a comparative focus consequently need to resort to the *Translation Mining* tradition. By adopting the focus on contexts from the typological tradition, the *Translation Mining* tradition is highly scalable and has a solid grip on the relations between multiple items/constructions across multiple languages. By adopting an MDS-approach, it furthermore does not have to make *a priori* assumptions about the complexity of the data. Turning finally to contrastive studies, the choice is one between the contrastive and the *Translation Mining* tradition and this is the choice we focus on in this section. Providing a full decision tree to decide between the two lies beyond the scope of this chapter, though. We will instead set the stage for future studies to build on. On the one hand, we will introduce a generalized version of the measure of mutual correspondence (see Section 3.3.2) that can be applied to parallel corpora in the two traditions (Section 3.6.1). This will allow future studies to compare their respective outcomes more easily. On the other hand, we will argue that the assumptions of the contrastive tradition about monolingual and translation corpora (see Section 3.3.2) may be correct for big corpora but may not always hold for smaller corpora (Section 3.6.2). We will also discuss what this entails for the choice between the contrastive and the

Translation Mining tradition and in particular for the Camus corpus we started the chapter with (Section 3.6.3).

3.6.1 Generalizing mutual correspondence

In Section 3.3.2, we presented a number of measures that are used in the contrastive tradition and illustrated them with English *talk* and Norwegian *snakke* data. The uni-directional measures in (2) and (3) were concerned with how often a given form in the target language is a translation of a given form in the source language. These measures can be generalized to apply to any pair of languages, independently of whether they are source or target languages. The same does not hold for the bi-directional measure defined in (4): mutual correspondence. The problem that presents itself is that mutual correspondence is based on data from two independent samples of source and translated texts. Corpora in the *Translation Mining* tradition do not come with such independent samples, and we consequently have to reconsider the rationale behind mutual correspondence to come to a bi-directional measure that can be applied in both traditions and allows for easy comparison of their respective findings. We argue that Normalized Pointwise Mutual Information (NPMI, Bouma 2009), a measure that originates in Information Theory, provides us with such an alternative rationale.

The intuition behind our use of NPMI can best be understood with a small analogy. Imagine person A is tossing a coin and person B is throwing a die. The probability of person A ending up with heads is 1 out of 2, and the probability of person B ending up with 6 is 1 out of 6. The probability of them ending up with these results in the same turn is the product of the probabilities of each of the results, *viz.* 1 out of 12. With two fully independent processes, we can thus calculate the probability of ending up with a given pair of results by multiplying the probabilities of the individual results.

Moving to parallel texts, the turns in the coin-and-die example become pairs of expressions that occur as each other's counterparts. We refer to these pairs as *counterpart pairs* or CPs for short. Frequencies give us a handle on the probabilities of individual expressions occurring in CPs. For example, for our Camus corpus, we know that the probability of finding the *imparfait*

in a CP is 128 out of 509. Likewise, the probability of finding *zai* in a CP is 6 out of 509. With the probabilities of these individual expressions in place, we can calculate what the probability of them occurring in the same CP would be if co-occurrence in a CP were random. In the same way as for the coin-and-die example, we simply have to take the product of the individual probabilities, *viz.* 768 out of 259081.

Clearly, co-occurrence in a CP is not random but given that we can calculate what the probability of two expressions co-occurring in a CP would be if it were, we can compare the actual probability of finding them together in a CP in the corpus to this hypothetical probability. By dividing the actual probability by the hypothetical probability, we then get a measure of how strongly the two expressions are associated with each other across their respective languages. For the *imparfait* and *zai* in our Camus data, the actual probability is 5 out of 509 (5 instances of *zai* being translations of the *imparfait*). If we divide this by their hypothetical probability, we end up with 3.31, indicating that the actual probability of finding the *imparfait* in the same CP as *zai* is around three times higher than we would expect on the basis of random co-occurrence.

NPMI builds on the actual/hypothetical probability ratio we have introduced, but puts it through two further transformations. The first is takes the (binary) logarithm of this ratio. The main effect of this operation is that the cut-off point between actual probabilities that are higher than the hypothetical ones is moved from 1 to 0. The rationale behind this first transformation is internal to Information Theory, where information is measured in (binary) bits and random co-occurrence is taken to have no information value. The second transformation consists in dividing the result of the first transformation by the negative value of the logarithm of the actual probability. The latter value equals the result of the first transformation in case the two expressions in question only occur together, *i.e.*, when the ratio is at its highest. The effect of this operation then is to project all values on a scale from -1 to 1 while maintaining 0 as the cut-off point between actual probabilities that are higher than the hypothetical ones. This second transformation thus counts as a normalization and allows for easy comparison across datasets. The NPMI score for the *imparfait* and *zai*

in the Camus corpus is $\log_2(3.31)/-\log_2(5/509)=0.26$. The formula of the NPMI score between expressions x and y in a parallel corpus is:

$$(8) \text{ NPMI}(x;y) = \log_2(N * \text{cofq} / X * Y) / -\log_2(\text{cofq}/N)$$

(N: number of total occurrences in a corpus, cofq: number of the co-occurrences of x and y in a CP, X/Y: number of x / y in a corpus)

With the definition of NPMI in place, we are in a good position to come back to mutual correspondence and discuss the way the two measures relate to one another. We argue that both measures quantify the strength of association between expressions across languages. Mutual correspondence does so by comparing the frequency of expressions in source texts to the frequency of their counterparts in translations. The more frequently their counterparts occur as their translation equivalents, the stronger the association is between the expressions and their counterparts. NPMI follows a different route and compares the actual probability of two expressions occurring as each other's counterparts to the hypothetical probability of the two randomly occurring as each other's counterparts. The more NPMI approaches a value of 1, the stronger the association is between the two expressions. Despite the fact that mutual correspondence and NPMI are clearly mathematically different, we conclude that they do measure the same construct, *viz.* the association between expressions across languages. NPMI comes out as the more general measure as it does not rely on two independent samples of source and translated texts. It can consequently be used in parallel corpora from both the contrastive and the *Translation Mining* tradition and thus allows for easy comparison of the outcomes of the two traditions.

3.6.2 Assumptions of the contrastive tradition and corpus size

In Section 3.3.2, we pointed out that there are two assumptions that underlie research in the contrastive tradition. The first is that source texts are representative of the target language whereas translated texts are less so, the second is that the differences between source and translated texts *within* a language are to be related to the process of translation underlying the latter.

Even though we agree with these assumptions, we also want to warrant against too strict an interpretation, in particular for smaller corpora like the ones used in the different traditions discussed in this chapter. The argument we develop is as follows: if (potential) source texts were representative of the target language, we would expect there to be little to no variation between them. We will show that this expectation is not borne out and conclude that taking source texts as the ultimate touchstone for target language representativeness in parallel corpus research is not a foolproof strategy. In our discussion, we will reflect on what this conclusion entails for research within the contrastive and the *Translation Mining* tradition, preparing our discussion in Section 3.6.3 of how to best deal with the Camus corpus we started the chapter with.

To make our discussion as concrete as possible, we go back to Johansson's study on *hate* and *love* in the ENPC and remind the reader that Johansson observes that English *hate* and *love* are less frequent in translated texts than in source texts, and that he relates this fact to the influence of translation. On the strongest interpretation of Johansson's reasoning, there should be no independent reason for *hate* and *love* to be less frequent in the translated texts of his corpus. However, this is exactly where smaller corpora are at a disadvantage: unless we have a corpus that is balanced for the phenomenon under study, there is no way to exclude independent factors from intervening in the frequencies of individual expressions. To get a feel for the size of corpus that would be required to be able to abstract away from the influence of such independent factors, we extracted two *hate/love* datasets from the Corpus of Contemporary American English (COCA, Davies 2008). Like the ENPC used by Johansson, COCA is a balanced corpus, but unlike the ENPC, COCA has over a billion words and contains over 20 million words for every year from 1990 to 2019, in the same balanced design as the overall corpus. For comparison, we note that the English and Norwegian source text subcorpora of the ENPC each contain between 600k and 700k words.

The first dataset we extracted opposes the frequencies of *hate* and *love* in the years 1992 (23.8m words) and 1993 (24.5m words):

	hate	love
1992	1374 (57)	4671 (196)
1993	1762 (72)	5430 (221)

Table 6: Frequencies of *hate* and *love* in the years 1992 and 1993 in COCA (relative frequencies per 1m words between brackets)

What we find is that *hate* and *love* are clearly more frequent in 1993 than in 1992. We checked the differences for each verb with the same log-likelihood test as the one used by McEnery & Xiao (1999) and found that the distribution of the two verbs is significantly different between the two years (*hate* : LL value = 37.54 (p<.001), *love* : LL value = 37.21 (p<.001)). What this dataset shows then is that even in a far bigger corpus than the ENPC, there is no way to guarantee that there are no independent fluctuations in the frequencies of individual expressions. The relevance of this observation lies in the fact that COCA is a monolingual corpus and therefore the fluctuations cannot be related to translation.

The second dataset we extracted moves to an even higher level of aggregation and opposes the frequencies of *hate* and *love* in the years 1990-1994 to those in the years 1995-1999. Where the data in Table 6 were still concerned with two subcorpora of around 20m words, we now move to two subcorpora with over 100m words (139m and 147m words respectively). The data are presented in Table 7.

	hate	love
1990-1994	7671 (55)	24656 (177)
1995-1999	8377 (56)	31979 (216)

Table 7: Frequencies of *hate* and *love* in the years 1990-1994 and 1995-1999 in COCA (relative frequencies per 1m words between brackets)

The difference we found in Table 6 for *hate* in the 1992 and 1993 subcorpora has clearly become smaller, especially if we were to focus on relative frequencies. It is still significant, though (*hate*: LL value = 4.12 ($p < .05$)). For *love*, moving to this higher level of aggregation makes little difference, even in relative frequencies, and the difference between the two subcorpora in Table 7 remains highly significant (*love*: LL value = 584.19 ($p < .001$)). This second dataset thus further strengthens our claim that independent fluctuations in the frequencies of individual expressions are difficult to avoid and that these need not be related to translation in any way. We conclude that the comparison between source and translated texts can inform us about the influence of translation but that this comparison should be handled with care. This holds for big corpora and *a fortiori* for the smaller corpora used in the traditions discussed in this chapter. Corpus size is of course relative to the phenomenon under study: lexical phenomena are likelier to require bigger corpora than more grammatical phenomena.

Our discussion up till now warrants against an overreliance on the comparison between source and translated texts *within* a language to control for the influence of translation. What the data from COCA show is that the variation we find might well be due to factors that have little or nothing to do with translation. The question that imposes itself is how to best deal with this extra complication, in particular for smaller corpora. The answer – we argue – lies in the extended research design of the *Translation Mining* tradition.

In Section 3.5.2, we already pointed out that the *Translation Mining* tradition does not rely on one corpus but replicates the parallel vs. monolingual perspective of the contrastive tradition across studies of multiple parallel corpora with different source languages. The advantage of this approach is that it maintains the parallel vs. monolingual perspective but at the same time forces researchers to pay attention to the individual characteristics of each corpus and invites them to systematically reflect on different sources of variation. Predictions based on one corpus are checked on the next and hypotheses on why predictions are borne out or not are systematically evaluated.

A further research design feature that we did not treat in Section 3.5.2 but that does play a role in teasing apart different types of variation in the

Translation Mining tradition is related to an architectural feature of its corpora whose relevance can be best highlighted here. Major corpus compilation projects from the contrastive tradition include fragments of different source texts from different authors and translations from different translators. Corpora in the *Translation Mining* tradition are markedly different in the sense that they are typically built around a single source novel and one translation per language at a time. The rationale behind this move is that it allows researchers to keep constant as many variables as possible while actively looking for variation between subparts of the corpus. In Le Bruyn *et al.* (2019) and van der Klis *et al.* (2021b), this strategy leads to the opposition between dialogue and narrative discourse in their analysis of the uses of tense-aspect forms in the first volume of the *Harry Potter* series by J.K. Rowling and its translations to a number of Western European languages. The inclusion of this opposition is a direct consequence of the difference in the use of the *HAVE*-perfect they found between Chapter 1 and Chapters 16/17. On closer analysis, this difference turned out to be due to the fact that Chapter 1 contains little to no dialogue whereas dialogue abounds in Chapters 16/17. This active search for variation within a single corpus typically turns up variation that is independent of translation and complements the attention for different types of variation across multiple corpora we noted above. Together, they allow research within the *Translation Mining* tradition to lead – across multiple studies – to the critical mass required to support claims about cross-linguistic variation on the one hand and about the influence of translation on the other hand.

3.6.3 Choosing a tradition for contrastive research in the Camus corpus

In Sections 3.6.1 and 3.6.2, we tackled the question *how* parallel corpus research should be implemented in the study of cross-linguistic variation. For typological and comparative research, this question was easy to answer as there are – to our knowledge – no real alternatives to the typological and the *Translation Mining* traditions for these respective types of research. For contrastive research, the choice is between the contrastive and the *Translation Mining* tradition and we have tried to lay the foundations for future research into comparing these traditions. On the one hand, we

proposed NPMI as a generalized version of mutual correspondence, allowing for easy comparisons of the outcomes of the two traditions. On the other hand, we argued that (relative) corpus size may play an important role in the choice for the one or the other, the *Translation Mining* tradition being better equipped to deal with different types of variation in smaller corpora.

Even though a general decision tree to determine whether a specific contrastive study is best carried in the contrastive or the *Translation Mining* tradition has to await future research, we do have enough insight into translated Mandarin aspect data to recommend the *Translation Mining* tradition for smaller parallel corpora like the Camus corpus we started the chapter with. Rather than relying on a monolingual corpus to try and control for translation biases, the way forward is to propose a full analysis of the data, formulate the hypotheses that follow and check these in a complementary parallel corpus study that takes Mandarin as its source language.

Our recommendation is based on a comparison between McEnery & Xiao (1999) and Xiao & Hu (2015). Even though both studies conclude that the absence of tense-aspect forms is higher in translated Mandarin texts than in untranslated Mandarin texts, the comparison between the two studies reveals that increasing corpus size considerably reduces the differences between the two types of texts. Where McEnery & Xiao note that *le* and *guo* are twice more frequent in untranslated texts than in translated ones in their 35k word corpora, Xiao & Hu find far smaller differences in their 1m word corpora. The difference for *le* goes down to 5 percent and the difference for *guo* is even below 1 percent. What these data suggest is that the huge differences between translated and untranslated texts noted by McEnery & Xiao were likely not due to the influence of translation. This suggestion is supported by Sun & Grisot (2020) and Grisot & Sun (2021). The parallel corpus architecture of these authors follows that of the contrastive tradition, but they find no noteworthy differences in aspect marking between translated and untranslated Mandarin texts. What this body of literature shows is that there can but need not be considerable differences between translated and untranslated texts. These differences can however only be properly addressed with an analysis that takes different types of variation

into account. In light of our discussion in Section 3.6.2, we submit that the replication-based research design of the *Translation Mining* tradition is the more appropriate choice in this particular case.

Although for contrastive studies conducted in the Camus corpus, such as the one we did in Section 3.2, the *Translation Mining* tradition is methodologically the best choice, our discussion in Section 3.7 which circles back to the preliminary testing in Section 3.2 will show that in order to appropriately test Hypotheses 1–7, the standard *Translation Mining* method does not suffice. Alternatively, we propose a variation called *Aggregated Translation Mining* to achieve the goal.

3.7 From standard *Translation Mining* to *Aggregated Translation Mining*

Section 3.6 draws the conclusion that the influence of translation is unlikely to cause the different use frequencies of tense-aspect forms between translated and untranslated Mandarin texts. This brings us back to the reflection on the unexpected findings of our preliminary testing in Section 3.2 and supports assumption (i), namely that the translated Mandarin data in the Camus corpus is qualified to represent Mandarin. Therefore, the unexpected findings cannot be attributed to translation effects.

Excluding the factor of translation effects, we still cannot assert that according to the unexpected findings, the hypotheses whose predictions are not in line with our data are invalid without reexamining assumption (ii), i.e., whether French tense-aspect forms approximately represent the general tense-aspect categories involved in the hypotheses. Figure 5 and the hierarchy of *HAVE*-perfect (7) indicate that the *HAVE*-perfect form has more extensive use in French than in other European languages included in the Camus corpus (except Italian). The French *HAVE*-perfect form, *passé composé*, can convey not only the meaning of Perfect but also the meaning of Perfective past which are expressed by non-Perfect forms in many other European languages, such as Spanish and English (see also Section 2.3.2). Therefore, *passé composé* turns out not to be an appropriate representation of the general category of Perfect, at least in the corpus we use, which takes spoken French as the source language. This indicates that assumption (ii) is

untenable. Due to the untenable assumption, the unexpected findings do not lead to the conclusion that the hypotheses whose predictions are not in line with our data are invalid.

In fact, the problem of assumption (ii) is reflected in our practice. We could not test Hypotheses 2a and 2b separately because in our spoken French data, *passé composé* conveys the meanings of Perfect and Perfective (as *passé composé* systematically replaces *passé simple*). As a result, Hypotheses 2a,b make predictions (i.e., Predictions 2a,b) that have overlap. The same problem also occurs with Hypotheses 3a and 3b. Moreover, French does not grammaticalize the Progressive category but grammaticalizes its supercategory, Imperfective, by *imparfait* (as Section 2.3.2 notes). This causes the problem that the distinction between *zai* and *zhe* cannot be reflected through their French translations. Consequently, they both are predicted to typically occur as the translation of (Imperfective) *imparfait* (see Predictions 4 and 5). To sum up, the spoken French we use has a typical instance of Imperfective (*imparfait*), but it lacks typical instances of Perfect, Perfective, and Progressive.

Just like spoken French, other European languages in the Camus corpus have tense-aspect forms that typically instantiate particular general tense-aspect categories, but none of them have the full inventory of the typical instances of all the categories. For example, English has the instance of Progressive (*-ing*) but lacks instances of Perfective/Imperfective (recall Section 2.3.2). Since the general categories are originated by abstracting over specific tense-aspect forms in European languages, their representations should have cross-linguistically stable semantics. Therefore, the crux of the problem of assumption (ii) cannot be eliminated by replacing French with any other language in the corpus.

To solve the problem, we attempt to exploit the multiple languages in the corpus to obtain good representations for the general tense-aspect categories in a data-driven way. The idea is to aggregate multiple European languages in the corpus and find cross-linguistically stable patterns from the uses of tense-aspect forms in the languages. Based on the patterns, we then try to construct data-driven representations which we argue can appropriately represent general tense-aspect categories. To achieve our goal,

we need to operate on a compilation of multiple languages, but this cannot be done with the standard *Translation Mining*, the methodology best suited to contrastive studies in the Camus corpus (argued in Section 3.6), because it only allows operations on individual languages. Therefore, we develop a variation of the *Translation Mining* methodology to compile languages, which is dubbed *Aggregated Translation Mining*. The next chapter will elaborate on the variation and applies it to build good representations which we dub *European tense-aspect tuples*. Furthermore, the next chapter will conduct a sophisticated test of Hypotheses 1–7 by measuring the association between Mandarin tense-aspect forms and European tense-aspect tuples.

3.8 Conclusions

This chapter used the Camus corpus to conduct preliminary testing on Hypotheses 1–7, which are formulated in Chapter 2 according to the literature. The unexpected findings drove us to reflect on the testing design. As a result, we argued that the *Aggregated Translation Mining* methodology suited our testing goal best so we decided to apply it to a sophisticated testing of Hypotheses 1–7 in Chapter 4.

Specifically, in Section 3.1 we argued that using a monolingual Mandarin corpus to do the testing could cause circular reasoning. To address this caveat, we opted for the Camus corpus, a parallel corpus that takes (spoken) French as the source language and has Mandarin and multiple European languages as target languages. Then in Section 3.2, we did a preliminary test in the corpus. To operationalize the hypotheses, we used French tense-aspect forms to represent general tense-aspect categories involved in the hypotheses. The test exploited a contrastive variation study between tense-aspect forms in French source texts and the ones in Mandarin translations so as to uncover the relations between Mandarin tense-aspect forms and general tense-aspect categories. The test made two assumptions: (i) the translated Mandarin data can represent Mandarin; (ii) French tense-aspect forms approximately represent general tense-aspect categories. Some findings of the test were in line with Hypotheses 4 and 6, but unexpected findings also arose, leaving the validity of other hypotheses not determined.

To properly interpret the unexpected findings, we first reflected on the testing design, particularly the assumptions. Reexamining assumption (i) reminded us of the caveat of translation effects that may lead to a heavily distorted view of the target language (McEnery & Xiao 1999). This led to the question of *whether* parallel corpora fit in the toolbox of linguists interested in studying cross-linguistic variation. Therefore, we discussed three traditions which use parallel corpora for cross-linguistic variation studies, i.e., the contrastive tradition (Section 3.3), typological tradition (Section 3.4), and *Translation Mining* tradition (Section 3.5), and we reached the conclusion that the influence of translation in parallel corpora can effectively be controlled for, and we consequently answered the *whether* question affirmatively.

Since we have justified using translated texts for cross-linguistic variation studies, in Section 3.6, we turned to the question of *how* parallel corpus research should be implemented so as to find out the most appropriate tradition for our testing of hypotheses. We argued that the typological and the *Translation Mining* traditions suited typological and comparative research, respectively. For the contrastive research that our preliminary test was concerned with, we pointed out that further research is necessary to decide under which conditions the contrastive or the *Translation Mining* traditions are to be preferred. To accommodate easy comparisons between the two traditions, we introduced NPMI as a general bi-directional measure that can be applied to parallel corpora in both traditions. We further identified a core issue for future research, *viz.* the role of (relative) corpus size in the reliability of the outcomes of the comparison between source and translated texts in the contrastive tradition. Finally, we circled back to the preliminary test and argued that Mandarin aspectual marking fluctuates considerably independently of translation, which supported assumption (i), and suggested that the replication-based design of the *Translation Mining* tradition is therefore the more appropriate methodological way forward in the analysis of our small-size Camus corpus.

While Section 3.6 supported assumption (i), we reexamined assumption (ii) in Section 3.7 and found that it was not well grounded. Hence, we could not conclude the hypotheses whose predictions were not in line with our data

were invalid just based on the unexpected findings. The problem of assumption (ii) raised the issue that French, as well as any other European language in the Camus corpus, does not have a full inventory of the typical instances of general tense-aspect categories. Since good representations of general tense-aspect categories are crucial to operationalizing our hypotheses, we proposed to aggregate multiple European languages in the corpus to obtain European tense-aspect tuples as better representations than tense-aspect forms in a specific language. The aggregation, however, cannot be achieved by following the standard *Translation Mining* methodology, so we develop a variation of it, dubbed *Aggregated Translation Mining*. Chapter 4 will introduce this variation and apply it to a sophisticated test of Hypotheses 1–7.

Chapter 4

*Aggregated Translation Mining: the association between Mandarin tense-aspect forms and European tense-aspect tuples*¹

4.1 Introduction

In Chapter 3, I conducted a preliminary test of Hypotheses 1–7 in the Camus corpus through a contrastive study between Mandarin and French tense-aspect forms. The rationale was to find out how Mandarin tense-aspect forms are related to the French ones, which I used to represent general tense-aspect categories characterizing Mandarin tense-aspect forms in the hypotheses. The test gave rise to unexpected findings, leading me to realize that French tense-aspect forms are not good representations of general tense-aspect categories. This motivated me to improve the test design by using the *Aggregated Translation Mining* methodology. *Aggregated Translation Mining* is a variation of the standard *Translation Mining* which, as argued in Chapter 3, suits the contrastive studies conducted in the small-size Camus

¹ The investigation in this chapter is a joint work with Bert Le Bruyn.

corpus best. The standard *Translation Mining* operates on individual languages, but *Aggregated Translation Mining* compiles multiple languages such that I can use it to obtain European tense-aspect tuples that will be argued in this chapter as good representations of general tense-aspect categories. Using this methodology, I will conduct a sophisticated test of Hypotheses 1–7 through an association study between Mandarin tense-aspect forms and European tense-aspect tuples.

This chapter is organized as follows. Section 4.2 introduces *Aggregated Translation Mining*. To make the methodology crystal-clear, I first introduce the Camus dataset used in this chapter. Next, I elaborate on the annotated European data which are aggregated and thus give rise to European tense-aspect tuples in a data-driven way. The tuples are argued to represent general tense-aspect categories well such that they are applied to operationalize Hypotheses 1–7. The operationalization derives Predictions 1–7 for the Camus dataset. Moving to the Mandarin data, Section 4.3 elaborates on the Mandarin annotation work and summarizes annotation results. Section 4.4 presents the statistics of the whole dataset, including the absolute frequencies of Mandarin tense-aspect forms occurring in contexts instantiating the European tense-aspect tuples and the NPMI scores measuring the association between Mandarin tense-aspect forms and the tuples. On top of that, Section 4.5 interprets the NPMI scores and absolute frequencies so as to examine Predictions 1–7. Finally, Section 4.6 concludes the whole chapter and puts forward issues to be explored in following chapters.

4.2 *Aggregated Translation Mining*

This section begins with introducing the overall Camus dataset used in this chapter for testing hypotheses (Section 4.2.1). I then zoom into the annotated European data and explain how the *Aggregated Translation Mining* methodology compiles multiple European languages to obtain European tense-aspect tuples in a data-driven way (Section 4.2.2). Finally, I apply the tense-aspect tuples to operationalize Hypotheses 1–7, which gives rise to predictions needing to be examined against the Camus dataset (Section 4.2.3).

4.2.1 Introduction to the Camus dataset used for the association study

Section 3.2 has mentioned that the Camus corpus data come from the first three chapters of the French novel *L'Étranger* and its translations in six European languages (English, German, Dutch, Spanish, Italian, and Greek) and Mandarin. To test my hypotheses by implementing *Aggregated Translation Mining*, I choose to aggregate four European languages: two Germanic languages, English and German, and two Romance languages, French and Spanish. The four languages are chosen for two reasons. First, they form a balanced representation of Western European languages. Second, the tense-aspect forms in these languages cover the typical instances of the general tense-aspect categories (recall Section 2.3.2) that are involved in Hypotheses 1–7. The data from the four European languages plus Mandarin, which I call the Camus dataset, will be used to test the hypotheses in this chapter.

Furthermore, Section 3.2 has noted that the Camus corpus data were annotated in a form-based way, according to the explicit tense-aspect forms used in the European/Mandarin data. The annotation labels are adapted from conventional terms in traditional language-specific grammars. The annotation is oriented to verbs, as verbs are morphological carriers of tense-aspect forms in the languages under investigation. The tense-aspect forms used in the European data were annotated by the Utrecht-based *Time in Translation* group in a semi-automatic way, combining computational and manual approach (van der Klis *et al.* 2017, 2021a). The Mandarin data were annotated manually by me and double checked by another Mandarin native speaker in the group.²

The French source data and their translations are aligned at the level of the clause which uses an annotated tense-aspect form (a single clause using a finite verb is a sentence). The aligned clauses are translation equivalents, forming a datapoint (hereafter called a context) in the dataset. The verb-oriented data alignment was accomplished by an automatic computer algorithm and re-examined by me. Source clauses which were split or combined in the translations were left out so as to ensure every clause in a

² I express my gratitude to Ms. Jianan Liu for helping me re-examine the annotation.

context having a single annotated tense-aspect form. The Camus dataset altogether includes 509 contexts,³ each consisting of a French source clause and its translations in English, German, Spanish, and Mandarin. Here is an example:

- (1) ID 26151
- | | |
|--|---|
| a. J' <u>ai fait</u> la lettre. | [French: <i>passé composé</i>] |
| b. I <u>wrote</u> the letter. | [English: <i>simple past</i>] |
| c. Ich <u>habe</u> den Brief <u>aufgesetzt</u> . | [German: <i>Perfekt</i>] |
| d. <u>Hice</u> la carta. | [Spanish: <i>pretérito indefinido</i>] |
| e. Wo <u>xie-hao</u> xin. | [Mandarin: <i>RVC</i>] |
- I write-finished letter
'I wrote the letter.'

The context above includes the French source clause (1a) and its translations in English (1b), German (1c), Spanish (1d), and Mandarin (1e). (1a) is annotated by *passé composé* because the French verb *ai fait* is marked by the tense-aspect form *passé composé*. The verb is translated into the English verb *wrote* (marked by simple past), the German verbal construction *habe aufgesetzt* (marked by *Perfekt*), the Spanish verb *hice* (marked by *pretérito indefinido*), and the Mandarin resultative verb compound *xie-hao* 'write-finished' in which the verb *xie* 'write' is marked by a resultative verb complement (RVC) *hao* 'finished'. The annotations are indicated in the square brackets following the data.

Below I will elaborate on the European data and explain how to obtain European tense-aspect tuples through *Aggregated Translation Mining*.

4.2.2 European tense-aspect tuples as representations of general tense-aspect categories

Table 1 presents the absolute frequencies of annotated European tense-aspect

³ Since the research of the *Time in Translation* group focuses on the semantics of Perfect, the source texts of the Camus corpus only include the first chapter of *L'Étranger* and the French clauses marked by *passé composé* (the French Perfect form) in the second and the third chapters.

forms in the Camus dataset. The numbers of tense-aspect forms used in the data from French (N=11), English (N=12), and Spanish (N=11) are close to each other, but much lower in German (N=6).

Tense-aspect form	#	Tense-aspect form	#
<i>passé composé</i>	310	<i>simple past</i>	388
<i>imparfait</i>	128	<i>simple present</i>	36
<i>présent</i>	37	<i>past continuous</i>	25
<i>plus-que-parfait</i>	20	<i>past perfect</i>	19
<i>conditionnel présent</i>	4	<i>present perfect</i>	13
<i>futur simple</i>	3	<i>present participle</i>	12
<i>futur proche</i>	2	<i>future in the past</i>	6
<i>passé simple</i>	2	<i>simple future</i>	6
<i>conditionnel passé</i>	1	<i>future continuous</i>	1
<i>futur antérieur</i>	1	<i>future in the past continuous</i>	1
<i>futur proche du passé</i>	1	<i>future perfect</i>	1
		<i>past perfect continuous</i>	1
(a) French		(b) English	
Tense-aspect form	#	Tense-aspect form	#
<i>Perfekt</i>	295	<i>pretérito indefinido</i>	304
<i>Präteritum</i>	158	<i>pretérito imperfecto</i>	127
<i>Präsens</i>	36	<i>presente</i>	35
<i>Plusquamperfekt</i>	14	<i>pretérito perfecto compuesto</i>	18
<i>Futur I</i>	5	<i>pretérito pluscuamperfecto</i>	16
<i>Futur II</i>	1	<i>futuro próximo</i>	3
(c) German		<i>futuro imperfecto</i>	2
		<i>futuro perfecto</i>	1
		<i>futuro próximo en imperfecto</i>	1
		<i>infinitivo</i>	1
		<i>infinitivo perfecto</i>	1
		(d) Spanish	

Table 1: The overview of tense-aspect form uses in European languages in the Camus dataset

The most frequent tense-aspect forms used in every language, as Table 1 indicates, are *passé composé* (French), simple past (English), *Perfekt* (German) and *pretérito indefinido* (Spanish). Each accounts for more than 50% of the data per language. The high frequency of *passé composé* is understandable because, as Section 3.2 has mentioned, *L'Étranger* is written in spoken French such that the author systematically uses *passé composé* to replace *passé simple* in the source texts (the latter is used in written French but is replaced by the former in spoken French, recall Section 2.3.2). The German translation accordingly uses *Perfekt* to replace *Präteritum* (the former replaces the latter in spoken German, see also Section 2.3.2).

Aggregating the European data together and observing them closely, I notice that the four most frequent tense-aspect forms often co-occur in contexts. For example, the French *passé composé* (2a) is translated into simple past in English (2b), *Perfekt* in German (2c), and *pretérito indefinido* in Spanish (2d). (2a)–(2d) all describe a completed thanking event in the past. The four forms occur as one another's counterpart. Any two of them form a counterpart pair (CP, recall Section 3.6.1).

(2) ID 24822

- | | |
|---|---|
| a. Je l' ai <u>remercié</u> . | [French: <i>passé composé</i>] |
| b. I <u>thanked</u> him. | [English: <i>simple past</i>] |
| c. Ich <u>habe</u> ihm <u>gedankt</u> . | [German: <i>Perfekt</i>] |
| d. Le <u>di</u> las gracias. | [Spanish: <i>pretérito indefinido</i>] |

The frequent co-occurrence of the four forms emerges as a fixed combination of tense-aspect forms, i.e., \langle *passé composé*, *simple past*, *Perfekt*, *pretérito indefinido* \rangle . I name a combination of European tense-aspect forms co-occurring in a context as a European *tense-aspect tuple* (*tuple* for short, c.f., verb tuple in Section 3.4.1.1). Crucially, the fact that the four forms consisting of the tuple \langle *passé composé*, *simple past*, *Perfekt*, *pretérito indefinido* \rangle are used in translation equivalents indicates there is a cross-linguistic semantic stability across the forms, i.e., their semantics has an intersection. Their uses, previously visualized in Figure 5 in Section 3.5.1, can be described as follows. In (spoken) French, *passé composé* conveys Perfective meaning in the past domain and Perfect meaning in the present

domain. So does German *Perfekt*. English simple past conveys past non-Progressive meaning (including Perfective meaning in the past domain). Spanish *pretérito indefinido* is a typical instance of (past) Perfective aspect. Since the semantic intersection of the four forms is Perfective meaning in the past, I label the tuple as Past Perfective (i.e., Past Perfective:= <*passé composé, simple past, Perfekt, pretérito indefinido*>) and argue it can represent the general category of Perfective (recall Section 2.3.2).

Following the Past Perfective tuple, the second most frequent tuple is <*imparfait, simple past, Präteritum, pretérito imperfecto*>. It consists of the second most frequent tense-aspect forms in French, German and Spanish, and the most frequent English tense-aspect form. For instance:

(3) ID 31981

- | | |
|-------------------------------------|---|
| a. Il lui <u>fallait</u> une garde. | [French: <i>imparfait</i>] |
| b. She <u>needed</u> a nurse. | [English: <i>simple past</i>] |
| c. Sie <u>brauchte</u> Pflege. | [German: <i>Präteritum</i>] |
| d. <u>Necesitaba</u> una enfermera. | [Spanish: <i>pretérito imperfecto</i>] |

(3a)–(3d) are translation equivalents describing a state of needing in the past. The French *imparfait* and the Spanish *pretérito imperfecto* are typical instances of (past) Imperfective aspect. *Präteritum* is used in written German to convey past meaning, irrespective of aspect (recall Section 2.3.2). English simple past, as aforementioned, conveys past non-Progressive meaning (including the stative and habitual meanings of Imperfective aspect). The semantic intersection of tense-aspect forms in the tuple <*imparfait, simple past, Präteritum, pretérito imperfecto*> is the union of the stative and habitual meanings of Imperfective aspect in the past. Therefore, I label the tuple <*imparfait, simple past, Präteritum, pretérito imperfecto*> as Past Imperfective and argue it can represent the general category of Imperfective (deprived of the Progressive meaning).

The third most frequent tuple is <*présent, simple present, Präsens, presente*>, consisting of the third most frequent tense-aspect forms in French, German, and Spanish, and the second most frequent one in English. The forms are language-specific tenses of simple present, which make sentences have a stative interpretation (recall Section 2.3.2). See (4a)–(4d), all

describing the state that the old people's home currently exists at Marengo.

(4) ID 31952

- a. L' asile de vieillards est à Marengo, [...] [French: *présent*]
- b. The old people's home is at Marengo, [...] [English: *simple present*]
- c. Das Altersheim ist in Marengo, [...] [German: *Präsens*]
- d. El asilo de ancianos está en Marengo, [...] [Spanish: *presente*]

The use of the English simple present is narrower than the others. *Présent* (French), *Präsens* (German), and *presente* (Spanish) can convey Progressive meaning in the present domain (i.e., to indicate the ongoing state of processes or events at present), but this meaning is conveyed in English by the tense-aspect form of present continuous rather than simple present. Hence, the semantic intersection of the forms in $\langle \textit{présent}, \textit{simple present}, \textit{Präsens}, \textit{presente} \rangle$ does not encode a present progressive meaning. I thus label the tuple as Present and argue it can represent the general category Present.

The fourth most frequent tuple is $\langle \textit{imparfait}, \textit{past continuous}, \textit{Präteritum}, \textit{pretérito imperfecto} \rangle$, see (5a)–(5d).

(5) ID 32160

- a. Le jour glissait sur la verrière. [French: *imparfait*]
- b. The dawn was creeping up over the glass roof. [English: *past continuous*]
- c. Über dem Glasdach wurde es hell. [German: *Präteritum*]
- d. Resbalaba el día en la cristalera. [Spanish: *pretérito imperfecto*]

(5a)–(5d) all describe an ongoing state of creeping in the past. The constitution of the tuple is similar to that of the Past Imperfective tuple, with only one difference, which lies in how the English tense-aspect form is involved. The English past continuous, conveying Progressive aspect in the past (5b), is complementary to the English simple past (involved in the Past Imperfective tuple), which conveys a non-Progressive meaning. Therefore, I label $\langle \textit{imparfait}, \textit{past continuous}, \textit{Präteritum}, \textit{pretérito imperfecto} \rangle$ as Past Progressive and argue it can represent the general category of Progressive.

The Camus dataset also includes other frequent tuples besides the ones mentioned above. What is particularly relevant to my hypothesis testing (relevant to post-verbal *le* and *guo*) is the one consisting of Perfect forms, namely *<passé composé, present perfect, Perfekt, pretérito perfecto compuesto>*. See (6a)–(6d), each describing the current relevance of a state resulting from a past punishing event.

(6) ID 26079

- a. Et pour moi, je l'ai pas assez punie. [French: *passé composé*]
- b. And I don't think I've punished her enough. [English: *present perfect*]
- c. Und für mein Gefühl habe ich sie nicht genug bestraft.
[German: *Perfekt*]
- d. Para mí, no la he castigado bastante.
[Spanish: *pretérito perfecto compuesto*]

Although the semantics of the Perfect forms in the tuple varies a lot (see also Figure 5 and the Perfect use hierarchy (7) in Section 3.5.1), their intersection is captured by the tuple, i.e., a past event resulting in a state that has current relevance (the canonical Perfect use introduced in Section 2.3.2). I thus label the tuple as Present Perfect (c.f., past Perfect or Pluperfect, the morphological mirror image of Perfect in the past domain, see Comrie (1976: 53)), and argue it can represent the category of Perfect.

Table 2 summarizes the five tense-aspect tuples and their absolute frequencies as well as the general tense-aspect categories they represent. It crosses the data in Table 1 and merges the tense-aspect forms used in the 4 European translation equivalents per context into a single tuple. All the general tense-aspect categories involved in Hypotheses 1–7 can find their representations in Table 2, with each representation including at least one tense-aspect form typically instantiating the represented category (recall Section 2.3.2). Therefore, using the tuples as representations of general tense-aspect categories can circumvent the problem of assumption (ii) in my preliminary test (recall Section 3.7).

European tense-aspect tuple (consisting of tense-aspect forms in French, English, German, and Spanish)	General tense-aspect category represented	#
Past Perfective:= < <i>passé composé, simple past, Perfekt, pretérito indefinido</i> >	Perfective	267
Past Imperfective:= < <i>imparfait, simple past, Präteritum, pretérito imperfecto</i> >	Imperfective	88
Present:= < <i>présent, simple present, Präsens, presente</i> >	Present	28
Past Progressive:= < <i>imparfait, past continuous, Präteritum, pretérito imperfecto</i> >	Progressive	24
Present Perfect:= < <i>passé composé, present perfect, Perfekt, pretérito perfecto compuesto</i> >	Perfect	8

Table 2: Five European tense-aspect tuples in the Camus dataset: frequencies

To sum up, aggregating the European data led to the finding of the five European tense-aspect tuples, which naturally emerged from the annotated dataset. Their emergence indicates that there is cross-linguistic semantic stability underlying the specific tense-aspect forms constituting every tuple, i.e., the forms have semantic intersections. Having zoomed into each tuple, I find the semantic intersections of the tense-aspect forms constituting the tuples can be labeled by tense and/or aspect categories. Driven by balanced data from Western European languages, the tuples average the semantic variation among specific tense-aspect forms and, moreover, cover all the typical instances of the general tense-aspect categories involved in Hypotheses 1–7. Hence, I have argued that the tuples are good (i.e., data-driven and exhaustive) representations of the general categories used in my hypotheses.

Next, I will operationalize Hypotheses 1–7 by exploiting the tuples and accordingly formulate predictions for the Camus dataset.

4.2.3 Operationalization of hypotheses and formulation of predictions

The preliminary test in Section 3.2 operationalized Hypotheses 1–7 by using French tense-aspect forms to represent general tense-aspect categories.

However, the findings of the test exposed the fact that the French forms are not good representations (recall Section 3.7). Given that, I propose to replace them by European tense-aspect tuples which have been argued to be good representations of the general categories (see Section 4.2.2). This subsection will do the operationalization again by using the tuples.

Just as the preliminary test spelled out the relations between French tense-aspect forms and the aspectual interpretations they contribute to sentences, (7)–(9) spell out the relations between tense-aspect tuples and the aspectual interpretations of European clauses appearing in the contexts instantiating the tuples, in order to predict how Mandarin sentences without grammatical tense-aspect markers (concerning Hypotheses 1, 7a–7d) are related to the contexts instantiating the tuples.

- (7) European clauses in contexts instantiating the Past Perfective tuple (representing the Perfective category), have an eventive interpretation.
- (8) European clauses in contexts instantiating the Past Imperfective tuple (representing the Imperfective category), the Past Progressive tuple (representing the Progressive category), or the Present tuple (representing the present category), have a stative interpretation.
- (9) European clauses in contexts instantiating the Present Perfect tuple (representing the Perfect category), denote result states caused by past events, having a stative interpretation.

Below I will operationalize Hypotheses 1–7 into predictions.

Hypothesis 1: A resultative verb compound (V+RVC) denotes a culminated event plus result state (along the lines of Li & Thompson 1981).

For the contexts in the Camus dataset, Hypothesis 1 predicts that Mandarin clauses marked by RVCs can co-occur with European clauses denoting events with inherent results (e.g., arriving events) or states resulting from events. According to (7) and (9), European clauses in contexts instantiating the Past Perfective or the Present Perfect tuple denote events or result states, so this prediction can be formulated as:

Prediction 1: Resultative verb compounds (V+RVC) typically occur in contexts instantiating the Past Perfective or the Present Perfect tuple.

To make the prediction concrete, let me illustrate it with an example. (10) is a case where the resultative verb compound *xie-hao* ‘write-finished’ occurs in a context instantiating the Past Perfective tuple. The RVC *hao* ‘finished’ co-occurs with the Past Perfective tuple in the context.

(10) ID 26151

- | | |
|--|---|
| a. J’ <u>ai fait</u> la lettre. | [French: <i>passé composé</i>] |
| b. I <u>wrote</u> the letter. | [English: <i>simple past</i>] |
| c. Ich <u>habe</u> den Brief <u>aufgesetzt</u> . | [German: <i>Perfekt</i>] |
| d. <u>Hice</u> la carta. | [Spanish: <i>pretérito indefinido</i>] |
| e. Wo <u>xie-hao</u> xin.
I write-finished letter
‘I wrote the letter.’ | [Mandarin: <i>RVC</i>] |

The controversial marker post-verbal *le* has two competing hypotheses:

Hypothesis 2a: Post-verbal *le* is a Perfective marker (along the lines of Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014).

Hypothesis 2b: Post-verbal *le* is a resultative Perfect marker (along the lines of Lin 2006).

Since the general Perfective and Perfect categories are represented by the Past Perfective and the Present Perfect tuples, respectively, I make the following predictions based on Hypotheses 2a, 2b:

Prediction 2a: Post-verbal *le* typically occurs in contexts instantiating the Past Perfective tuple.

Prediction 2b: Post-verbal *le* typically occurs in contexts instantiating the Present Perfect tuple.

The two hypotheses on *guo* are similar to those made on post-verbal *le*, defining *guo* as a Perfective or a Perfect marker:

Hypothesis 3a: *Guo* is a Perfective marker (along the lines of Smith 1997; Lin 2006).

Hypothesis 3b: *Guo* is an experiential Perfect marker (along the lines of Xiao & McEnery 2004).

The corresponding predictions are:

Prediction 3a: *Guo* typically occurs in contexts instantiating the Past Perfective tuple.

Prediction 3b: *Guo* typically occurs in contexts instantiating the Present Perfect tuple.

The hypotheses on *zai* and *zhe* define them as a Progressive marker and an Imperfective marker, respectively:

Hypothesis 4: *Zai* is a Progressive marker requiring a process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006; Sun 2014).

Hypothesis 5: *Zhe* is an Imperfective marker requiring a state or process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006).

Since the Past Progressive tuple represents the Progressive category, I formulate Prediction 4 as:

Prediction 4: *Zai* typically occurs in contexts instantiating the Past Progressive tuple.

As mentioned in Section 4.2.2, the Past Imperfective tuple only captures the subset of Imperfective deprived of the Progressive subdivision. Therefore,

Prediction 5 adds the complementary Past Progressive tuple in addition to the Past Imperfective tuple.

Prediction 5: *Zhe* typically occurs in contexts instantiating the Past Imperfective or the Past Progressive tuple.

Hypothesis 6 defines verbal reduplication as a Perfective marker, which motivates Prediction 6 that uses the Past Perfective tuple to represent the Perfective category.

Hypothesis 6: Verbal reduplication is a Perfective marker (along the lines of Smith 1997; Dai 1997; Xiao & McEnery 2004).

Prediction 6: Verbal reduplication typically occurs in contexts instantiating the Past Perfective tuple.

Aspectually unmarked sentences have four competing hypotheses. The first one states that the aspectual class of eventuality description determines the aspectual interpretation of unmarked sentences:

Hypothesis 7a: Mandarin aspectually unmarked sentences are aspectually transparent (i.e., they have an eventive interpretation if the underlying eventuality description is quantized and have a stative interpretation if the eventuality description is homogeneous, along the lines of de Swart 1998).

I have reported that my Mandarin data contain quantized and homogeneous eventuality descriptions (see Section 3.2). Therefore, Hypothesis 7a predicts aspectually unmarked sentences in the Camus dataset to have an eventive or a stative interpretation. Applying (7)–(8), I formulate Prediction 7a. (9) does not apply to the hypothesis because the state denoted by Present Perfect results from an event.

Prediction 7a: Mandarin aspectually unmarked sentences typically occur in contexts instantiating the Past Perfective, the Past Imperfective, the Present, or the Past Progressive tuples.

The second hypothesis on unmarked sentences, as introduced in Section 2.6, argues that unmarked sentences have neutral aspect which has a vague interpretation and thus is defined in a negative way:

Hypothesis 7b: Mandarin aspectually unmarked sentences have neutral aspect (i.e., neither Perfective nor Imperfective, along the lines of Smith 1997).

This gives rise to a prediction also formulated in a negative way. To negate the entire Imperfective category, it includes both the Past Progressive and the Past Imperfective tuples:

Prediction 7b: Mandarin aspectually unmarked sentences do not occur in contexts instantiating the Past Perfective, the Past Imperfective or the Past Progressive tuple.

The third hypothesis relates the interpretations of unmarked sentences to the discourse context and to the aspectual class of underlying eventuality description (this is similar to the first hypothesis):

Hypothesis 7c: Mandarin aspectually unmarked sentences using non-dynamic eventuality descriptions have a stative interpretation whereas those using dynamic eventuality descriptions are underspecified for aspect (they receive a Perfective or an Imperfective interpretation depending on the discourse context, along the lines of Xiao & McEnery 2004).

Since my Mandarin data use both dynamic and non-dynamic eventuality descriptions (see Section 3.2), I apply (7) and (8) to Hypothesis 7c and

obtain Prediction 7c, whose contents are the same as Prediction 7a. (9) does not apply to Hypothesis 7c because the Present Perfect denotes a state resulting from an event, which is dynamic.

Prediction 7c: Mandarin aspectually unmarked sentences typically occur in contexts instantiating the Past Perfective, the Past Imperfective, the Past Progressive, or the Present tuple.

Finally, the fourth hypothesis claims unmarked sentences denote lexical states or generics (but not result states):

Hypothesis 7d: Mandarin aspectually unmarked sentences have a stative interpretation (denoting lexical states or generics, along the lines of Sun 2014).

Applying (8) to the hypothesis, I formulate the following prediction:

Prediction 7d: Mandarin aspectually unmarked sentences typically occur in contexts instantiating the Past Imperfective, the Past Progressive, or the Present tuple.

To quantitatively test Predictions 1–7 in the Camus dataset, I need to obtain the descriptive statistics (absolute frequency) of Mandarin tense-aspect forms that occur in contexts instantiating the aforementioned tense-aspect tuples. Since the annotation of Mandarin data is not trivial and it has a direct impact on the statistics, Section 4.3 will elaborate on the Mandarin annotation work and present the descriptive statistics of the Mandarin data.

4.3 Mandarin annotation

This section first explains the annotation rules (Section 4.3.1) and then discusses difficult annotation cases and my solutions to them (Section 4.3.2). Finally, I present the descriptive statistics of the annotated Mandarin data (Section 4.3.3).

4.3.1 Annotation rules

I used 9 labels to annotate the Mandarin data: *le1*, *le12*, *guo*, *zhe*, *zai*, RVC (resultative verb complement), verbal reduplication, unmarked verb form, and non-verb form. The labels are adapted from standard terminologies used in the Mandarin literature (see Chapter 2). Below I will explain and illustrate my annotation rules with corpus data:

(i) *le1*: the Mandarin clause is annotated by *le1* when the French verb bearing a tense-aspect form is translated into a Mandarin verb marked by the grammaticalized morpheme *le* which appears at the post-verbal position, i.e., linearly following the Mandarin verb. For example:

(11) ID 26103

- a. J' ai encore bu un peu de vin. [French: *passé composé*]
b. Wo you he-le dian jiu. [Mandarin : *le1*]
I again drink-LE a bit wine
'I drank a bit more wine.'

The French verb *ai bu* (infinitive: *boire* 'drink') in (11a) is translated by *he-le* in which the verb *he* 'drink' is followed by the morpheme *le*. Hence, (11b) was annotated by the label *le1*.

(ii) *le12*: the Mandarin clause is annotated by *le12* when the grammaticalized morpheme *le* appears at the sentence-final position. For example:

(12) ID 25663

- a. La journée a tourné encore un peu. [French: *passé composé*]
b. Tian you dian an le. [Mandarin : *le12*]
sky have a bit dark LE
'The day advanced a bit more.'

The French verb *a tourné* (infinitive: *tourner* 'turn') in (12a) is paraphrased into the verb *you* 'have' in (12b). According to (ii), (12b) was annotated by *le12* because it contains a sentence-final *le*. As explained in Section 3.2, an

empirical reason for using the label *le12* is to cover borderline cases where the sentence-final and the post-verbal positions coincide, for example:

(13) ID 24642

- a. Aujourd' hui, maman est morte. [French: *passé composé*]
 b. Jintian, mama si le. [Mandarin: *le12*]
 today mother die LE.
 'Mother died today.'

The French verb *est morte* (infinitive: *mourir* 'die') in (13a) is translated into the verb *si* 'die' in (13b). The morpheme *le* marks *si* 'die' in (13b) and appears at the end of the sentence, satisfying the definitions of post-verbal *le* and sentence-final *le*. Hence using *le12* to label (13b) can indicate it is a borderline case. Whether the two *les* could be theoretically unified is still controversial (recall Section 2.5.1). Although the *mei(you)* 'not(have)' test⁴ can syntactically distinguish the two, I stuck to the form-based annotation principle of *Aggregated Translation Mining* and abandoned using the test. Since occurrences of *le12* do not have a uniform identity, I leave *le12* an open issue (as announced in Section 3.2).

(iii) *Guo*: the Mandarin clause is annotated by *guo* when a grammaticalized morpheme *guo* follows the Mandarin verb which translates the French verb bearing a tense-aspect form, for example:

(14) ID 24774

- a. J' ai lu le dossier de votre mère. [French: *passé composé*]
 b. Wo kan-guo nin muqin de dang'an. [Mandarin: *guo*]
 I read-GUO your mother DE file
 'I've read your mother's file.'

The French verb *ai lu* (infinitive: *lire* 'read') in (14a) is translated into the Mandarin verb *kan* 'read', which is followed by *guo*. Hence, (14b) was annotated by *guo*.

⁴ Comrie (1976: 82) and Xiao & McEnery (2004: 91–92) note that sentence-final *le* rather than post-verbal *le* is licensed in sentences negated by *mei(you)* 'not(have)'.

(iv) *Zhe*: the Mandarin clause is annotated by *zhe* when the grammaticalized morpheme *zhe* follows the Mandarin verb which translates the French verb bearing a tense-aspect form, for example:

(15) ID 32236

- a. Je regardais la campagne autour de moi. [French: *imparfait*]
b. Wo wang-zhe zhouwei de tianye. [Mandarin: *zhe*]
I look-ZHE surrounding DE field.
'I was looking at the countryside around me.'

The French verb *regardais* (infinitive: *regarder* 'look') in (15a) is translated into the Mandarin verb *wang* 'look' that is followed by *zhe*. (15b) thus was annotated by *zhe*.

(v) *Zai*: the Mandarin clause is annotated by *zai* when the French verb bearing a tense-aspect form is translated into a Mandarin verb linearly preceded by the grammaticalized morpheme *zai*, for example:

(16) ID 32130

- a. La femme pleurait toujours. [French: *imparfait*]
b. Na-ge nüren yizhi zai-ku. [Mandarin: *zai*]
that-CL woman continuously ZAI-cry
'That woman was continuously crying.'⁵

The French verb *pleurait* (infinitive: *pleurer* 'cry') in (16a) is translated into the Mandarin verb *ku* 'cry' preceded by the morpheme *zai*. Therefore, (16b) was annotated by *zai*. *Zai* is different from other Mandarin grammatical tense-aspect markers in that it takes a pre-verbal position.

(vi) Resultative verb complement (RVC): the Mandarin clause is annotated by an RVC when a verb compound consisting of "a bare verb + a resultative verb complement" is used to translate the French verb bearing a tense-aspect form (the criterion to distinguish verb compounds using RVCs from aspectually unmarked verb compounds will be illustrated later in

⁵ I produced the English translation to accurately convey the Mandarin translation, see my explanation for example (34) in Section 4.5.2.

Section 4.3.2.1). For example:

(17) ID 24646

- a. J' ai reçu un télégramme de l' asile: Mère décédée.[...]
 [French: *passé composé*]
- b. Wo shou-dao yanglaoyuan de yi-feng dianbao, [Mandarin: *RVC*]
 I receive-arrive nursing home DE one-CL telegram
 shuo: "Mu si. [...]"
 say mother die
 'I had a telegram from the home: "Mother passed away. [...]".'

The French verb *ai reçu* (infinitive: *recevoir* 'receive') in (17a) is translated into the verb compound *shou-dao* 'receive-arrive' which consists of a bare verb *shou* 'receive' and a verbal morpheme *dao* 'arrive'. *Dao* 'arrive' can be used as an independent verb, but it conveys aspectual information when used as a resultative verb complement. According to (vi), (17b) was annotated as RVC.

(vii) Verbal reduplication: the Mandarin clause is annotated by verbal reduplication when a reduplicated form of a bare verb is used to translate the French verb bearing a tense-aspect form. For example:

(18) ID 25042

- a. Le concierge s' est penché vers elle, lui a parlé,
 mais elle a secoué la tête [...] [French: *passé composé*]
- b. Menfang chao ta wan-xia shen, shuo-le ju hua,
 caretaker towards her bend-descend body say-LE CL remark
 ke ta yao-yao tou [...] [Mandarin: *verbal reduplication*]
 but she RED=shake head
 'The caretaker leant over and spoke to her, but she shook her head [...]'

The translation of the French verb *a secoué* (infinitive: *secouer* 'shake') in (18a) is *yao-yao* 'shake-shake' (18b), a reduplication of the bare verb *yao* 'shake'. (18b) was thus annotated by verbal reduplication.

(viii) Unmarked verb form: the Mandarin clause is annotated by an unmarked verb form when the French verb bearing a tense-aspect form is translated into a Mandarin bare verb. For example:

(19) ID 32238

- a. [...] je comprenais maman. [French: *imparfait*]
b. [...] Wo lijie muqin de xinli.
I understand mother DE psychology
'[...] I understood mother.'
[Mandarin: *unmarked verb form*]

Since the French verb *comprenais* (infinitive: *comprendre* 'comprehend') in (19a) is translated into the Mandarin bare verb *lijie* 'understand', (19b) was annotated by 'unmarked verb form'.

(ix) Non-verb form: Some French verbs bearing tense-aspect forms are not translated into Mandarin verbal items but are paraphrased by non-verbal expressions. Mandarin clauses that do not contain any verb are annotated by 'non-verb form'. This commonly happens when the French source clauses use the copula verb *être* 'be', as in (20a), or verbs conveying stative meanings in idiomatic sentence patterns, such as *avoir* 'have' in (21a) and *faire* 'do' in (22a).

(20) ID 32170

- a. Au-dessus des collines qui séparent Marengo de la mer, le ciel était
plein de rougeurs. [French: *imparfait*]
b. Malangge he dahai zhijian de shanling shangkong,
Marengo and big-sea between DE hill above
yi-pian hong guang. [Mandarin: *non-verb form*]
one-CL red light
'Above the hills which separate Marengo from the sea, the sky was
full of red streaks.'

The Mandarin translation (20b) does not involve any verbs equivalent to the French copula verb *était* (infinitive: *être* 'be') in (20a) but only contains a

DP *yi-pian hongguang* ‘a stretch of red light’. Therefore, (20b) was annotated by ‘non-verb form’.

(21) ID 32075

- | | |
|--------------------------------------|-----------------------------------|
| a. Mais je n' <u>avais</u> pas faim. | [French: <i>imparfait</i>] |
| b. Danshi wo <u>bu</u> e. | [Mandarin: <i>non-verb form</i>] |
| but I not hungry | |
| ‘But I wasn’t hungry.’ | |

The French verb *avais* (infinitive: *avoir* ‘have’) does not have a verbal equivalent in the Mandarin translation (21b). The stative meaning of *avais* is paraphrased by (21b) which was annotated by ‘non-verb form’.

(22) ID 31966

- | | |
|----------------------------------|-----------------------------------|
| a. Il <u>faisait</u> très chaud. | [French: <i>imparfait</i>] |
| b. Tianqi <u>hen</u> re. | [Mandarin: <i>non-verb form</i>] |
| weather very hot | |
| ‘It was very hot.’ | |

The verb *faisait* (infinitive: *faire* ‘do’) in (22a) has no lexical equivalent in (22b). The stative meaning of (22a) is paraphrased by (22b) which consists of a noun *tianqi* ‘weather’, an adverb *hen* ‘very’ modifying the degree of hotness, and an adjective *re* ‘hot’. Hence, (22b) was annotated by ‘non-verb form’.

The annotation rules are form-based so that they were straightforwardly applied to most cases. However, below I will discuss difficult cases with syntactic complexity and my annotation decisions on them.

4.3.2 Annotation challenges

The annotation challenges I encountered include (i) distinguishing resultative verb compounds from aspectually unmarked verb compounds, and (ii) stacking of tense-aspect forms. I will discuss them and justify my annotation decisions.

4.3.2.1 Distinguishing resultative verb compounds from aspectually unmarked verb compounds

As introduced in Section 2.4.2, a resultative verb compound consists of a bare verb and a resultative verb complement (RVC) that conveys aspectual information. However, Mandarin also has other bare verb compounds such as *ming-bai* ‘understand-white’ and *gai-liang* ‘change-good’. They are aspectually unmarked and should be distinguished from resultative verb compounds by being labeled as ‘unmarked verb form’ in my dataset. Since the two kinds of verb compounds cannot be morphologically distinguished, I resort to the syntactic test of *-de-* ‘obtain’ / *-bu-* ‘not’ insertion. Although my annotation attempts to be form-based, it is necessary to exploit the test because my research must differentiate aspectually unmarked verbs from marked verbs so as to investigate the compositional mechanism of aspectual marking in Mandarin.

(23) *-De-* ‘obtain’ / *-bu-* ‘not’ insertion test

Resultative verb compounds can receive *potential* forms. According to Li & Thompson (1981: 56–57), inserting the morpheme *-de-* ‘obtain’ between the bare verb and the resultative verb complement gives the compound an affirmative potential meaning ‘achievable’ while inserting the morpheme *-bu-* ‘not’ gives a negative potential meaning.

Specifically, the insertion is a way to express the affirmative/negative modal meaning that the eventuality denoted by the resultative verb compound can be realized in a possible world (*-de-* ‘obtain’ insertion) or not (*-bu-* ‘not’ insertion). I thus judged verb compounds as resultative verb compounds if they can receive the insertion and accordingly give rise to the affirmative or negative potential meaning. For example:

(24) ID 31961

a. Mais il le fera sans doute après-demain, quand il me verra en deuil.

[French: *futur simple*]

- b. Buguo, houtian ta kan-jian wo
 but the day after tomorrow he look-see me
 dai-xiao de-shihou, yiding hui anwei wo de.
 wear-mourning DE-time definitely will console me PRT
 ‘But he probably will do the day after tomorrow, when he sees me
 in mourning.’

[Mandarin: *RVC*]

- c. Ta kan-de-jian wo.
 he look-obtain-see me
 ‘He can see me.’
 d. Ta kan-bu-jian wo.
 he look-not-see me
 ‘He cannot see me.’

The RVC *kan-jian* ‘look-see’ in (24b) is used to translate the French verb *verra* (infinitive: *voir* ‘see’) in (24a). The grammaticality of (24c) and (24d) indicate that *kan-jian* ‘look-see’ can receive the affirmative/negative potential form through *-de-* ‘obtain’/*-bu-* ‘not’ insertion. Therefore, (24b) was annotated by RVC.

On the other hand, a verb compound unable to pass the insertion test was annotated by ‘unmarked verb form’. For example:

(25) ID 32024

- a. [...] il a déclaré sans me regarder: «Je comprends.» [French: *présent*]
 b. Ta [...] ye bu kan wo, shuo-dao: “Wo ming-bai”.
 he too not look me say-arrive I understand-white
 [...] ‘without looking at me, he announced, “I understand.”’

[Mandarin: *unmarked verb form*]

- c. * Wo ming-de-bai.
 I understand-obtain-white
 d. * Wo ming-bu-bai.
 I understand-not-white

The verb compound *ming-bai* ‘understand-white’ in (25b), which translates the French verb *comprends* (infinitive: *comprendre* ‘understand’) in (25a),

does not pass the test because both the *-de-* ‘obtain’ and *-bu-* ‘not’ insertions cause semantic anomalies, as (25c) and (25d) show. Hence, (25b) was annotated by “unmarked verb form”.

4.3.2.2 Stacking of tense-aspect forms

Remember how Chapter 1 introduced the fact that Mandarin allows multiple tense-aspect forms to occur in one sentence. In my dataset, the stacking of tense-aspect forms is attested in three ways: (i) verbal reduplication co-occurs with *le1*; (ii) resultative verb compound co-occurs with *le1* or *le12*; (iii) *le1* co-occurs with *le12*. Although the stacking led to label competition, as I will show below, the competition was carefully treated, allowing me to stick to single labeling.

Verbal reduplication co-occurring with le1

9 cases in my dataset use verbal reduplication with *le1*, for example:

(26) ID 25318

- a. J' ai regardé aussi le directeur. [French : *passé composé*]
- b. Wo ye kan-le kan yuanzhang. [Mandarin: *verbal reduplication*]
I too look-LE look warden
'I also looked at the warden.'

In (26b), *kan-le kan* ‘look-LE look’ is in the form of V-*le* V which is counted as a variation of verbal reduplication (Wang 1963). Since there is no agreement that verbal reduplication should be limited to the simple V-V form (recall Section 2.5.4), I decided to label the 9 cases as “verbal reduplication”. Given that my dataset contains very limited verbal reduplication cases (3 in simple form and 9 variations), I leave the semantics of verbal reduplication open ⁶ and will only briefly discuss it in my overall analysis of the dataset.

⁶ Also, my analysis of post-verbal *le* will not take the V-*le* V cases into consideration given that the interaction between verbal reduplication with post-verbal *le* is beyond my research scope.

RVC co-occurring with *le1/le12*

Resultative verb compounds co-occur with *le1* in 11 cases, such as (27b).

(27) ID 25262

- a. Il avait un feutre mou à la calotte ronde et aux ailes larges
 (il l' a ôté quand la bière a passé la porte), [...]
 [French: *passé composé*]
- b. Ta dai-zhe yi-ding yuanding kuanyan ruan zhanmao,
 he wear-ZHE one-CL round-top wide-brim soft felt hat
 (Guancai jingguo de-shihou, ta zhai-diao-le maozi), [...]
 coffin pass-by DE-time, he take-off-LE hat
 'He was wearing a soft felt hat with a round crown and a wide brim
 (he took it off when the coffin passed by), [...]'⁷
 [Mandarin: *le1*]

The French verb *a ôté* (infinitive: *ôter* 'remove') in (27a) is translated into the resultative verb compound *zhai-diao* 'take-off' that is marked by *le1*. This causes label competition between RVC and *le1*. A similar competition between RVC and *le12* is found in 12 cases, such as (28b). The French verb *sont arrivés* (infinitive: *arriver* 'arrive') in (28a) is translated into the resultative verb compound *kai-guo-lai* 'drive-pass-come' in (28b) where a *le12* appears.

(28) ID 25631

- a. À cinq heures, des tramways sont arrivés dans le bruit.
 [French : *passé composé*]
- b. Wu-dian-zhong, dianche honglonglongde kai-guo-lai le.
 five o'clock tram loudly drive-pass-come LE
 'At five o'clock there was a lot of noise as some trams arrived.'
 [Mandarin: *le12*]

⁷ The Mandarin translation ignores the object *la porte* 'the gate'. The English translation equivalent in the dataset is: *He was wearing a soft felt hat with a round crown and a wide brim (he took it off when the coffin came through the gate).*

I annotated (27b) and (28b) ‘*le1*’ and ‘*le12*’, respectively, for two reasons. First, I wanted to ensure the data labeled by RVC only contained “pure” resultative verb compounds so that later I can observe and analyze the independent contribution of RVCs. Second, *le* is syntactically higher than RVCs. Recall that Chapter 2 introduced the idea that *le* is a grammatical tense-aspect marker associated with AspP while RVCs are related with eventuality descriptions associated with VPs. As previously explained in Section 4.3.1, I leave *le12* open such that I will not investigate the stacking of RVCs and *le12*. However, the stacking of RVCs and *le1* will be analyzed in Chapter 7, where I will distinguish the different roles played by them in the Mandarin aspect system.

Le1 co-occurring with le12

The corpus contains one single case (29b) which contains both *le1* and *le12*:

(29) ID 32189

- a. Il a pris le téléphone en main et il m’a interpellé: «Les employés des pompes funèbres sont là depuis un moment.[...]» [French: *présent*]
- b. Ha na-qi dianhua, wen wo:
he pick-arise telephone ask me
“Binyiguan de ren yi lai-le yihuier le.[...]”
the undertaker’s DE people already come-LE a while LE
‘He picked up the telephone and addressed me: “The undertaker’s men have just arrived.[...]”’

[Mandarin: *le1*]

The French verb *sont* (infinitive: *être* ‘be’) in (29a) is translated into *lai* ‘come’ in (29b) where *le1* co-occurs with *le12*. I annotated (29b) as *le1* for two reasons: first, I am interested in *le1* but not *le12*; second, ignoring this single occurrence of *le12* will not cause any significant influence on my statistical test in this chapter, and I will discuss the case in Chapter 7.

Having thoroughly explained the Mandarin annotation work, below I will present the descriptive statistics of the annotated Mandarin data.

4.3.3 The descriptive statistics of the annotated Mandarin data

Implementing the annotation rules and the solutions to difficult cases, I obtained the absolute frequencies of all the Mandarin tense-aspect forms used in the Camus dataset; see Table 3.

	\emptyset	RVC	<i>Le1</i>	<i>Le12</i>	<i>Zhe</i>	<i>Zai</i>	<i>Guo</i>	RED	NV
Absolute Frequency	265	65	59	46	19	6	5	12	32

Table 3: The annotation overview of Mandarin tense-aspect forms in the Camus dataset (\emptyset : unmarked verb form, RED: verbal reduplication, NV: non-verb form)

The unmarked verb form is most frequently used, followed by resultative verb complements (RVCs). All the grammatical tense-aspect markers introduced in Chapter 2 are attested. Further, around 6% of the Mandarin data are under the “non-verb form” label as the French verbs in the source clauses are omitted or paraphrased into Mandarin non-verbal expressions.

So far, I have obtained the annotation overviews of European tense-aspect tuples (Section 4.2.2) and Mandarin tense-aspect forms (Section 4.3.3). They pave the way to apply statistical tools to test Hypotheses 1–7, which will be done in Section 4.4.

4.4 Statistics of the annotated Camus dataset

This section will present the statistics of the annotated Camus dataset, including the descriptive statistics of absolute frequency (Section 4.4.1) and the bi-directional association measure NPMI (Section 4.4.2). NPMI is the generalized version of mutual correspondence (recall Section 3.6.1 for a sample calculation), and I will use it to investigate the association between Mandarin tense-aspect forms and European tense-aspect tuples (tense-aspect tuples or tuples for short). NPMI is a more sophisticated measure than absolute frequency, and I will use it as the main measure for hypothesis testing in Section 4.5.

4.4.1 Descriptive statistic: absolute frequency

Since Predictions 1–7 describe the expected distributions of all kinds of Mandarin tense-aspect forms occurring in contexts instantiating different European tense-aspect tuples, in line with the practice in my preliminary test in Section 3.2, a straightforward way to check the predictions is to identify the tendencies of individual Mandarin tense-aspect forms to co-occur with different tuples in contexts (namely how frequently this happens). (30) is a case where a RVC co-occurs with the Past Perfective tuple in the same context, copied from (10).

(30) ID 26151

- | | |
|--|---|
| a. J' <u>ai fait</u> la lettre. | [French: <i>passé composé</i>] |
| b. I <u>wrote</u> the letter. | [English: <i>simple past</i>] |
| c. Ich <u>habe</u> den Brief <u>aufgesetzt</u> . | [German: <i>Perfekt</i>] |
| d. <u>Hice</u> la carta. | [Spanish: <i>pretérito indefinido</i>] |
| e. Wo <u>xie-hao</u> xin.
I write-finished letter
'I wrote the letter.' | [Mandarin: <i>RVC</i>] |

Section 3.2 used absolute frequencies to characterize the use tendencies of Mandarin tense-aspect forms. Here I use the frequencies again to characterize the co-occurring tendencies between Mandarin tense-aspect forms and European tense-aspect tuples; see Table 4 below. It crosses Tables 2 and 3. Horizontally, Table 4 displays the different frequencies of a tense-aspect tuple that co-occurs with different Mandarin tense-aspect forms in contexts. Vertically, it shows the different frequencies that a Mandarin tense-aspect form co-occurs with different tense-aspect tuples in contexts. Table 4 indicates that each Mandarin tense-aspect form is related with many tense-aspect tuples and *vice versa*. The many-to-many relations between Mandarin tense-aspect forms and European tense-aspect tuples reflect complex co-occurring tendencies, which need to be unpacked.

	∅	RVC	Le1	Le12	Zhe	Zai	Guo	RED	NV	Sum of TT
Past PFV	138	41	43	23	8	1	0	11	2	267
Past IMP	44	5	4	8	4	1	0	1	21	88
Present	21	1	0	3	0	0	0	0	3	28
Past PROG	13	1	0	1	4	4	0	0	1	24
Present Perfect	3	0	1	2	0	0	2	0	0	8
Other TT	46	17	11	9	3	0	3	0	5	94
Sum of aspectual form	265	65	59	46	19	6	5	12	32	509

Table 4: Co-occurrences of Mandarin tense-aspect forms and European tense-aspect tuples in same contexts: frequencies (∅ : unmarked verb form, RED: verbal reduplication, NV: non-verb form, TT: tense-aspect tuple, PFV: Perfective, IMP: Imperfective, PROG: Progressive)

Although using absolute frequencies, the discussion of the data in Section 3.2 is actually based on relative frequencies of the relations between forms in Mandarin and French. Essentially, the use tendencies of Mandarin tense-aspect forms investigated in Section 3.2 evaluated how frequently such forms are used to translate French tense-aspect forms. It is a uni-directional association evaluation (in the spirit of (2) and (3) in Section 3.3.2.1), without looking at how frequently French tense-aspect forms are related to the Mandarin ones. To obtain an overall picture of the association between Mandarin tense-aspect forms and European tense-aspect tuples, this chapter will use NPMI as the main measure (besides absolute frequencies), for it is a general bi-directional association measure fitting into the *Translation Mining* tradition (recall Section 3.6.1). To the best of my knowledge, it is also the only bi-directional association measure that has been explicitly argued to apply to the type of translation data the *Translation Mining* corpus architecture gives rise to. Furthermore, NPMI considers contingency information, which is ignored by absolute frequencies, by taking into account that the strength of association between two expressions also depends on the strength of association both have with other expressions.

Contingency information is important to unpack the many-to-many relations reflected by Table 4.

My analysis uses non-inferential statistics because my data has the caveat of not meeting the assumption of independence made by inferential association tests (e.g., chi-squared test) for two reasons. First, the data I use is not a random sample because each language in the corpus is represented by text produced by only one author who may have an idiosyncratic use of tense-aspect forms. Second, occurrences of tense-aspect forms in my narrative discourse data could be regulated by discourse cohesion. For instance, Chang (1986: 265) mentions that post-verbal *le* only marks the “peak event” in a narrative sequence of events, although it could be applied to the whole series of events. Therefore, not all occurrences in my dataset are independent from each other.

Below I will apply NPMI to measure the association between Mandarin tense-aspect forms and European tense-aspect tuples.

4.4.2 Bi-directional association measure: NPMI

NPMI builds on the ratio of the actual probability of two expressions occurring in the same CP (counterpart pair, recall Section 3.6.1) to the hypothetical probability of them randomly occurring in the same CP. Its gist is to compare the rate of the actual co-occurrence of two expressions to the rate of their co-occurrence by chance. In my research, the two expressions are a Mandarin tense-aspect form and a European tense-aspect tuple, and the two occurring in the same context counts as occurring in the same CP. (30) is just a case where the RVC and the Past Perfective tuple occur in the same CP. Since NPMI is a bi-directional association measure that combines the measurement of how strongly each expression in a CP is associated with the other (for details see Section 3.6.1), it does not reach a high score when multiple Mandarin tense-aspect forms appear in contexts instantiating a given tense-aspect tuple or *vice versa*. Given the many-to-many relations between Mandarin tense-aspect forms and tense-aspect tuples, in general I expect no high NPMI scores.

Using the frequencies in Table 4 as raw data, I obtained the NPMI

scores (all rounded off) between Mandarin tense-aspect forms and European tense-aspect tuples; see Table 5. NPMI is mathematically undefined when co-occurrence is not attested, indicated by the star * in Table 5.⁸

	∅	RVC	Le1	Le12	Zhe	Zai	Guo	RED	NV
Past Perfective	0	0.1	0.1	0	-0.1	-0.2	*	0.1	-0.4
Past Imperfective	0	-0.2	-0.2	0	0	0	*	-0.1	0.4
Present	0.1	-0.2	*	0	*	*	*	*	0.1
Past Progressive	0	-0.2	*	-0.1	0.3	0.5	*	*	-0.1
Present Perfect	-0.1	*	0	0.2	*	*	0.6	*	*
Other TT	0	0.1	0	0	0	*	0.2	*	0

Table 5: Association between Mandarin tense-aspect forms and European tense-aspect tuples: NPMI scores (∅ : unmarked verb form, RED: verbal reduplication, NV: non-verb form, TT: tense-aspect tuple)

Remember Section 3.6.1 notes that NPMI ranges from -1 to 1, with 0 as the cutting-point (mathematically obtained when two expressions randomly co-occur, implying no association). Positive NPMI scores are obtained when actual probabilities are higher than hypothetical ones, i.e., the probability of two expressions co-occurring is above the random rate. The higher NPMI score is, the more likely two expressions are to co-occur. NPMI is a heuristic tool for measuring semantic association between expressions: positive NPMI scores imply semantic association and the higher NPMI score is, the stronger the association is. Hence, I expect the Mandarin tense-aspect forms and tense-aspect tuples associated in Predictions 1–7 to have positive NPMI scores. The more exclusive the association is, the higher the NPMI score would turn out to be. On the other hand, negative NPMI scores indicate two expressions co-occur less frequently than random rate. Mathematically, the

⁸ Here is a calculation example: according to the NPMI formula in Section 3.6.1, the association between *guo* and the Present Perfect tuple is: NPMI (*guo*; Present Perfect) = $\log_2(N \cdot \text{cofq} / X \cdot Y) / -\log_2(\text{cofq} / N) = \log_2(509 \cdot 2 / 5 \cdot 8) / -\log_2(2 / 509) = 0.6$.

lower NPMI score is, the less likely two expressions are to co-occur. However, since the linguistic interpretation of negative NPMI scores is tricky (Bouma 2009), my analysis will mainly use positive NPMI scores.

It should be noted that NPMI assigns more weight to co-occurrences of low frequency (Levshina 2015: 238, 327). Low-frequency expressions can quickly lead to high NPMI scores because chances of them co-occurring with another expression are already quite low. This can be seen as an advantage because I can pick up on tendencies for low-frequency expressions (and this is also one of the ways NPMI is exploited in monolingual corpus research) but also as a disadvantage (co-occurrence might be more accidental than the NPMI score suggests). Therefore, it is useful to replicate the NPMI measurement for low-frequency expressions in bigger size datasets. The inherent bias of NPMI makes it impossible to standardize the description of association strength when NPMI is used. For descriptive convenience, however, I assume 0 to 0.3 indicates weak association, 0.3–0.6 for moderate association (including 0.3) and 0.6–1 for strong association (including 0.6) .

Section 4.5 will interpret the NPMI scores in Table 5, along with frequencies in Table 4, so as to test Hypotheses 1–7 by examining Predictions 1–7.

4.5 Testing hypotheses on Mandarin tense-aspect forms

This section will use the NPMI scores (see Table 5) as well as frequencies (see Table 4) to test Hypotheses 1–7 by checking whether the statistics are in line with Predictions 1–7. I will start with cases where stronger associations are found and will use qualitative analyses, if needed, to interpret the statistics. Besides the testing, I will also check whether the verbal selections of individual tense-aspect forms described in the literature (recall Section 2.5) are consistent with my data. A preview of this section is that the statistics are in line with the hypotheses on *guo*, *zai*, and *zhe* but do not show strong support for the hypotheses on *le1* (post-verbal *le*), RVCs, verbal reduplication and aspectually unmarked sentences.

4.5.1 *Guo*: experiential Perfect marker

My dataset contains 5 occurrences of *guo*, 2 of them occurring in contexts instantiating the Present Perfect tuple. See the example in (31).

(31) ID 24774

- a. J' ai lu le dossier de votre mère. [French: *passé composé*]
- b. I' ve read your mother's file. [English: *present perfect*]
- c. Ich habe die Akte Ihrer Mutter gelesen. [German: *Perfekt*]
- d. He leído el expediente de su madre.
[Spanish: *pretérito perfecto compuesto*]
- e. Wo kan-guo nin muqin de dang'an. [Mandarin: *guo*]
I read-GUO your mother DE file
'I've read your mother's file.'

(31e) is used in the scene where “I” (the director of an old people’s home) was telling the protagonist that “I” already knew the information of the protagonist’s mother. (31e) indicates that before speech time “I” read the files and at speech time the experiential state of having read the files (and thus knowing the information) holds. A high NPMI score is found between *guo* and Present Perfect (NPMI=0.6), indicating a strong association between the two. The score is in line with Prediction 3b that *guo* typically occurs in contexts instantiating the Present Perfect tuple.

The other 3 cases of *guo* appear in the contexts where all the European data use language-specific Pluperfect forms, e.g., *plus-que-parfait* in French. The Pluperfect form is the mirror image of the Perfect form in the past, “expressing a relation between a past state and an even earlier situation” (Comrie 1976: 53). See (32) for an illustration; the Mandarin translation (32e) negates the state of having noticed the big paunches of old women. The association between *guo* and Pluperfect is positive (NPMI=0.2).

(32) ID 32109

- a. Je n' avais encore jamais remarqué à quel point les vieilles femmes
pouvaient avoir du ventre. [French: *plus-que-parfait*]

- b. I'd never noticed before what huge paunches old women can have.
[English: *past perfect*]
- c. Ich hatte noch nie bemerkt, was für emen Bauch alte Frauen haben können.
[German: *Plusquamperfekt*]
- d. Yo no había advertido nunca hasta qué punto las ancianas podían tener vientre.
[Spanish: *pretérito pluscuamperfecto*]
- e. Wo hai cong mei-you zhuyi-guo laotaitai [Mandarin: *guo*]
I still ever not-have notice-GUO old woman
hui you zheyang da de duzi.
can have such big DE paunch
'I'd never noticed before what huge paunches old women can have.'

After scrutinizing the 5 cases of *guo*, I found them all to denote a past experience holding at the evaluation time (no matter speech time or a past time), which falls into the use of Perfect termed as experiential Perfect, (recall Section 2.3.2). I thus conclude that my data is in line with Hypothesis 3b that *guo* is an experiential Perfect marker. Of course, given that my dataset only includes 5 cases of *guo* and NPMI is sensitive to low frequency, it would be useful to replicate the association testing in a bigger dataset. On the other hand, Prediction 3a fails because no occurrence of *guo* appears in contexts instantiating the Past Perfective tuple (with NPMI undefined). Furthermore, given that verbs marked by *guo* in the dataset all denote eventualities that can happen more than once (e.g., *kan* 'read', *zhuyi* 'notice', and *xiang* 'think'), I thus confirm the description in the literature that *guo* only applies to verbs denoting repeatable eventualities (recall Section 2.5.2).

4.5.2 *Zai*: Progressive marker

4 out of 6 occurrences of *zai* appear in contexts instantiating the Past Progressive tuple, with a moderate positive association found between *zai* and Past Progressive (NPMI=0.5). The statistics are in line with Prediction 4 that *zai* typically occurs in contexts instantiating the Past Progressive tuple, supporting Hypothesis 4 that *zai* is a Progressive marker. See (33) for an

example: using *zai* to mark the verb *gan* ‘do’, (33e) indicates that “she” was in the process of doing something at speech time.

(33) ID 32090

- a. Je ne voyais pas ce qu’ elle faisait. [French: *imparfait*]
- b. I couldn’t see what she was doing. [English: *past continuous*]
- c. Ich konnte nicht sehen, was sie machte. [German: *Präteritum*]
- d. No veía lo que hacía. [Spanish: *pretérito imperfecto*]
- e. Wo kan-bu-jian ta zai gan shenme. [Mandarin: *zai*]
 I look-not-see her ZAI do what
 ‘I could not see what she was doing.’

The other 2 occurrences of *zai* are not counterexamples against Hypothesis 4, as I will show. One is (34), where *zai* occurs in a context instantiating the Past Imperfective tuple.

(34) ID 32130

- a. La femme pleurait toujours. [French: *imparfait*]
- b. The woman went on crying. [English: *simple past*]
- c. Die Frau weinte immer noch. [German: *Präteritum*]
- d. La mujer seguía llorando. [Spanish: *pretérito imperfecto*]
- e. Na-ge nüren yizhi zai ku. [Mandarin: *zai*]
 that-CL woman continuously ZAI cry.
 ‘That woman was continuously crying.’

(34e) uses *zai* to mark the verb *ku* ‘cry’, describing a crying state extending over the speech time. However, compared with (33e), (34e) has a stronger stative flavor because the Mandarin translator uses the adverb *yizhi* ‘continuously’ to translate the French adverb *toujours* ‘always’, highlighting the durativity of the crying. *Yizhi* ‘continuously’ weakens the dynamicity of the Progressive meaning contributed by *zai* and makes (34e) qualified to translate (34a), which has a stative interpretation of Imperfective aspect. The NPMI score between *zai* and Past Imperfective is 0, indicating no

association between them, and *zai* just randomly co-occurs with Past Imperfective.

The other occurrence of *zai*, however, co-occurs with the Past Perfective tuple (35):

(35) ID 26087

- | | |
|---------------------------------------|---|
| a. Raymond <u>a continué</u> . | [French: <i>passé composé</i>] |
| b. Raymond <u>went on</u> . | [English: <i>simple past</i>] |
| c. Raymond <u>hat weitergeredet</u> . | [German: <i>Perfekt</i>] |
| d. Raymond <u>siguió</u> . | [Spanish: <i>pretérito indefinido</i>] |
| e. Laimeng <u>zai-jixü</u> shuohua. | [Mandarin: <i>zai</i>] |
- Raymond ZAI-continue speak
'Raymond is continuously speaking.'

(35) seemingly is a counterexample against Hypothesis 4 because the eventive Perfective aspect is semantically orthogonal to the stative Progressive aspect. However, (35e) is not a counterexample because *zai* still conveys Progressive meaning in this case. According to my intuition, (35e) paraphrasing (35a) has a Progressive meaning, as my English translation of (35e) indicates. The freedom of translation is probably due to syntactic restriction.⁹ My intuition about freedom of translation is supported by the negative association between *zai* and Past Perfective (NPMI= -0.2), which means the actual co-occurrence rate between *zai* and Past Perfective is lower

⁹ The example comes from a scene where Raymond was telling his story to the protagonist. I find it ungrammatical if post-verbal *le* (which can convey Perfective aspect, see Section 2.5.1) is used here rather than *zai*, namely:

* Laimeng jixü-le shuohua.
Raymond continue-LE speak

Notice the Mandarin translation adds another predicate *shuohua* 'speak'. Intuitively, I find that *jixü* 'continue' relies on another predicate to express a concrete event, as neither '*Laimeng zai-jixü' nor '*Laimeng jixü-le' sounds natural to me. My intuition is that Mandarin syntax forbids a single verb *jixü* 'continue' to be affixed by post-verbal *le* and the translator has to paraphrase (35a) by using *zai*. Actually, the word *jixü* 'continue' in (35e) has an adverbial flavor of "continuously" rather than being a pure verb.

than by chance. In other words, *zai* co-occurring with Past Perfective is a rare event, implying that their co-occurrence is not due to semantic association but due to other factors such as freedom of translation. For cases unable to be literally translated, such as (35a), the Mandarin translator has to paraphrase and even adopts a grammatical aspect different from the source text, as (35e) demonstrates. Zooming into the outlier has deepened my understanding of the statistical numbers.

Additionally, I found that verbs marked by *zai* in my dataset are all process descriptions such as *zhi* ‘wave’ and *ku* ‘cry’, in line with the statement in Hypothesis 4 that *zai* operates on processes. Therefore, I conclude that Hypothesis 4 is in line with my data, which means *zai* is a Progressive marker requiring processes as its input (of course, given the low frequency of *zai*, it is worthwhile to replicate the testing in a bigger dataset).

One thing worth attention is that the association between *zai* and Past Progressive is just moderate (c.f., the strong association between *guo* and Present Perfect). This can be explained by the competition between *zai* and *zhe*, and the latter will be discussed immediately.

4.5.3 *Zhe*: Imperfective marker

19 occurrences of *zhe* appear in my dataset: 4 co-occurring with Past Progressive, 4 with Past Imperfective, 8 with Past Perfective, and 3 with other tense-aspect tuples irrelevant to my hypotheses and thus ignored. *Zhe* has a moderate association with Past Progressive (NPMI=0.3). This is in line with Prediction 5 as Past Progressive is one of the tuples that *zhe* is predicted to typically co-occur with. (36) is an example where *zhe* co-occurs with Past Progressive. (36e) uses *zhe* to mark the verb *zou* ‘walk’, describing an ongoing walking at speech time.

(36) ID 32262

- a. Il marchait avec beaucoup de dignité, sans un geste inutile.

[French: *imparfait*]

- b. He was walking in a very dignified way, without a single pointless movement.

[English: *past continuous*]

- c. Er marschierte mit großer Würde ohne eine unnötige Bewegung.
[German: *Präteritum*]
- d. Caminaba con mucha dignidad, sin un gesto inútil.
[Spanish: *pretérito imperfecto*]
- e. Ta zhuangyande zou-zhe, mei-you yi-ge duoyude dongzuo.
he solemnly walk-ZHE not-have one-CL extra action
'He was walking in a very dignified way, without a single
pointless movement.'
[Mandarin: *zhe*]

Recall *zai* also has a moderate association with Past Progressive (NPMI=0.5, see Section 4.5.2). I attribute the not-very-high NPMI scores between either *zhe* or *zai* with Past Progressive to the fact that they divide the labor of conveying Progressive aspect, since NPMI is a bi-directional association measure which does not reach a high score when multiple Mandarin tense-aspect forms appear in contexts instantiating a given tense-aspect tuple (noted in Section 4.4.2).

Nevertheless, the NPMI scores indicate that Progressive aspect has a weaker association with *zhe* than with *zai* ($0.3 < 0.5$). I argue this is because *zhe* has a broader use than *zai*, as Prediction 5 also predicts *zhe* to typically occur in contexts instantiating the Past Imperfective tuple. (37) is exactly such a case: *zhe* conveys the stative interpretation of Imperfectivity (remember Imperfective aspect has not only Progressive meaning, but also stative and habitual meanings, see Section 2.3.2).

(37) ID 32188

- a. J'ai vu qui il était habillé de noir avec un pantalon rayé.
[French: *imparfait*]
- b. I noticed that he was dressed in black and wearing pin-striped trousers.
[English: *simple past*]
- c. Ich habe gesehen, daß er schwarz gekleidet war, mit einer gestreiften Hose.
[German: *Präteritum*]
- d. Advertí que iba vestido de negro con un pantalón a rayas.
[Spanish: *pretérito imperfecto*]

- e. Wo jian ta chuan-zhe hei yifu he dai tiaowen de kuzi.
 I see he wear-ZHE black clothes and carry strip DE trousers
 ‘I noticed that he was dressed in black and wearing pin-striped
 trousers.’

[Mandarin: *zhe*]

(37e) uses *zhe* to mark the verb *chuan* ‘wear’, conveying that the wearing state holds at speech time. Similar to (37e), other cases where *zhe* co-occurs with Past Imperfective all denote states, including result states (Smith 1997: 76, 273), e.g., the result state of standing, the state of managing people. Although the NPMI score between *zhe* and Past Imperfective is low (NPMI=0), the non-negative score is not against Prediction 5. I attribute the low score to the fact that the association between *zhe* and Past Imperfective is not exclusive, since many other Mandarin tense-aspect forms also appear in contexts instantiating the Past Imperfective tuple (see Table 4).

Surprisingly, *zhe* also co-occurs with Past Perfective, as (38) shows.

(38) ID 24738

- a. Il m’a regardé de ses yeux clairs. [French: *passé composé*]
 b. He looked at me with his bright eyes. [English: *simple past*]
 c. Er hat mich mit seinen hellen Augen angesehen. [German: *Perfekt*]
 d. Me miró con sus ojos claros. [Spanish: *pretérito indefinido*]
 e. Ta na-shuang qiansede yanjing ding-zhe wo. [Mandarin: *zhe*]
 he that-CL light eye stare-ZHE me
 ‘His light eyes were staring at me.’

The eventive interpretation of (38a) is however, paraphrased by the translator in (38e) as a stative interpretation. Marked by *zhe*, (38e) has a Progressive meaning, as my English translation indicates. Having checked the 8 cases where *zhe* co-occurs with Past Perfective, I intuitively found they all involve freedom of translation, just as what I found in the case of (35) with *zai*, and they have a Progressive meaning or the stative interpretation of Imperfectivity, as Prediction 5 expects. My intuition about freedom of translation is supported by the negative NPMI score between *zhe* and Past

Perfective (-0.1), which indicates their co-occurrence is a rare event, (happening less frequently than by chance), probably due to freedom of translation. Freedom of translation tends to happen when the verbs marked by *zhe* are posture or position verbs, (e.g., *deng-zhe* ‘wait-zhe’, *baoliu-zhe* ‘reserve-zhe’, *wo-zhe* ‘hold-zhe’), as 6 out of the 8 cases of *zhe* use such verbs. What triggers the freedom of translation is beyond my research scope, so I just leave it open.

The above discussion indicates that Prediction 5 accounts well for the use of *zhe* in my dataset. As for the claim made by Hypothesis 5 about the verbal section of *zhe*, I zoomed into my data and found that verbs marked by *zhe* either denote states (e.g., *chuan* ‘wear’) or processes (e.g., *zou* ‘walk’), which is in line with Hypothesis 5. I therefore conclude that my data is in line with Hypothesis 5 that *zhe* is an Imperfective marker requiring states or processes as its input. Just like *zai*, it can mark Progressive aspect when interacting with process verbs such as *zou* ‘walk’ (36e). Moreover, it has the second use to mark stative Imperfectivity when interacting with state verbs such as *chuan* ‘wear’ (37e), which is not shown by *zai* (*He zai-chuan yifu* ‘He is putting on clothes’ has a dynamic interpretation; recall Section 2.5.3). Which factors regulate the alternation between *zai* and *zhe* in terms of conveying Progressive aspect is a complex topic, and I will leave it for future research.

So far, I have discussed the markers *guo*, *zai*, and *zhe*, which show stronger associations (higher NPMI scores) with particular tense-aspect tuples. Unfortunately, I cannot develop full-fledged semantic analyses for them because the Camus corpus only contains very limited cases of the markers. As a corpus-based study, the dissertation has to leave the task for future studies. Next, I will discuss tense-aspect forms which show weaker associations (lower NPMI scores) with specific tense-aspect tuples.

4.5.4 *Le1* (post-verbal *le*)

Out of all the 59 occurrences of *le1*, 43 occur in contexts instantiating the Past Perfective tuple, such as (39). The culminated smoking event in (39a) is translated by (39e) which uses *le1*.

(39) ID 25619

- a. J' ai fumé deux cigarettes, [...] [French: *passé composé*]
- b. I smoked a couple of cigarettes, [...] [English: *simple past*]
- c. Ich habe zwei Zigaretten geraucht, [...] [German: *Perfekt*]
- d. Fumé dos cigarrillos, [...] [Spanish: *pretérito indefinido*]
- e. Wo chou-le liang-zhi yan, [...] [Mandarin: *le1*]
 I smoke-LE two-CL cigarette
 'I smoked two cigarettes, [...]'¹⁰

Although Prediction 2a (*le1* occurs in contexts instantiating the Past Perfective tuple) accounts for 73% occurrences of *le1*, *le1* only has a weak association with the Past Perfective tuple (NPMI=0.1). This is striking as Prediction 2a expects a strong association (a high NPMI score) between the two. The low NPMI score does not straightforwardly support Hypothesis 2a, though it is not against 2a either (for the score is positive).

The same conclusion also applies to the alternative Hypothesis 2b. Prediction 2b is attested by only one case of *le1*, which occurs in a context instantiating the Present Perfect tuple (40):

(40) ID 25759

- a. Le soir, j' y trouve moins de plaisir parce que la serviette roulante qu' on utilise est tout à fait humide : elle a servi toute la journée. [French: *passé composé*]
- b. I don't enjoy it so much in the evening because the roller towel which people use is all wet: it's been there all day. [English: *present perfect*]
- c. Abends macht er mir weniger Spaß, weil das Rollhandtuch, das man dabei gebraucht, ganz feucht ist: es ist den ganzen Tag benutzt worden. [German: *Perfekt*]
- d. Por la tarde, disfruto menos porque la toalla giratoria que se utiliza está completamente húmeda: ha servido toda la jornada. [Spanish: *pretérito perfecto compuesto*]

¹⁰ I did not copy (39b) here but produced my own English translation because (39b) uses the ambiguous expression *a couple of*.

- e. Wanshang, wo jiu bu name gaoxing le, yinwei gongyongde
evening I just not so happy LE because public
maojin yong-le yi-tian, dou shi-tou le. [Mandarin: *lel*]
towel use-LE one-day all wet-completely LE
'I don't enjoy it so much in the evening because the roller towel
which people use is all wet: it's been there all day.'

(40e) describes that the event of the towel being used caused the state that it was completely wet. According to Prediction 2b, I expect a high NPMI score between *lel* and Present Perfect. The low, non-negative NPMI score between the two (NPMI=0) does not meet my expectation, although it is not against Hypothesis 2b.

To sum up, neither of the two hypotheses on *lel* are straightforwardly supported by NPMI scores. Although the overall high frequency of *lel* could lower the NPMI scores (recall the bias of NPMI mentioned in Section 4.4.2), to properly interpret the scores requires an in-depth qualitative study of *lel*. Despite the uncertainty of the hypotheses, the description in the literature (see Section 2.5.1) that *lel* operates on all kinds of eventualities except individual-level states is borne out: *lel* has not been found to mark any individual-level state descriptions such as *dengyu* 'equal' and *xiwang* 'hope' in my dataset.

4.5.5 RVCs

Most RVCs (41 out of 65) occur in contexts instantiating the Past Perfective tuple, as (41) shows. (41e) uses RVC *hao* 'finished' to mark the verb *xie* 'write', conveying a culminated writing event.

(41) ID 26151

- | | |
|--|---|
| a. J' <u>ai fait</u> la lettre. | [French: <i>passé composé</i>] |
| b. I <u>wrote</u> the letter. | [English: <i>simple past</i>] |
| c. Ich <u>habe</u> den Brief <u>aufgesetzt</u> . | [German: <i>Perfekt</i>] |
| d. <u>Hice</u> la carta. | [Spanish: <i>pretérito indefinido</i>] |

- e. Wo xie-hao xin. [Mandarin: *RVC*]
 I write-finished letter
 ‘I wrote the letter.’

The frequent co-occurrence of RVCs and Past Perfective in contexts is covered by Prediction 1 that resultative verb compounds (V+RVC) typically occur in contexts instantiating the Past Perfective or the Present Perfect tuple, although no RVCs are found to co-occur with the Present Perfect tuple. However, the association between RVCs and Past Perfective is rather weak (NPMI=0.1), which is unexpected by Prediction 1. Similar to the case of *lel* (see Section 4.5.4), the low positive NPMI score does not straightforwardly support nor goes against Hypothesis 1. Although the low score could result from the high frequency of RVCs (see the bias of NPMI in Section 4.4.2), to properly interpret it I need to zoom into the RVC data.

4.5.6 Verbal reduplication

Out of all 12 occurrences of verbal reduplication, 11 occur in contexts instantiating the Past Perfective tuple, such as (42). In (42e), *yao-yao* ‘shake-shake’ reduplicates the verb *yao* ‘shake’, and the clause using the verbal reduplication describes a completed shaking event.

(42) ID 25042

- a. Le concierge s’ est penché vers elle, lui a parlé, mais elle a secoué la tête [...]. [French: *passé composé*]
- b. The caretaker leant over and spoke to her, but she shook her head, mumbled something and went on sobbing with the same regularity as before. [English: *simple past*]
- c. Der Pförtner hat sich zu ihr hin gebeugt, hat mit ihr gesprochen, aber sie hat den Kopf geschüttelt, hat etwas gestammelt und mit derselben Stetigkeit weitergeweint. [German: *Perfekt*]
- d. El conserje se inclinó hacia ella, le habló, pero la mujer sacudió la cabeza, musitó algo y siguió llorando con la misma regularidad. [Spanish: *pretérito indefinido*]

- e. Menfang chao ta wan-xia shen, shuo-le ju hua,
caretaker towards her bend-descend body say-LE CL remark
ke ta yao-yao tou [...] [Mandarin: *verbal reduplication*]
but she RED=shake head
'The caretaker leant over and spoke to her, but she shook her head,
[...]

Prediction 6 is borne out as verbal reduplication almost exclusively occurs in contexts instantiating the Past Perfective tuple. Nevertheless, verbal reduplication only has a weak association with Past Perfective (NPMI=0.1), against what Prediction 6 expects, i.e., a strong association between the two. The low NPMI score may be attributed to the non-exclusive association between Past Perfective and verbal reduplication, since previously in Sections 4.5.4 and 4.5.5, RVCs and *le1* were found to have an association with Past Perfective. Additionally, it should be noted that 9 out of all the 12 occurrences of verbal reduplication are in the *V-le V* form which is accounted for as a variation of verbal reduplication in the literature (see Section 4.3.2.2 for example). Given that my corpus only contains 3 occurrences of “pure” verbal reduplication (V-V), I cannot develop a solid corpus-based analysis for reduplication and have to leave it open. Despite that, I found that the reduplicated verbs in the 12 cases are process descriptions such as *wen* ‘ask’ and *xiao* ‘smile’, confirming the description in the literature (see Section 2.5.4) that only process descriptions can be reduplicated.

So far, I have discussed all the Mandarin tense-aspect markers except *le12*. I made no prediction on *le12* because its occurrences do not have a uniform identity, which could be *le1* or sentence-final *le*, and thus it is left open in the dissertation (recall Section 4.3.1). Crucially, a great number of the Mandarin data contain no tense-aspect markers: they either contain non-verb forms or unmarked verb forms. Although I made no prediction on non-verb forms, for they are beyond my research scope, I found non-verb forms have moderate association with (stative) Past Imperfective (NPMI=0.4), which is in line with my annotation finding that many cases labeled by non-verb form use adjectival predicates to translate the French stative copula

verb *être* ‘be’ or French idiomatic expressions of stative interpretation that use *avoir* ‘have’ or *faire* ‘do’ (see Section 4.3.1). Setting the non-verb forms aside, the remaining Mandarin data all use unmarked verb forms (bare verbs), and I will discuss them immediately.

4.5.7 Aspectually unmarked sentences

Half of my Mandarin data are aspectually unmarked sentences (N=265), reflecting the fact that sentences without aspectual marking are rather common in Mandarin narrative discourse (the type of data I use). Recall Section 4.2.3 formulated Predictions 7a–7d according to the 4 competing hypotheses proposed for aspectually unmarked sentences. Predictions 7a and 7c have the same contents and they are borne out as 82% aspectually unmarked sentences are found to occur in contexts expected by them: Past Perfective (N=138), Past Imperfective (N=44), Present (N=21), Past Progressive(N=13). Specific examples are shown below.

(43e) uses the unmarked verb *cheng* ‘take’, conveying a completed taking event. It occurs in a context (43) instantiating the Past Perfective tuple.

(43) ID 25414

- a. J’ai pris le tram pour aller à l’établissement de bains du port.
[French: *passé composé*]
- b. I caught the tram down to the bathing station at the port.
[English: *simple past*]
- c. Ich habe die Straßenbahn genommen, um zur Badeanstalt am Hafen zu fahren.
[German: *Perfekt*]
- d. Tomé el tranvía para ir a la casa de baños del puerto.
[Spanish: *pretérito indefinido*]
- e. Wo cheng che qu haibin yuchang.
I take tram go shore bathing spot
‘I caught the tram going to the bathing station at the port.’¹¹
[Mandarin: *unmarked verb form*]

¹¹ I produced the English translation here for accuracy.

(44) is a context where the aspectually unmarked sentence (44e) occurs, and it, meanwhile, instantiates the Past Imperfective tuple. (44e) describes a state of needing, and the verb *xuayao* ‘need’ is unmarked.

(44) ID 31981

- a. Il lui fallait une garde. [French: *imparfait*]
- b. She needed a nurse. [English: *simple past*]
- c. Sie brauchte Pflege. [German: *Präteritum*]
- d. Necesitaba una enfermera. [Spanish: *pretérito imperfecto*]
- e. Ta xuayao you ren zhaoliao.
she need have person take care
‘She needed someone to take care of her.’¹²
[Mandarin: *unmarked verb form*]

(45e) uses the unmarked verb *zai* ‘exist’, and the sentence occurs in a context (45) instantiating the Present tuple.

(45) ID 31952

- a. L’ asile de vieillards est à Marengo, [...] [French: *présent*]
- b. The old people’s home is at Marengo, [...] [English: *simple present*]
- c. Das Altersheim ist in Marengo, [...] [German: *Präsens*]
- d. El asilo de ancianos está en Marengo, [...] [Spanish: *presente*]
- e. Yanglaoyuan zai Malange, [...]
old people’s home exist Marengo
‘The old people’s home is at Marengo, [...]’
[Mandarin: *unmarked verb form*]

(46e) is predicated by the unmarked verb *shi* ‘make’, occurring in a context (46) instantiating the Past Progressive tuple.

(46) ID 32084

- a. L’ éclat de la lumière sur les murs blancs me fatiguait.
[French: *imparfait*]

¹² I produced the English translation rather than used the one in (44b) for accuracy.

- b. The glare from the white walls was tiring my eyes.
 [English: *past continuous*]
- c. Das Gleißeln des Lichts auf den weißen Wänden ermüdete mich.
 [German: *Präteritum*]
- d. El reflejo de la luz sobre las paredes blancas me fatigaba.
 [Spanish: *pretérito imperfecto*]
- e. Zhao zai bai qiang shang de dengguang
 illuminate at white wall on DE light
shi wo hen nanshou.
 make me very uncomfortable
 ‘The glare from the white walls was tiring my eyes.’
 [Mandarin: *unmarked verb form*]

Furthermore, Prediction 7b is not borne out as 74% aspectually unmarked sentences occur in the contexts against 7b’s prediction, namely those instantiating the Past Perfective, the Past Imperfective, and the Past Progressive tuples. As 29% aspectually unmarked sentences do appear in the contexts expected by Prediction 7d (Past Imperfective, Past Progressive, and Present), there is no strong descriptive statistic against Prediction 7d.

In terms of NPMI, unmarked sentences show no association with Past Perfective, Past Imperfective, and Past Progressive (all NPMI=0), which means that unmarked sentences randomly occur in contexts instantiating the three tuples. This is straightforwardly against Hypothesis 7b because it expects very low negative scores in these cases. However, the zero scores are in line with Hypotheses 7a and 7c because they both claim that aspectually unmarked sentences do not have a fixed aspectual interpretation, thus expecting no association between each of the three tuples and unmarked sentences. Furthermore, unmarked sentences show a positive association with the (stative) Present tuple (NPMI=0.1), presenting weak evidence favoring Hypothesis 7d, which claims unmarked sentences have a stative interpretation (7d hence expects a positive high NPMI score between unmarked sentences and the Present tuple). The positive score meanwhile is not against Hypotheses 7a and 7c (because 0.1 is close to 0, as Hypotheses 7a and 7c expect).

To sum up, Hypothesis 7b (Smith (1997)'s neutral aspect theory) is not in line with the statistics. However, the alternative Hypotheses 7a, 7c, and 7d each receive not-very-strong evidence. Hypotheses 7a and 7c require further examination that investigates the relations between eventuality descriptions (which have not been annotated in the dataset) and the aspectual interpretations of unmarked sentences. Therefore, to properly evaluate the three hypotheses, Chapter 5 will explore them by paying attention to eventuality descriptions.

4.5.8 Summary of the hypothesis testing

Section 4.5 has researched the association between Mandarin tense-aspect forms and European tense-aspect tuples through the bi-directional measure NPMI and absolute frequency so as to quantitatively test Hypotheses 1–7. Here are the results (starting from cases where strong evidence is found):

Since descriptive statistics and the NPMI score are in line with Prediction 3b rather than 3a, I concluded that *guo* is an experiential Perfect marker (Hypothesis 3b). Ignoring the cases involving freedom of translation, Predictions 4 and 5 were also in line with descriptive statistics. Although the NPMI scores just showed moderate positive evidence for them, I attributed the not-very-high NPMI scores to the divided labor between *zai* and *zhe* in terms of marking Progressive aspect and the non-exclusive association between *zhe* and Imperfective aspect. Having additionally looked into verbs selected by both markers, I concluded that *zai* is a Progressive marker taking processes as input (Hypothesis 4); *zhe* is an Imperfective marker taking states and processes as input (Hypothesis 5), which conveys Progressive aspect and the stative interpretation of Imperfective aspect.

Predictions 1, 2a, 2b, and 6 on *lel* (post-verbal *le*), RVCs, and verbal reduplication were in line with the descriptive statistics, but the NPMI scores do not strongly support them. I will zoom into the data concerning *lel* (post-verbal *le*) and RVCs so as to properly interpret the NPMI scores and evaluate the corresponding Hypotheses 1, 2a, and 2b. Verbal reduplication is left for future research due to the limited number of data.

As for aspectually unmarked sentences, the descriptive statistics failed Prediction 7b, reflecting that Hypothesis 7b is not in line with my data. On the other hand, Predictions 7a, 7c, 7d are in line with the descriptive statistics and NPMI scores, although none of them received very strong evidence. Particularly, Hypotheses 7a and 7c require further testing because I have not investigated the relations between eventuality descriptions and the aspectual interpretations of unmarked sentences. Therefore, I will explore Hypotheses 7a, 7c, and 7d further in the next chapter, particularly paying attention to eventuality descriptions.

Sentence-final *le* (under the label of *le12*) also plays a role in the constitution of the Mandarin aspect system, but I have to leave it open due to my methodology choice. Last but not least, some Mandarin clauses are predicated by non-verb forms, and they usually have a stative interpretation. The non-verbal forms are beyond my research goal, and I leave their relations with aspect for future studies.

Of course, the association study has limitation. The limitation is rooted in the methodological caveat that a corpus can never be a sufficient representation of a given language. The use of every Mandarin tense-aspect form may not be sufficiently represented by my corpus data. Therefore, the analysis I propose for Mandarin tense-aspect forms may just cover a subset of their uses. Zero occurrences of a Mandarin tense-aspect form in contexts instantiating a tense-aspect tuple does not entail that the form and the tuple are not semantically associated, because the zero co-occurrence may be due to the small size of the corpus. Also, I have not exploited inferential association statistics due to the limitation of my data choice. Given that this dissertation only implements the first “mining” step of *Translation Mining* methodology, inferential tests can be carried out in the future by using data produced by multiple authors and from varied genres when I proceed to implement the replication-based paradigm of the methodology.

4.6 Conclusions

This chapter conducted a sophisticated test on Hypotheses 1–7, which are proposed in Chapter 2 about Mandarin aspect. To operationalize the

hypotheses in the Camus dataset, the test applied the *Aggregated Translation Mining* methodology, a variation developed from the standard *Translation Mining* methodology introduced in Chapter 3. The application led to the finding of European tense-aspect tuples that I argued are good (countable) representations of general tense-aspect categories involved in the hypotheses. Using the tense-aspect tuples, I derived Predictions 1–7 from Hypotheses 1–7. Since my test is based on the annotation of forms, I then elaborated on the Mandarin annotation work. On top of that, I investigated the association between Mandarin tense-aspect forms and the European tense-aspect tuples. The descriptive statistics (absolute frequencies) showed that the Mandarin forms have complex many-to-many relations with the tuples. To unpack the many-to-many relations and measure the underlying associations, besides frequency I mainly resorted to the bi-directional association measure NPMI to examine Predictions 1–7. Here are my major conclusions:

The statistics are in line with hypotheses related to *guo* (Hypothesis 3b), *zai* (Hypothesis 4), and *zhe* (Hypothesis 5). Specifically, *guo* is an experiential Perfect marker, while *zai* is a Progressive marker, taking processes as its input, and *zhe*, an Imperfective marker, taking states and processes as its input. Nevertheless, the statistics do not straightforwardly support Hypothesis 1 on RVCs, Hypotheses 2a and 2b on *le1* (post-verbal *le*), and Hypothesis 6 on verbal reduplication. The statistics concerning aspectually unmarked Mandarin sentences are against Hypothesis 7b, i.e., Smith's (1997) neutral aspect theory, but show not-very-strong positive evidence for Hypotheses 7a, 7c, and 7d. As a corpus-based study, this chapter leaves verbal reduplication for future research due to data limitation. To evaluate the other pending hypotheses, I need to properly interpret the heuristic NPMI scores by zooming into the data marked by RVCs and *le1* (post-verbal *le*), as well as aspectually unmarked sentences. This will be achieved in Chapters 5–7. Taking a compositionally bottom-up perspective, I will first investigate aspectually unmarked sentences in Chapter 5 by exploring Hypotheses 7a, 7c, and 7d further.

Chapter 5

Aspectually unmarked sentences¹

5.1 Introduction

This chapter continues investigating the aspectual interpretations of aspectually unmarked Mandarin sentences. Among the four hypotheses proposed on unmarked sentences, Hypothesis 7b was rejected by the association study in Chapter 4, but 7a, 7c and 7d all received positive evidence, though not very strong. The pending hypotheses are copied below:

Hypothesis 7a: Mandarin aspectually unmarked sentences are aspectually transparent (i.e., they have an eventive interpretation if the underlying eventuality description is quantized and have a stative interpretation if the eventuality description is homogeneous, along the lines of de Swart 1998).

¹ The investigation in this chapter is a joint work with Bert Le Bruyn. The content of this chapter was presented as a talk entitled “The absence/presence of aspectual markers in narrative discourse in Mandarin” at the workshop “Tenselessness 2” in Lisbon (2019). Visit <https://sites.google.com/view/tenselessness2/programme> for the abstract.

- Hypothesis 7c: Mandarin aspectually unmarked sentences using non-dynamic eventuality descriptions have a stative interpretation whereas those using dynamic eventuality descriptions are underspecified for aspect (they receive a Perfective or an Imperfective interpretation depending on the discourse context, along the lines of Xiao & McEnery 2004).
- Hypothesis 7d: Mandarin aspectually unmarked sentences have a stative interpretation (denoting lexical states or generics, along the lines of Sun 2014).

Despite their differences, the three hypotheses agree that sentences having a stative interpretation can be aspectually unmarked. Remember Chapter 4 only gave a coarse-grained test on Hypotheses 7a and 7c, which did not examine how different eventuality descriptions (quantized/homogeneous or dynamic/non-dynamic) are related to the aspectual interpretations of unmarked sentences. Comparing Hypotheses 7a and 7c, I find they only make different statements about the interpretations of sentences which use dynamic descriptions: Hypothesis 7a claims that such sentences are aspectually transparent but Hypothesis 7c claims they are aspectually underspecified. Interestingly, taking a close look at Hypothesis 7a, I find it can be reconciled with Hypothesis 7d if the overt aspectual expressions are relaxed to include not only grammatical markers but also telicity-indicating methods in the lexicon and context. Specifically, if the quantized eventuality descriptions are counted as not purely “unmarked” – they can be reanalyzed as taking telicity-indicating methods that contribute the aspectual information of endpoints (temporal boundedness) – then Hypotheses 7a and 7d can be reconciled as follows: in the absence of grammatical aspectual markers, Mandarin sentences use bare verbs, having a stative interpretation by default, but the sentences have an eventive interpretation if they contain verbs interacting with telicity-indicating methods.

Furthermore, since this dissertation concerns the compositionality of Mandarin aspect, I am interested in factors regulating the presence/absence of all aspectual expressions. Therefore, I push the reconciled formulation

further by taking grammatical aspectual markers into account and propose Hypothesis 7e. The part of Hypothesis 7e concerning the use of grammatical markers comes from Sun's (2014: 226) generalization (the source of Hypothesis 7d) that sentences having an eventive interpretation (her episodic reading) all "involve overt aspect".

Hypothesis 7e: Mandarin sentences with predicates using aspectually unmarked verbs have a stative interpretation.
Mandarin sentences with an eventive interpretation must use overt aspectual expressions (including grammatical aspectual markers or telicity-indicating methods).

Given that Hypothesis 7e can make more specific predictions than Hypothesis 7c, I will first test Hypothesis 7e with the descriptive statistic (absolute frequency) and the association measure (NPMI) previously used in Chapter 4, and then circle back to the evaluation of Hypothesis 7c. If Hypothesis 7e is in line with my data, then I will not retain Hypothesis 7c because the latter is incompatible with the former. Otherwise, Hypothesis 7c will be retained. To operationalize Hypothesis 7e, I will propose an inventory of telicity-indicating methods in Section 5.2.

This chapter is organized as follows. Section 5.2 proposes an inventory of telicity-indicating methods, which will enable me to formulate a full-fledged version of Hypothesis 7e in Section 5.3. Section 5.4 elaborates on the testing methodology in this chapter, which leads me to select a subset of the Camus corpus by exploiting again two European tense-aspect tuples, Past Perfective and Past Imperfective (recall Section 4.2.2). Section 5.5 introduces the data for testing Hypothesis 7e and operationalizes the hypothesis into predictions needing to be examined against the data. Section 5.6 conducts the testing and presents its results. Reflecting on the results urges me to scrutinize my data such that I find an additional telicity-indicating method, i.e., (in)direct speech. I then reanalyze my data by taking (in)direct speech into consideration. Finally, the section indicates that Hypothesis 7e is in line with my data, as long as the telicity-indicating

inventory is enriched to include (in)direct speech. In Section 5.7, I circle back to Hypothesis 7c and conclude that it should not be retained. Also, I summarize the research on aspectually unmarked sentences in this dissertation and discuss insights brought by the research on the compositionality of Mandarin aspect. Section 5.8 concludes the chapter.

5.2 Telicity-indicating methods

Based on my intuition and the literature on Mandarin, in this section I will propose a series of telicity-indicating methods functioning within or across the clause domain. The methods interact with bare verbs, making sentences have an eventive interpretation.

5.2.1 RVCs

As Section 2.4.2 introduced, RVCs are verbal or adjectival morphemes which mark bare verbs, and the two form verb compounds. RVCs describe results (Li & Thompson 1981: 54–56) and thus are telicity markers. For example, the RVC *wan* ‘finished’ in *chi-wan* ‘eat-finished’ (1) characterizes the result that the breakfast was completely eaten.

- (1) Ta (san-fenzhong-nei) chi-wan zaofan.
 he (three-minute-in) eat-finished breakfast
 ‘He ate breakfast (in three minutes).’

Being result expressions, RVCs can make sentences have an eventive interpretation by providing endpoints to the eventualities denoted by the verbs they compound with. The endpoint can be indicated by the *in*-phrase *san-fenzhong-nei* ‘in three minutes’ as (1) shows.

5.2.2 *De*-resultatives

Mandarin has a degree modifier known as the *de*-resultative. Similar to RVCs, it also renders an endpoint to a temporally “open” event (Sybesma

1999: 29–31). For example, *de* introduces the degree ‘far’ in (2) and the *de*-resultative modifies the verb *zou* ‘walk’. The endpoint of walking is set by the degree and can be indicated by the *in*-phrase *san-fenzhong-nei* ‘in three minutes’.

- (2) Ta (san-fenzhong-nei) zou-de hen yuan.
 he (three-minute-in) walk-De very far
 ‘He walked far (in three minutes).’

The difference between the *de*-resultative and RVCs is pragmatic rather than semantic (Sybesma 1999: 33). I thus conclude the *de*-resultative is a result expression functioning as a telicity indicator just like RVCs.

5.2.3 Endpoint-indicating phrases

Phrases indicating endpoints can also make sentences have an eventive interpretation. For example, the directional phrase *dao xuexiao* ‘to school’ modifies the verb *zou* ‘walk’, specifying the final location reached by the man.

- (3) Ta (san-fenzhong-nei) zou dao xuexiao.
 he (three-minute-in) walk to school
 ‘He walked to school (in three minutes).’

The phrase *dao xuexiao* ‘to school’ functions as a goal argument of the verb *zou* ‘walk’, adding an endpoint to the walking process. As (3) shows, the endpoint can be indicated by the *in*-phrase *san-fenzhong-nei* ‘in three minutes’.

5.2.4 A consequent state in the causative construction

Mandarin has a *jianyu* construction which can express causative meaning (Lü 1999: 37–38). Causative verbs such as *shi* ‘make’, *rang* ‘let’ and *ling* ‘make’ are often used in this construction, for instance:

- (4) a. Wo shi Lisi hen xingfu.
 I make Lisi very happy
 ‘I made Lisi very happy.’
- b. Ta san-nian-nei shi Lisi hen xingfu.
 he three-year-in make Lisi very happy
 ‘He made Lisi very happy in three years.’

(4a) mirrors the English causative sentence *John made Mary happy*. The causative verb *shi* ‘make’ indicates a causing event, and the adjective *xingfu* ‘happy’ specifies a consequent state, namely the result of the causing event. (4b) indicates that the causing event has an endpoint, which is specified by the *in*-phrase *san-nian-nei* ‘in three years’. I thus propose that the consequent state in the causative construction expresses a result, making sentences have an eventive interpretation.

So far, all the telicity-indicating methods I have proposed interact with verbs within clauses. Below I will discuss another method functioning across clauses, inspired by “distant haplology” effect (Chen 1977).

5.2.5 Dynamic telicity indicating

Haplology can be regarded as an instance of the Principle of Least Effort (Zipf 1949). In phonology, it refers to the phenomenon that if two identical syllables occur adjacently, one of them should be eliminated. Chen (1977) studies the syntactic “distant haplology” effect, i.e., if two homophonous morphemes appear in a sentence, one of them can be deleted. Chen uses the effect to account for the ongoing interpretation of sentences such as (5a):

- (5) a. Ta zai keting-li da dianhua.
 he at living-room-in make phone
 ‘He’s making a phone call in the living room.’
 (adapted from Chen 1977: 236)
- b. Ta zai keting-li ~~zai~~- da dianhua.
 he at living-room-in ZAI make phone
 ‘He’s making a phone call in the living room.’

(5a) contains a bare verb *da* ‘make’ and a locative proposition *zai* ‘at’. Chen argues that the ongoing interpretation of (5a) comes from a deleted Progressive marker *zai*, which marks *da* ‘make’. It is deleted because of the distant haplology effect, as (5b) shows.

The syntactic distant haplology phenomenon inspires me to propose the method of dynamic telicity indicating that happens across clauses: if one event is described by two eventuality descriptions, only one description requires an explicit endpoint marker. Assuming the dynamic telicity indicating can explain the use of *yong* ‘use’ in (6):

- (6) Ta ganggang yong shou da-si laohu.
 he just now use hand beat-dead tiger
 ‘He used his hand to beat a tiger dead just now.’

(6) uses the bare verb *yong* ‘use’ and a resultative verb compound *da-si* ‘beat-dead’ in different clauses. Referring to the same event entity, *yong* ‘use’ introduces its instrument and *da-si* ‘beat-dead’ characterizes its manner and result. Since the RVC *si* ‘dead’ specifies the endpoint of the beating action (see Section 5.2.1), the using action is inferred to also be temporally bounded. I call this kind of endpoint transference across clauses dynamic telicity indicating. In this case, *yong* ‘use’ needs no aspectual marking because it is dynamically marked by the RVC which appears in another clause.

This section describes the telicity-indicating methods functioning within and across clauses. I will apply theoretical tools to analyze the former in Chapter 6 but leave the latter for future research. I will use the telicity-indicating methods to substantiate Hypothesis 7e in Section 5.3.

5.3 New hypothesis on aspectually (un)marked sentences

In Section 5.1, I initiated Hypothesis 7e (copied below) that covers the interpretations of aspectually (un)marked sentences.

Hypothesis 7e: Mandarin sentences with predicates using aspectually unmarked verbs have a stative interpretation. Mandarin sentences with an eventive interpretation must use overt aspectual expressions (including grammatical aspectual markers or telicity-indicating methods).

The telicity-indicating methods have been substantiated by the proposal in Section 5.2, see the summary in Table 1.

Telicity-indicating method	Domain
Resultative verb complement (RVC)	Within verbal domain
<i>De</i> -resultative	Within clause domain
Endpoint-indicating phrase (e.g., goal argument)	Within clause domain
Consequent state in the causative construction	Within clause domain
Dynamic telicity indicating	Across clause domain

Table 1: Telicity-indicating methods in Mandarin (to be revised)

As announced in Section 5.1, I will empirically test Hypothesis 7e against the Camus corpus data. To operationalize the hypothesis, I will exploit European tense-aspect tuples (see Section 4.2.2) again. The methodology will be explained in Section 5.4.

5.4 Methodology

To test Hypothesis 7e in the Camus corpus, the first step is to distinguish the aspectually unmarked Mandarin data from the marked ones. According to the hypothesis, Mandarin data using bare verbs along with telicity-indicating methods should be counted as aspectually marked. However, those data were previously annotated by “unmarked verb form” in Section 4.3. Therefore, the Camus corpus should be re-annotated: the Mandarin data using telicity-indicating methods (listed in Table 1) or grammatical aspectual

markers (*le1*, *le12*, *guo*, *zhe*, *zai*, and verbal reduplication) should be annotated as “marked” and the remaining Mandarin data as “unmarked”. I will manually accomplish this task.

After the re-annotation, the second step is to judge the aspectual interpretations of the Mandarin data (i.e., eventive or stative). Recall how Section 4.2.1 noted that the Mandarin data are aligned with European data at the level of the clause which uses an annotated Mandarin/European tense-aspect form (a single clause using a finite verb is a sentence). Given that, the second step will exploit the European tense-aspect tuples obtained from *Aggregated Translation Mining* in Section 4.2.2, because the aspectual interpretations of the Mandarin data can be reflected by the interpretations of tense-aspect tuples instantiated by the contexts where the Mandarin data occur (a context consists of aligned cross-linguistic clauses, having an ID, recall Section 4.2.1). As an alternative to (subjective) native speakers’ intuition, tuples can function as (objective) probes to help me judge the interpretations of the Mandarin data.

Since Hypothesis 7e concerns the eventive/stative interpretation of Mandarin data, I will employ Past Perfective (Table 2), the only tuple of eventive interpretation, and Past Imperfective (Table 3), the tuple of stative interpretation in the past domain (see Section 4.2.3 for their interpretations). I keep out stative tuples in the present domain (Present and Present Perfect) to avoid tense as an extra factor intervening in my test. The stative Past Progressive is also excluded to avoid terminology confusion because Sun (2014), one of the studies inspiring Hypothesis 7e (recall Section 5.1), would count Past Progressive sentences as having her eventive interpretation (“eventive” in her terminology means “dynamic” in my terminology).

Language	Tense-aspect form
French	<i>Passé composé</i>
English	<i>Simple past</i>
German	<i>Perfekt</i>
Spanish	<i>Pretérito indefinido</i>

Table 2: Past Perfective: eventive tense-aspect tuple

Language	Tense-aspect form
French	<i>Imparfait</i>
English	<i>Simple past</i>
German	<i>Präteritum</i>
Spanish	<i>Pretérito imperfecto</i>

Table 3: Past Imperfective: stative tense-aspect tuple

Let me illustrate the second step with examples. The Mandarin sentence (7e) is judged as having an eventive interpretation because (7e) occurs in a context instantiating the Past Perfective tuple.

(7) ID 25827

- a. J' ai travaillé tout l' après-midi. [French: *passé composé*]
- b. I worked all afternoon. [English: *simple past*]
- c. Ich habe den ganzen Nachmittag gearbeitet. [German: *Perfekt*]
- d. Trabajé toda la tarde. [Spanish: *pretérito indefinido*]
- e. Wo gan-le yi xiaowu. [Mandarin: *leI*]
I work-LE one afternoon
'I worked all afternoon.'

On the other hand, the Mandarin sentence (8e) is judged as stative because it occurs in a context instantiating the Past Imperfective tuple.

(8) ID 31981

- a. Il lui fallait une garde. [French: *imparfait*]
- b. She needed a nurse. [English: *simple past*]
- c. Sie brauchte Pflege. [German: *Präteritum*]
- d. Necesitaba una enfermera. [Spanish: *pretérito imperfecto*]
- e. Ta xuyao you ren zhaoliao. [Mandarin: *unmarked verb form*]
she need have person take care
'She needed someone to take care of her.'

This methodology leads to a particular data selection, which will be explained in Section 5.5. Predictions made for the selected data are presented in the same section.

5.5 Data selection and predictions

According to the aforementioned methodology, I choose to investigate a subset of the Camus corpus (named the Camus subcorpus hereafter), namely the contexts instantiating the Past Perfective tuple (N=267) and Past Imperfective tuple (N=88). Additionally, since I am only interested in the (un)markedness of verbal forms, the contexts instantiating the two tuples but including Mandarin data not using verbal predicates and thus labeled by “non-verb form” (see Section 4.3.1) are excluded (altogether 23 cases, see Table 4 in Section 4.4.1). I also kick out 17 Mandarin cases involving the negation words *mei* ‘not’ or *mei-you* ‘not have’ because they are not “pure” unmarked cases given that the negation words are negative counterparts of post-verbal *le* (Comrie 1976: 82; Xiao & McEnery 2004: 91–92), intervening in the aspectual interpretation of a sentence. Since negation words are out of my research scope, I just leave them open. In total, I will investigate 315 contexts, 248 instantiating the Past Perfective tuple and 67 instantiating the Past Imperfective tuple.

As Section 5.4 notes, Past Imperfective and Past Perfective tuples have stative and eventive interpretations, respectively; applying the tuples to operationalize Hypothesis 7e derives the following predictions:

- Prediction 1: Mandarin aspectually unmarked sentences always occur in contexts instantiating the Past Imperfective tuple.
- Prediction 2: Mandarin sentences occurring in contexts instantiating the Past Perfective tuple must use grammatical aspectual markers or telicity-indicating methods.

The following section will apply the descriptive statistic (absolute frequency) and the association measure (NPMI) to check the predictions.

5.6 Results

This section initially presents the first-round testing of Hypothesis 7e by implementing the methodology introduced in Section 5.4. As I will show, the results are not in line with Predictions 1 and 2 (Section 5.6.1). Reflecting on the results enables me to notice a special verb class, namely communication verbs, which stay aspectually unmarked when followed by instances of (in)direct speech (Section 5.6.2). I then propose (in)direct speech as a special telicity-indicating method for communication verbs and reanalyze the cases using (in)direct speeches as aspectually marked. After the second-round testing (Section 5.6.3), the two predictions turn out to account for my data quite well (except a small amount of data noise). The final results show that my data supports Hypothesis 7e with the fine-tuned enrichment by adding (in)direct speech to the Mandarin inventory of telicity-indicating methods.

5.6.1 First-round testing: absolute frequency and NPMI

Implementing the first step of the methodology (Section 5.4), I re-annotated the Mandarin data in the Camus subcorpus, and the subcorpus turned out to include 172 marked cases and 143 unmarked cases. Table 4 summarizes the absolute frequencies of the marked cases using different aspectual expressions. All the aspectual expressions involved in the full-fledged Hypothesis 7e (see Section 5.3) were found except the consequent state in the causative construction.

Aspectual expressions	#
Grammaticalized morpheme (<i>le1, le12, guo, zhe</i> and <i>zai</i>)	92
Verbal reduplication	12
Resultative verb complement (RVC)	46
<i>De</i> -resultative	4
Endpoint-indicating phrase (e.g., goal argument)	8
Consequent state in the causative construction	0
Dynamic telicity indicating	10

Table 4: Mandarin cases using overt aspectual expressions: frequencies

Below I present examples of the aspectual expressions appearing in the subcorpus. Cases of grammaticalized morphemes, verbal reduplication, and RVCs will not be repeated here because Section 4.3 already showed them.

Using a *de*-resultative, (9e) translates the French sentence (9a): the verb *xie* ‘write’ is modified by *de* that introduces the degree ‘a bit haphazardly’.

(9) ID 26155

- a. Je l’ ai écrite un peu au hasard, [...] [French: *passé composé*]
- b. I did it rather haphazardly, [...] [English: *simple past*]
- c. Ich habe ihn ein bißchen aufs Geratewohl geschrieben, [...] [German: *Perfekt*]
- d. La escribí un poco al azar, [...] [Spanish: *pretérito indefinido*]
- e. Xin xie-de you-dian-er suibian, [...] letter write-De have-a bit haphazardly
‘The letter was written a bit haphazardly.’² [Mandarin: *marked(de-resultative)*]

(10e) translating the French sentence (10a) contains a verb *song* ‘accompany’ marked by an endpoint-indicating phrase *dao menkou* ‘to doorway’. As a goal argument, the phrase indicates the final location reached by the people, specifying the endpoint of the accompanying event.

(10) ID 24678

- a. Quand je suis parti, ils m’ ont accompagné à la porte. [French: *passé composé*]
- b. When I left, they came to the door with me. [English: *simple past*]
- c. Als ich gegangen bin, haben sie mich zur Tür begleitet. [German: *Perfekt*]
- d. Cuando salí me acompañaron hasta la puerta. [Spanish: *pretérito indefinido*]

² I produced the verbatim translation here for accuracy.

- e. Wo zou de shihou, tamen yizhi
 I leave DE moment they all the way
song wo dao menkou.
 accompany me to doorway
 ‘When I left, they accompanied me to the door.’³

[Mandarin: *marked(endpoint-indicating phrase)*]

(11e) is the Mandarin translation of the French sentence (11a), applying dynamic telicity indicating. (11e) contains the verbs *cheng* ‘take’ and *qu* ‘go’, both conveying information about the person’s action but from different perspectives. *Cheng* ‘take’ stays bare, while *qu* ‘go’ is followed by the NP *haibin yuchang* ‘bathing station at the port’. The NP is an endpoint-indicating phrase, specifying the person’s final location. Due to the presence of the NP, which dynamically marks *cheng* ‘take’, the tram-taking event is inferred to have an endpoint.

(11) ID 25414

- a. J’ ai pris le tram pour aller à l’établissement de bains du port.
 [French: *passé composé*]
- b. I caught the tram down to the bathing station at the port.
 [English: *simple past*]
- c. Ich habe die Straßenbahn genommen, um zur Badeanstalt am Hafen zu fahren.
 [German: *Perfekt*]
- d. Tomé el tranvía para ir a la casa de baños del puerto.
 [Spanish: *pretérito indefinido*]
- e. Wo cheng che qu haibin yuchang.
 I take tram go shore bathing spot
 ‘I caught the tram going to the bathing station at the port.’
 [Mandarin: *marked(dynamic telicity indicating)*]

With the annotation in place, I then proceeded to the second step of my methodology, namely, to identify the stative or eventive interpretations of the Mandarin data according to the tense-aspect tuples instantiated by the

³ I produced the verbatim translation here for accuracy.

contexts where the Mandarin data occur. Table 5 displays the absolute frequencies of Mandarin cases occurring in contexts instantiating the stative tuple (Past Imperfective) or the eventive tuple (Past Perfective).

	Unmarked Mandarin Cases	Marked Mandarin Cases	Total
Stative	44	23	67
Eventive	99	149	248
Total	143	172	315

Table 5: (Un)marked Mandarin cases occurring in contexts instantiating the stative/eventive tuple (1st-round testing): frequencies

According to Prediction 1, unmarked Mandarin cases are expected to only occur in contexts instantiating the stative tuple. Although 44 unmarked cases meet the expectation, surprisingly, there are 99 unmarked cases occurring in contexts instantiating the eventive tuple, against Prediction 1. The 99 unmarked cases, also challenge Prediction 2, which expects the Mandarin data of eventive interpretation to have overt aspectual expressions (although Prediction 2 correctly covers another 149 cases).

Also, I measure the association between (un)marked cases with the stative/eventive tuple through NPMI, see Table 6 (numbers are rounded-off).

	Unmarked Mandarin Cases	Marked Mandarin Cases
Stative	0.2	-0.2
Eventive	-0.1	0.1

Table 6: Association between (un)marked Mandarin cases and the stative/eventive tuple (1st-round testing): NPMI

Prediction 1 expects a strong association between unmarked cases and the stative tuple, (i.e., NPMI close to 1), but the NPMI score shows the two only

have a weak association (NPMI=0.2). On the other hand, Prediction 2 expects a strong association between the marked cases and the eventive tuple, but the two actually only form a weak association (NPMI=0.1).

To sum up, neither Predication 1 nor Prediction 2 are straightforwardly supported by the descriptive statistics or the association measure. However, after scrutinizing the 99 unmarked cases occurring in contexts instantiating the eventive tuple, I surprisingly found that the majority of them (96) fall into a single verb class, i.e., communication verbs, which will be discussed immediately.

5.6.2 (In)direct speeches following communication verbs

To describe a communication event, communication verbs such as *shuo* ‘say’, *wen* ‘ask’, *gaosu* ‘tell’, and *huida* ‘answer’ are usually marked by post-verbal *le* in sentences, but they stay unmarked when followed by (in)direct speech. The contrast is shown by (12e):

(12) ID 26191

- a. Il a répété sa phrase et j’ ai dit : «Oui.» [French: *passé composé*]
- b. He repeated his remark and I said, ‘Yes.’ [English: *simple past*]
- c. Er hat seinen Satz wiederholt, und ich habe « Ja » gesagt.
[German: *Perfekt*]
- d. Como repitió su frase, contesté : «Sí».
[Spanish: *pretérito indefinido*]
- e. Ta you shuo-le yibian, wo shuo: “dui”.
he again say-LE once I say right
‘He repeated his remark and I said, “Yes.”’
[Mandarin: *unmarked verb form*]

The French verb *a répété* ‘repeat’ (12a) is translated into the communication verb *shuo* ‘say’ (12e), and the latter is marked by post-verbal *le*. In contrast, the second French communication verb *ai dit* ‘say’ (12a) is translated into an unmarked verb *shuo* ‘say’ which is followed by direct speech. (13) indicates that the second *shuo* ‘say’ cannot be marked by post-verbal *le*.

- (13) *Ta you shuo-le yibian, wo shuo-le: “dui”.
 he again say-LE once I say-LE right

Moreover, when followed by an instance of indirect speech, the communication verb *shuo* ‘say’ also stays unmarked and refuses to be marked by post-verbal *le*, as (14e) and (15) show.

(14) ID 24918

- | | |
|---------------------------------------|---|
| a. Il m’ a <u>dit</u> que non. | [French: <i>passé composé</i>] |
| b. He <u>said</u> no. | [English: <i>simple past</i>] |
| c. Er <u>hat</u> es <u>verneint</u> . | [German: <i>Perfekt</i>] |
| d. Me <u>dijo</u> que no. | [Spanish: <i>pretérito indefinido</i>] |
| e. Ta <u>shuo</u> bu shi. | [Mandarin: <i>unmarked verb form</i>] |
- he say not right
 ‘He said that it was not right.’⁴

- (15) *Ta shuo-le bu shi.
 he say-LE not right
 (Intended) ‘He said that it was not right.’

In the Camus subcorpus, I found 102 cases of communication verbs. They all occur in contexts instantiating the eventive tuple, with 6 marked by post-verbal *le* and 96 followed by (in)direct speech. In fact, communication verbs staying unmarked when followed by (in)direct speech has been reported in the literature (e.g., Chang 1986), and my data have confirmed the phenomenon. Essentially, instances of (in)direct speech are verbatim representations of communication events. Since intuitively, the verbatim representations make the result of speaking explicit, (i.e., showing the completion of speaking), I propose that (in)direct speech can be analyzed as a special telicity-indicating method which manifests the completion of speaking events. Since my data indicates that communication verbs used in eventive Mandarin sentences are either marked by post-verbal *le* or followed by (in)direct speech, it is worthwhile to explore the mechanism causing the

⁴ I produced the verbatim translation here for accuracy.

alternation between post-verbal *le* and (in)direct speech. Given that it is a complex topic, I will leave it for future studies. An interesting relevant phenomenon is that the use of the Perfect form (which is associated with post-verbal *le*, as Hypothesis 2b suggests) is found to be different in dialogue and narrative discourse (recall Section 3.6.2). Since cases of (in)direct speech can appear in dialogue, it is intriguing to investigate whether the dialogue/narrative discourse distinction influences the alternation between (in)direct speech and post-verbal *le*.

Based on the proposal that (in)direct speech is a telicity-indicating method, the communication verb cases using this method should be reanalyzed. And on top of that, I will give a second-round test of Predictions 1 and 2 in Section 5.6.3.

5.6.3 Second-round testing: absolute frequency and NPMI

According to the discussion in Section 5.6.2, I enriched the inventory of telicity-indicating methods with (in)direct speech (Table 7).

Telicity-indicating method	Domain
Resultative verb complement (RVC)	Within verbal domain
<i>De</i> -resultative	Within clause domain
Endpoint-indicating phrase (e.g., goal argument)	Within clause domain
Consequent state in the causative construction	Within clause domain
(In)direct speech	Across clause domain
Dynamic telicity indicating	Across clause domain

Table 7: The inventory of Mandarin telicity-indicating methods

Also, the 96 communication verb cases using (in)direct speech were reanalyzed as aspectually marked. The descriptive statistics were accordingly revised (Table 8).

	Unmarked Mandarin Cases	Marked Mandarin Cases	Total
Stative	44	23	67
Eventive	3	245	248
Total	47	268	315

Table 8: (Un)marked Mandarin cases occurring in contexts instantiating the stative/eventive tuple (2nd-round testing): frequencies

The frequencies indicate that almost all the unmarked Mandarin cases are found to appear in contexts instantiating the stative tuple (44/47), with only 3 exceptions. The result is rather close to what Prediction 1 describes. On the other hand, Prediction 2 also receives strong support, as almost all the Mandarin cases occurring in contexts instantiating the eventive tuple are marked (245/248).

Based on Table 8, I re-calculated the NPMI scores:

	Unmarked Mandarin Cases	Marked Mandarin Cases
Stative	0.8	-0.3
Eventive	-0.5	0.6

Table 9: Association between (un)marked Mandarin cases and the stative/eventive tuple (2nd-round testing): NPMI

The NPMI score between the unmarked Mandarin cases and the stative tuple rises to 0.8, which is rather close to 1 (the maxim value of NPMI). The number is in line with Prediction 1, which expects a strong association between the two. On the other hand, the marked cases and the eventive tuple also have a strong association (NPMI=0.6), just as Prediction 2 expects. Since Hypothesis 7e made the correct Predictions 1 and 2 for my data, I thus conclude that the hypothesis is in line with my data.

Below I will look into the 3 exceptional cases. The cases contain the unmarked process verbs *kesou* ‘cough’, *you* ‘swim’, and *zhuanyou* ‘wander’,

all appearing in sentences which describe a sequence of events. According to my intuition, the cases involve freedom of translation: the eventive source French sentence is translated into a stative Mandarin sentence with the aspectual information changed. See example (16e): *women yiqi you* ‘we were swimming together’ has a stative interpretation, as my own English translation indicates. Although the translation does not convey that the swimming had an endpoint, it is pragmatically inferred from the discourse because another sentence following (16e) asserts the people climbed onto the quayside nearby.

(16) ID 25475

- a. Je l’ai rattrapée, j’ai passé ma main autour de sa taille et nous avons nagé ensemble. [French: *passé composé*]
- b. I caught her up, put my arm round her waist and we swam together. [English: *simple past*]
- c. Ich habe sie eingeholt, habe die Hand um ihre Taille gelegt, und wir sind zusammen geschwommen. [German: *Perfekt*]
- d. Le di alcance, pasé mi mano alrededor de su cintura y nadamos juntos. [Spanish: *pretérito indefinido*]
- e. Wo zhui-shang ta, shen-shou bao-zhu ta-de yao,
I chase-ascend-her stretch-arm hold-stop her waist
women yiqi you. [Mandarin: *unmarked verb form*]
we together swim
‘I caught her up, put my arm round her waist, and we were swimming together.’

(16e) is a stative case but due to my methodology, it is misjudged as an eventive case. The other two process-verb cases are just like (16e). The three are not real exceptions because they involve freedom of translation. I thus treat them as translation noise in the data. Why the translator did the free translation is worth exploration, but I will leave it open here.

To sum up, the Camus subcorpus is in line with Hypothesis 7e, which reconciles and develops Hypotheses 7a and 7d by integrating the studies of de Swart (1998) and Sun (2014). My research indicates that Mandarin sentences with predicates using aspectually unmarked verbs have a stative

interpretation and Mandarin eventive sentences must use grammatical aspectual markers or telicity-indicating methods. Also, Mandarin has a rich inventory of telicity-indicating methods which function within and across clauses.

5.7 Discussion

Previously in Chapter 2, I formulated Hypotheses 7a–7d on aspectually unmarked sentences according to the literature. The association testing in Chapter 4 indicated that Hypothesis 7b (Smith’s (1997) neutral aspect theory) was not in line with my data, while the other three received positive but not-strong statistical evidence. This chapter thus deals with Hypotheses 7a, 7c and 7d. I have reconciled and developed Hypotheses 7a and 7d into Hypothesis 7e by integrating the studies of de Swart (1998) and Sun (2014). Given that Hypothesis 7c, which is inspired by Xiao & McEnery (2004), cannot make predictions as specific as Hypothesis 7e, I hence tested Hypothesis 7e in this chapter. It turned out that Hypothesis 7e received strong statistical evidence in the association testing in Section 5.6. The results indicate that Sun’s (2014) generalizations for Mandarin (un)marked sentences, which are derived from Mandarin data used in out-of-the-blue contexts, can be extended to narrative discourse (the type of data I used), as long as the telicity-indicating methods are also counted as overt expressions of aspect. Hypothesis 7e also gives rise to the conclusion that in the absence of grammatical aspectual markers, Mandarin sentences with predicates using aspectually unmarked verbs have a stative interpretation by default, but sentences have an eventive interpretation if they contain verbs interacting with telicity-indicating methods.

Since my data strongly supports Hypothesis 7e, I do not retain Hypothesis 7c that is incompatible with Hypothesis 7e in their assertions about the interpretations of aspectually unmarked sentences using dynamic eventuality descriptions. My findings reveal the problem of Hypothesis 7c: such aspectually unmarked sentences in discourse are unlike what Xiao & McEnery(2004) claim to let contexts determine their aspectual

interpretations; rather, their interpretations depend on the elements in sentences and their compositional interaction, if any.

Last but not least, the varied members in the Mandarin inventory of telicity-indicating methods confirm Smith & Erbaugh's (2005) statement that telicity (their "boundedness") may be expressed by eventuality descriptions (their "situation type") or other resources of a language. The interaction between verbs and the telicity-indicating methods can happen within verbal or clausal domain, or even across clauses, reflecting the diversified compositional derivations of Mandarin aspect.

5.8 Conclusions

This chapter focused on investigating the aspectual interpretations of aspectually unmarked sentences in Mandarin. Given that the statistical test in Chapter 4 showed evidence supporting Hypotheses 7a and 7d, I reconciled and developed them into a new hypothesis:

Hypothesis 7e: Mandarin sentences with predicates using aspectually unmarked verbs have a stative interpretation. Mandarin sentences with an eventive interpretation must use overt aspectual expressions (including grammatical aspectual markers or telicity-indicating methods).

The telicity-indicating methods, which I proposed in this chapter, are summarized in Table 10.

Telicity-indicating method	Domain
Resultative verb complement (RVC)	Within verbal domain
<i>De</i> -resultative	Within clause domain
Endpoint-indicating phrase (e.g., goal argument)	Within clause domain
Consequent state in the causative construction	Within clause domain
(In)direct speech	Across clause domain
Dynamic telicity indicating	Across clause domain

Table 10: The inventory of Mandarin telicity-indicating methods

Hypothesis 7e is in line with the descriptive statistics (absolute frequency) and the association measure NPMI. Based on Hypothesis 7e, I conclude that in the absence of grammatical aspectual markers, Mandarin sentences with predicates using aspectually unmarked verbs have a stative interpretation as the default but sentences have an eventive interpretation if they contain verbs interacting with telicity-indicating methods.

Since I take a compositionally bottom-up perspective to investigate the Mandarin aspect system, in the coming Chapter 6, I will probe into RVCs, the telicity markers that function within the verbal domain and thus have the closest interaction with verbs. The hypothesis on RVCs, which has not been straightforwardly supported by the statistical test in Chapter 4, will be evaluated again.

Chapter 6

The semantics of resultative verb compounds

6.1 Introduction

Chapter 5 investigated aspectually unmarked sentences in Mandarin and found that they always have a stative interpretation. Moreover, the same chapter also pointed out that the presence of an aspectual expression is a necessary condition for Mandarin sentences to have an eventive interpretation. Since this dissertation adopts a compositionally bottom-up way to explore the Mandarin aspect system, this chapter will zoom into resultative verb complements (RVCs), the aspectual expressions which most closely interact with verbs as telicity indicators, functioning in the verbal domain. As Chapter 2 introduced, the RVC is the second component of the resultative verb compound (RVC compounds hereafter) whose first component is a bare verb. Remember that Chapter 4 tested the hypothesis on RVC compounds that I drew from the lines of Li & Thompson (1981), i.e., an RVC compound denotes a culminated event plus result state (Hypothesis 1). The statistics, however, did not straightforwardly support this hypothesis: although most RVCs in the Camus corpus (41 out of 65) were found to occur in contexts instantiating the eventive tense-aspect tuple Past Perfective, the association between RVCs and the eventive tuple was weak (NPMI=0.1). To

properly interpret the statistics so as to evaluate the hypothesis, Chapter 4 noted that RVCs should be given a more in-depth qualitative analysis. I will tackle this issue in the current chapter.

In fact, the family of RVCs is complex (Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Peck *et al.* 2013) and RVCs are usually classified into three types: completive RVCs, result-state RVCs and directional RVCs (Xiao & McEnery 2004: 160). The subtypes can be described as follows (adapted from Xiao & McEnery 2004: 160–165).

A completive RVC is a verbal or an adjectival morpheme entailing that an event reaches its culmination (e.g., *wan* ‘finished’, *dao* ‘arrive’). Completive RVCs form a closed set, although no agreement has been reached on its members. Commonly mentioned completive RVCs include *zhao* ‘reach’, *cheng* ‘become’, *dao* ‘arrive’, *jian* ‘see’, *zhu* ‘stop’, *wan* ‘finished’, *hao* ‘finished’, etc., (Xiao & McEnery 2004: 162). For example:

(1) ID 26151

- | | | |
|----|--|---|
| a. | J’ <u>ai fait</u> la lettre. | [French: <i>passé composé</i>] |
| b. | I <u>wrote</u> the letter. | [English: <i>simple past</i>] |
| c. | Ich <u>habe den Brief aufgesetzt</u> . | [German: <i>Perfekt</i>] |
| d. | <u>Hice</u> la carta. | [Spanish: <i>pretérito indefinido</i>] |
| e. | Wo <u>xie-hao</u> xin. | [Mandarin: <i>RVC</i>] |
| | I write-finished letter | |
| | ‘I wrote the letter.’ | |

The French verb *ai fait* ‘do’ (1a) is translated into the RVC compound *xie-hao* ‘write-finished’ (1e). The completive RVC is an adjectival morpheme *hao* ‘finished’, specifying that the letter was completely written. Although *hao* means ‘good’ when used as an independent adjective (2), the completive RVC *hao* does not mean the letter has a good quality.¹ Rather, it

¹ *Hao* can also be used as a result-state RVC meaning ‘good’, for example:

Wo yiding yao ba wo de diyi bu dianshiju pai-hao.
 I must want BA I DE first CL TV-play shoot-good
 ‘I must make my first TV play well.’

(Xiao & McEnery 2004: 162)

indicates “completing the task signaled by the first verb” (Li & Thompson 1981: 66).

- (2) Zhangsan shi-ge hao xuesheng.
 Zhangsan be-CL good student
 ‘Zhangsan is a good student.’

Result-state RVCs form an open set which includes a great number of adjectives, e.g., *po* ‘broken’ and *kai* ‘open’ (Xiao & McEnery 2004: 164). Result-state RVCs qualitatively characterize the results of events. For example:

(3) ID 26015

- a. Il a sorti du boudin, il l’ a fait cuire à la poêle, et il a installé des verres, des assiettes, des couverts et deux bouteilles de vin.
 [French: *passé composé*]
- b. He got out some black pudding, fried it up and put some glasses, plates, knives and forks and two bottles of wine on the table.
 [English: *simple past*]
- c. Er hat Blutwurst herausgeholt, hat sie in der Pfanne angebraten und hat Gläser, Teller, Bestecke und zwei Flaschen Wein hingestellt.
 [German: *Perfekt*]
- d. Sacó la salchicha, le dió unas vueltas en la sartén y puso en la mesa vasos, platos, cubiertos y dos botellas de vino.
 [Spanish: *pretérito indefinido*]
- e. Ta na-chu xiangchang, zai guo-li zhu-shu,
 he take-out sausage at pan-in boil-cooked
 you na-chu jiubei, panzi, daocha, liang-ping jiu.
 again take-out wine-glass plate knife-fork two-CL wine
 ‘He took out sausages, boiled them well in a pan, and took out glasses, plates, knives and forks and two bottles of wine.’
 [Mandarin: *RVC*]

The French verb *a fait* ‘do’ (3a) is translated into the RVC compound *zhu-shu* ‘boil-cooked’ (3e). The adjectival result-state RVC *shu* ‘cooked’ specifies the result of frying: the sausages were ready to eat.

Directional RVCs form a closed set consisting of directional verbs such as *lai* ‘come’, *qu* ‘go’, *shang* ‘ascend’, *xia* ‘descend’ and their combinations such as *xia-lai* ‘descend-come’ (Xiao & McEnery 2004: 164). They specify the locative direction related to the goal of the event. For example:

(4) ID 26011

- a. Il a sorti du boudin, il l’a fait cuire à la poêle, et il a installé des verres, des assiettes, des couverts et deux bouteilles de vin.
[French: *passé composé*]
- b. He got out some black pudding, fried it up and put some glasses, plates, knives and forks and two bottles of wine on the table.
[English: *simple past*]
- c. Er hat Blutwurst herausgeholt, hat sie in der Pfanne angebraten und hat Gläser, Teller, Bestecke und zwei Flaschen Wein hingestellt.
[German: *Perfekt*]
- d. Sacó la salchicha, le dio unas vueltas en la sartén y puso en la mesa vasos, platos, cubiertos y dos botellas de vino.
[Spanish: *pretérito indefinido*]
- e. Ta na-chu xiangchang, zai guo-li zhu-shu,
he take-out sausage at pan-in boil-cooked
you na-chu jiubei, panzi, dao cha, liang-ping jiu.
again take-out wine-glass plate knife-fork two-CL wine
‘He took out sausages, boiled them well in a pan, and took out glasses, plates, knives and forks and two bottles of wine.’
[Mandarin: *RVC*]

The Mandarin translation for the French verb *a sorti* ‘leave’ (4a) is *na-chu* ‘take-out’ (4e). The directional RVC *chu* ‘out’ specifies that the sausages were out of the place in which they had been stored.

Besides the three subtypes, some RVC compounds are frozen expressions whose meanings cannot be compositionally derived from their

components (Li & Thompson 1981: 68). For example, the RVC compound *kan-chu-lai* ‘look-out-come’ means “realize”(5e), translating the French verb *ai vu* ‘see’ (5a).² The “realize” meaning is not compositionally derived from the verb *kan* ‘look’ and the directional RVC *chu-lai* ‘out-come’.

(5) ID 26147

- a. Quand il m’ a dit le nom de la femme, j’ai vu que c’était une
Mauresque. [French: *passé composé*]
- b. When he told me the girl’s name I realized she was Moorish.
[English: *simple past*]
- c. Als er mir den Namen der Frau genannt hat, habe ich gemerkt, daß
es eine Maurin war. [German: *Perfekt*]
- d. Cuando me dijo el nombre de la mujer, comprendí que era una
mora. [Spanish: *pretérito indefinido*]
- e. Ta gaosu wo na nüren de mingzi,
he tell me that woman DE name
wo kan-chu-lai shi ge moerren. [Mandarin: *RVC*]
I look-out-come be CL Moorish
‘When he told me the girl’s name I realized she was Moorish.’

The RVCs in (1), (3), (4), and (5) all occur in contexts instantiating the eventive tense-aspect tuple Past Perfective. This means the Mandarin data using the RVCs have an eventive interpretation. However, the examples also show that RVC subtypes specify different meanings. To obtain a thorough understanding of the aspectual contributions made by RVCs, it is useful to decompose RVC compounds. Sybesma (1999: 58) proposes an influential syntactic proposal for RVCs by analyzing them as the heads of small clauses that complement main verbs, but I will use Ramchand’s (2008) “first-phase syntax” framework to accomplish this task because, to my knowledge, it is the only syntactic-semantic framework that not only has the proper granularity to syntactically decompose RVC compounds but also associates the syntax with a semantics which is compatible with the neo-Davidsonian

² *Kan-chu-lai* ‘look-out-come’ can also mean ‘see’, such as *Wo kan-chu-lai ta hen haipa* ‘I saw that he was scared.’

event semantics I have used throughout the dissertation (recall Chapter 2), i.e., a post-Davidsonian event semantics.

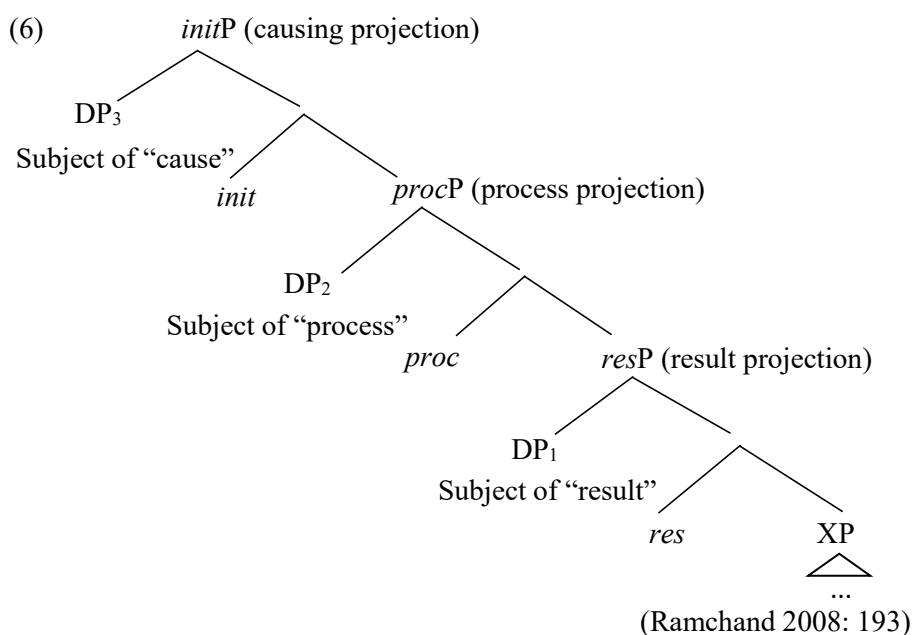
The chapter is structured as follows. Section 6.2 introduces the first-phase syntax, with illustrations from English. Section 6.3 uses it to decompose the aforementioned examples of RVC compounds and reflects on the differences between English and Mandarin in terms of deriving telicity. Section 6.4 introduces the post-Davidsonian event semantics and applies it to analyze the semantics of RVC compounds. Then Section 6.5 re-examines Hypothesis 1 based on the analysis given of RVC compounds in the previous sections. Section 6.6 exploits the first-phase syntax to analyze other telicity-indicating methods which function within clauses (recall Chapter 5). Section 6.7 concludes the chapter.

6.2 A first-phase syntax

Ramchand (2008: 42) argues that a single verbal item may be internally complex and thus can be decomposed into several verbal heads “in a regular and systematic way”. Therefore she proposes a first-phase syntax to deal with the internal complexity of verbal items at the lexicon-syntax interface. The term “syntax” refers to a linguistically specific combinatorial system of human linguistic competence (Ramchand 2008: 1) while “first-phase” refers to “a phase for the assignment of idiosyncratic encyclopedic information” (Ramchand 2008: 141), corresponding to the canonical VP shell or *vP*. Crucially, Ramchand investigates not only simplex verbs but also complex predicates, that is, verbs augmented by result expressions. Hence her framework is appealing for the decomposition of RVC compounds. This section illustrates the backbone of the framework with Ramchand’s English data. The semantics of the framework will come later in Section 6.4.

The framework assumes that there is a mapping between event structure and syntactic structure (Hale & Keyser 1993; Travis 2010; among others). Its essence is a template of event structure represented by a sequence of functional phrases in a syntactic tree (6). In traditional neo-Davidsonian event semantics, eventualities are primitive and verbs are predicates over eventualities (see Section 2.2). Ramchand decomposes eventualities into

subeventualities, and accordingly, verbs are decomposed into several verbal heads constituting the phrasal heads in the template. The template also includes event participants, i.e., the arguments (or complements) of verbs.



Ramchand argues that a maximal event consists of three subeventualities: a causing (sub-)state,³ an intermediate (sub-)process and a result (sub-)state.⁴ They are represented by three phrases: *initP* (the initiational causing projection), *procP* (the process projection) and *resP* (the result projection). The syntax is built through the Merge operation.⁵ The phrasal heads, *init*, *proc* and *res*, are usually “identified” (in Ramchand’s word) by verbs (but can also be identified by other syntactical categories such as adjectives and

³ For simplicity, I do not specify the *sub-* prefix in the rest of the dissertation when the first-phase syntax is applied, unless necessary.

⁴ Ramchand (2008: 42) assumes that the causing subeventuality is a state for theory-internal reasons: it allows a simpler ontology and also a simpler analysis of state verbs. However, she leaves it open whether the causing subeventuality should indeed ultimately be analyzed as a state or, instead, as another eventuality type.

⁵ Ramchand uses the capitalized Merge to refer to the binary combinatoric operation in the trees.

null items, see later discussion). Verbs in the lexicon carry between one and three features from the set {init, proc, res} and the features carried by verbs determine the phrasal heads that the verbs associate with. Features and their bundles determine verb classes (e.g., [init, proc] verb or [proc] verb), which partially or fully instantiate the structure (6). Ramchand's verb classes can be translated into the three-fold eventuality descriptions adopted by the dissertation (recall Section 2.3.1) as follows. State verbs are assumed to project *initP*.⁶ Dynamic verbs (process verbs and event verbs) obligatorily project *procP* and optionally project *initP* and/or *resP*: *initP* appears when a causing state is encoded by the verbal item, while *resP* appears when the verbal item lexicalizes the result state. The Vendlerian predicate classification can also be reformulated accordingly. For example, activities correspond to either [init, proc] or [proc] verbs and achievements are [init, proc, res], or [proc, res] verbs (Ramchand 2008: 196). The translation between Ramchand's verb classes and the three-fold eventuality descriptions/Vendlerian classification will be used occasionally in the rest of the dissertation.

Furthermore, Ramchand (2008: 58) assumes that a lexical item is a bundle of multi-modal information (syntactic, conceptual, phonological...) among which the syntactic information (e.g., the features [proc], [res]) is accessed and processed by the linguistic computational system. For example, with the [proc] feature, a verb projects a *procP* and it also carries lexical-encyclopedic information about the process (more specific information about the process can be elaborated by the complement of *proc*). The syntactic information restrains the usage of verbal items, leading to the lexical selection of verbs.

The specifiers of phrases are event participants, identified by arguments or complements of verbs. Engaging with the ideas of constructionalism (Goldberg 1995; Borer 2005), Ramchand abandons using the classical thematic roles of neo-Davidsonian event semantics (e.g., Agent, Theme, see Section 2.2) to interpret event participants but reinterprets them in a more general way according to the abstract roles they play in subeventualities. She

⁶ See Ramchand (2008: 56) for syntactic and ontological considerations for this assumption.

creates the notions INITIATOR, UNDERGOER and RESULTEE to refer to the semantic subjects of subeventualities. INITIATOR, UNDERGOER, and RESULTEE are introduced by the specifiers of *initP*, *procP* and *resP*, respectively. INITIATOR is the participant that causes the eventuality as a whole, which is usually identified by the external argument of the verb. UNDERGOER is the participant experiencing the process of the eventuality. RESULTEE is the participant holding the result state. Depending on the specific verb classes, INITIATOR, UNDERGOER, and RESULTEE can be expressed by different or the same DP(s) in a given sentence. Thus composite roles such as RESULTEE-UNDERGOER are also possible.

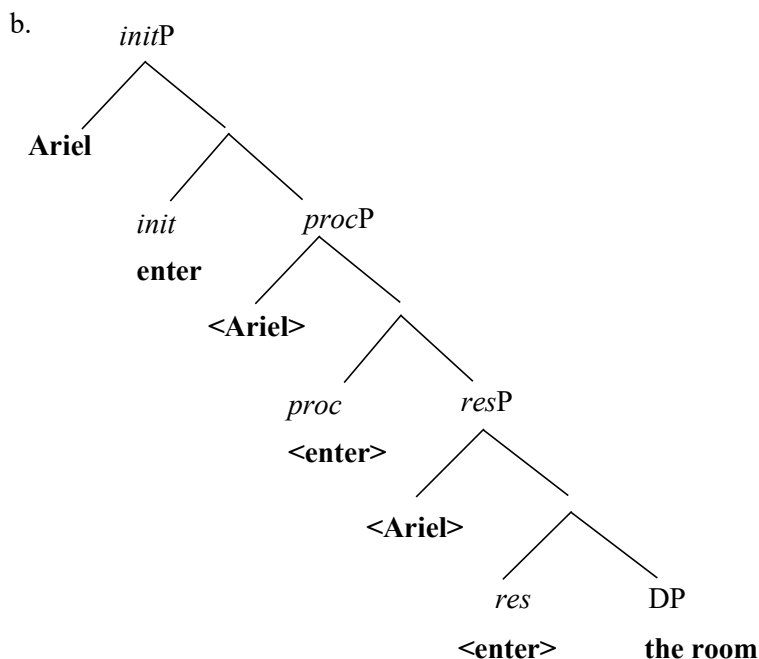
With the introduction to elements in the template in place, let us look at how they are systematically combined. Driven by the idea that the semantics of elements in the template are compositionally combined to produce the semantics of eventualities, Ramchand assigns each syntactic position a semantic interpretation and assumes each phrase has a subject-predicate structure. The specifier is the semantic subject predicated by the head-complement complex. The head carries the basic predicative information of the subeventuality and its complement specifies further predicative information about the head. Canonical thematic arguments identify specifiers whereas canonical rhematic arguments identify complements of phrasal heads.

To sum up, the gist of the framework is that a maximal eventuality can be decomposed into three subeventualities, represented by the hierarchical phrase structure (6). (6) displays the syntax of the first phase, showing primitives of eventualities. Inspired by English, Ramchand (2008) shows that the framework also accounts for other languages such as Hindi/Urdu and Russian. She argues that (6) is a universal template of event structure, although there is superficial morpho-syntactic variation of verbal items cross-linguistically.

For concreteness, let us look at the example (7a). The verb *enter* in (7a) describes a spatial change. It encodes the lexical-encyclopedic information about the kinds of actions required to initiate and undergo an entering event and the result of final arrival. Therefore, *enter* is an [init, proc, res] verb,

associated with the heads *init*, *proc* and *res* (7b).⁷ The complement of *res* specifies the final location: a context-specific room.

(7) a. Ariel entered the room.



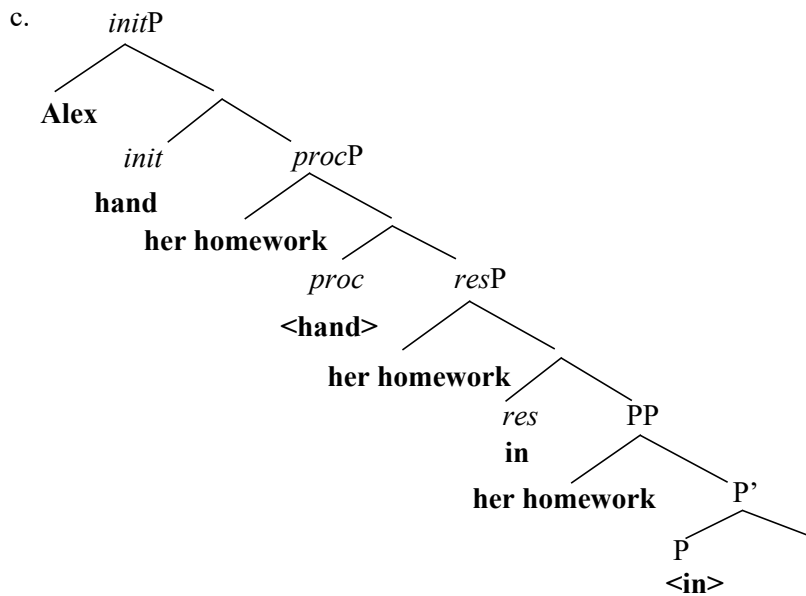
(Ramchand 2008: 76)

The result state encoded by *enter* gives an endpoint to the entering. Therefore, (7a) conveys a culminated event. Verbs which have the [res] feature such as *enter* and *arrive* denote culminated events because they lexicalize result states. As such, the head *res* is a source of telicity.

⁷ Here is one notation issue: angle brackets indicate copies of lexical items. The bracketed copy is simply a representation of Rmerge (Move) for a perspicuous consideration (Ramchand 2008: 59–60). Rmerge is a technique to reflect the intuition that one lexical item can project more than one category label, and thus be associated with more than one position in the syntax. Accordingly, Ramchand abandons two conventional assumptions: (i) verbs are inserted at a single node; (ii) the initial Merge position is privileged. The lexical item is spelled out at its highest position in the first-phase representation, but complications may be needed for high levels of the clause, see footnote 6 in Ramchand (2008: 59).

English verbal particles also encode result states by having the feature [res] as part of their lexical specification (Ramchand 2008: 134). For example, the main verb *hand* in (8a) is associated with *init* and *proc* in (8c), and the particle *in* with *res*. English allows particle shift, i.e., the particle can appear in post-verbal position (8a) or post-object position (8b). To account for that, Ramchand assumes that English verb-particles are derived from a lower PP and obligatorily move to *res*.⁸ In the lower PP, the nominal phrase *her homework* is the semantic subject of the stative predicate *in*. The different word orders are determined by the position where the DP object is spelled out. It could be the lower specifier of the PP (8b) or the higher specifier of the PP (8a). Treating particles as intransitive versions of prepositions (Emonds 1976), Ramchand (2008: 131–132) assumes that they do not have explicit complements, so she leaves the complement of P blank.⁹

- (8) a. Alex handed in her homework.
 b. Alex handed her homework in.



⁸ This is represented using the copy theory of movement, recall footnote 7.

⁹ Ramchand (2008: 132) left the UNDERGOER (specifier of *proc*) blank in her representation. I insert *homework* in that position, following *Mary sent the schedules out to the shareholders*, which has *the schedules* as the UNDERGOER, see Ramchand (2008: 137).

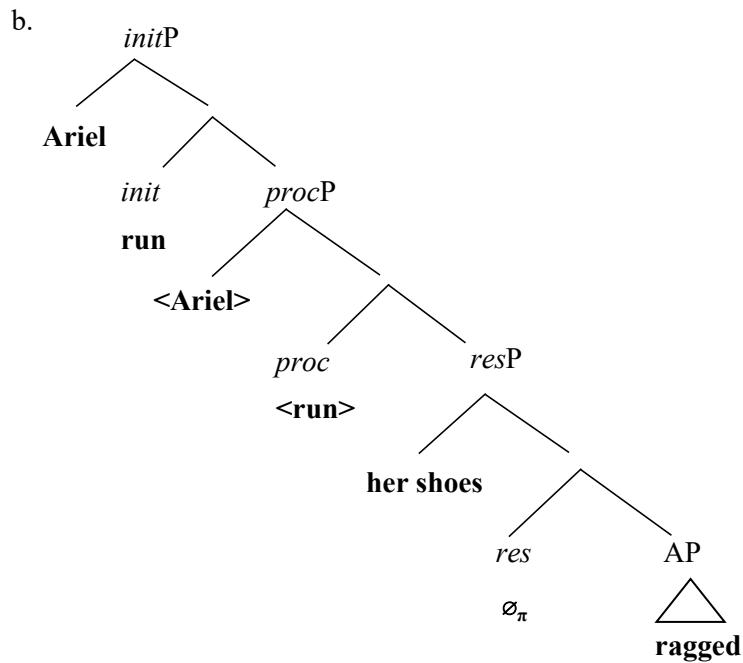
(7a) and (8a) show that verbal items bearing the [res] feature give rise to telicity. In addition to *res*, Ramchand points out that there are another two sources of telicity: the complement of *res* and the complement of *procP* (when no *resP* is projected). I will explain them below.

The second source of telicity is the complement of *res* which elaborates on the result state encoded by *res*. Secondary predicates are typical examples providing telicity in this way. In (9a), the main predicate *run* encodes the initiation and process information of a running action, thus associated with *init* and *proc* (9b). The adjective *ragged* is a secondary predicate specifying the result state, namely Ariel's shoes becoming ragged. World knowledge gives the pragmatic inference that the running caused the raggedness. Importantly, Ramchand (2008: 124) argues that APs, unlike VPs, cannot license a specifier position.¹⁰ To host the specifier of *res* (i.e., RESULTEE), Ramchand proposes a null *res* head \varnothing_{π} (9b) for English, which has a general meaning of “property possession”. \varnothing_{π} sets no semantic restriction on its complement except requiring it to satisfy real-world “felicity” (Ramchand 2008: 138). With the support of \varnothing_{π} , *ragged* constitutes the complement of *res*. The process is temporally independent from the result state headed by the null *res* (Ramchand 2008: 131). The telicity of running is derived from the causal relation that requires the process to temporally precede the result state.¹¹ The combination of a *res* head with a predicative complement denoting a static property is called result augmentation (Ramchand 2008: 125–126).

(9) a. Ariel ran her shoes ragged.

¹⁰ This idea is following Baker (2003). Specifically, Baker (2003: 23, 224) argues that adjectives are distinguished from verbs in that adjectives do not have specifiers, unless supported by a functional head *Pred*, but verbs are defined as the lexical category which has specifiers. The underlying reason is that adjectives do not assign theta-roles but verbs do.

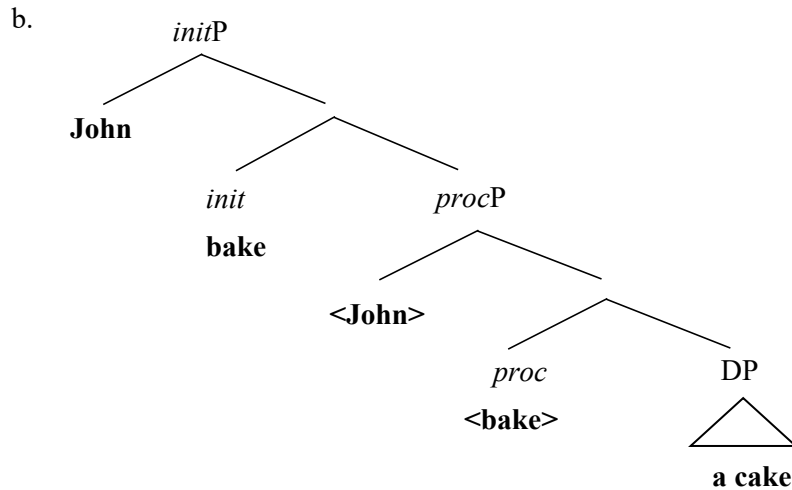
¹¹ The temporal order is constrained by *proc-res* coherence (Ramchand 2008: 130). I will discuss it in Section 6.4.1.



(Ramchand 2008: 124)

The configuration in (9b) is similar to (7b) and (8b) because all the examples have *resP* as their source of telicity. However, in cases where verbs do not bear the [res] feature, such that no *resP* is projected, sentences can still convey culminated events, see (10a). The DP object *a cake* provides telicity in (10a). This indicates that the complement of *proc*, where the DP is introduced, is the third source of telicity. The first-phase representation of (10a) is shown by (10b).

(10) a. John baked a cake.



(Ramchand 2008: 69)

Bake is an [init, proc] verb because it gives the lexical-encyclopedic information about the initiation and process of a baking action. Since *John* initiated and continuously experienced the baking event as a willful controller, he is an UNDERGOER-INITIATOR.¹² The DP *a cake* denotes an individual cake which came into being when the baking event culminated (known as the incremental Theme in the literature, see Section 2.3.1). The baking event is measured out by the changed extent of the material substance constituting the cake. Such a measuring-out function is interpreted by Ramchand as playing the role of Path in the eventuality, as the developmental process of a dynamic event is conceived by her as an abstract path. Path is associated with the complement of *proc*, where the DP *a cake* is located (10b). Additionally, the indefinite article *a* can be interpreted in a quantificational way so that the sentence could be understood as expressing that one cake rather two cakes were baked. In such a way, the DP still determines the endpoint of the event, although the event is measured out not by the quality of the material substance but by its quantity.

¹² Many so-called volitional Agents or Actors in the literature are UNDERGOER-INITIATORS (Ramchand 2008: 53, 55).

Ramchand (2008: 50–51) technically defines Path as a relation between the subeventuality introduced by *proc* and the entity *x* (e.g., a cake) denoted by the complement of *proc* such that a property of *x* is monotonic (in the same spirit of Krifka (1989)'s homomorphic, see Section 2.3.1) with the part-whole structure of the subeventuality (e.g., baking). If the property of *x* is quantized, then the measured quantity of *x* is mapped to the part-whole structure of the subeventuality, rendering the subeventuality an endpoint (See Chapter 7 for the formalization). In such a way, the complement of *proc*, which denotes *x*, plays a bounded Path role. Since the property of *x* is measured in the context, it is not simply regulated by the denotation of *x* but also by the context under pragmatic restriction. For example, the context in (10a) determines whether the interpretation of the DP *a cake* is quantificational or existential, which further decides whether the property being measured is quantitative or qualitative.

Besides quantized DPs such as *a cake* in (10a), PPs and APs can also denote entities playing bounded Path roles, such as spatial paths (e.g., *to the store* in (11b)) or closed-scale gradable properties (e.g., *clean* in (11b)¹³). Ramchand's idea that telicity can be introduced by the complement of *proc* is in line with the insights given by Verkuyl (1972, 1993) and Krifka (1989) that a quantized feature carried by a non-verbal item can be transferred to an event through syntactic composition.

- (11) a. John pushed the cart to the store.
 b. John wiped the table clean.

(Ramchand 2008: 68, 122)

So far I have shown that telicity in English has three sources: *res*, the complement of *res*, and the complement of *proc*. The lexicon, syntactic composition and pragmatic inference can all give rise to telicity. In English, telicity is either encoded by verbs, or is compositionally derived in two ways: (i) combining an [init, proc] verb with a bounded Path complement; (ii) result augmentation. Telicity is derived by (i) through the monotonicity

¹³ *Clean* is a closed-scale gradable adjective, as it is compatible with proportional modifiers such as *completely*, *half*, etc.

between an event and the property of a Path entity¹⁴ and by (ii) through the causal relation between an event and its result state.

The next section will apply Ramchand's framework to analyze the RVC compounds which were introduced in Section 6.1. I will show that Mandarin has many mirror images of the English examples which were analyzed in this section. However, I will argue that Mandarin only introduces telicity through *resP*, either by *res* itself, or its complement. The presence/absence of *resP* determines whether a Mandarin predicate is telic or atelic.

6.3 The first-phase representations of RVC compounds

This section will decompose RVC compounds according to the first-phase syntax. A snapshot is that RVCs are lexical items embedded in *resP*, specifying the result states of events. The phrase structures I propose below only reflect the semantically compositional order of Mandarin morphemes/lexical items. Hence the orders of Mandarin morphemes/lexical items in the trees are not always consistent with their linear orders in the clauses under investigation.

6.3.1 RVC as the complement of *res*

I start with the completive RVC (1e), which is copied in (12):

(12) ID 26151

Wo	<u>xie-hao</u>	xin.	[Mandarin: RVC]
I	write-finished	letter.	
	'I wrote the letter.'		

In (12), the creation verb *xie* 'write' forms a compound with the completive RVC *hao* 'finished', which indicates that the full letter was finished. The bare noun *xin* 'letter' refers to a context-specific letter.¹⁵ (13a) indicates the

¹⁴ Vendlerian accomplishments are examples of (i), see Ramchand (2008: 196).

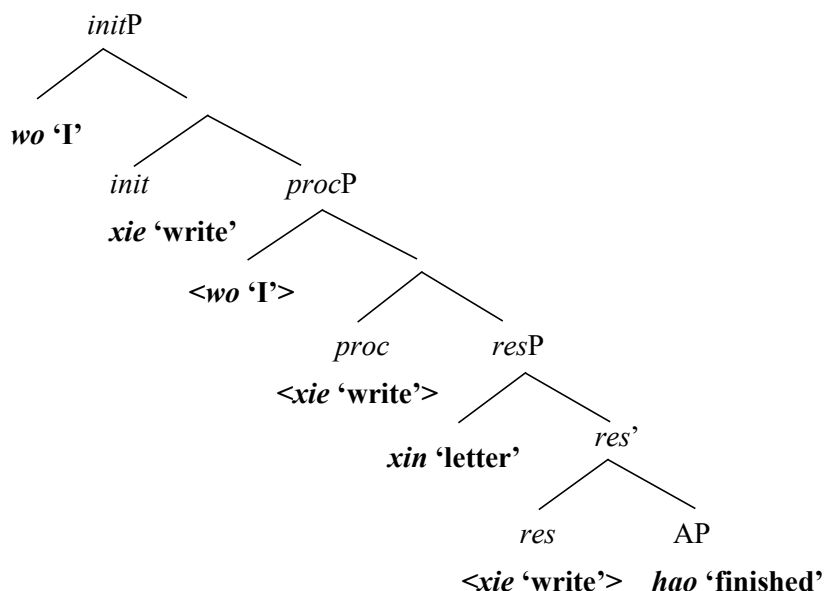
¹⁵ In Mandarin (an article-free language), the interpretation of bare nouns is context-dependent (Sybesma 1999:173). More discussion see Cheng & Sybesma (1997). The co-occurrence of bare nouns and RVCs will be discussed in Section 7.6.

culmination of writing event in (12) is non-cancelable. In contrast, the culmination interpretation of sentences marked by the grammatical marker post-verbal *le* is cancelable (Remember Chapter 5 concluded that eventive Mandarin sentences must use grammatical aspectual markers or telicity-indicating methods). See (13b,c) copied from Section 2.4.1, both describe writing events by marking *xie* ‘write’ with post-verbal *le*. The culminated interpretation is only a conversational implicature in (13b), which can be canceled (13c). Even when the object DP is modified by the quantifier *yi-feng* ‘one-CL’, the culminated interpretation of (13b) is still an implicature rather than entailment.

- (13) a. *Zhangsan xie-hao (yi-feng) xin,
 Zhangsan write-finished (one-CL) letter,
 keshi xin neirong bu wanzheng.
 but letter contents not complete
 *‘Zhangsan wrote a letter but the contents of the letter were incomplete.’
- b. Zhangsan xie-le (yi-feng) xin,
 Zhangsan write-LE (one-CL) letter,
 (zheng-feng xin hen duan).
 (whole-CL letter very short)
 ‘Zhangsan wrote a letter (, and the whole letter was very short).’
- c. Zhangsan xie-le (yi-feng) xin, keshi mei xie-wan.
 Zhangsan write-LE (one-CL) letter, but not write-finished
 ‘Zhangsan (partially) wrote a letter but he didn’t finish it.’

The comparison between (12) and (13a,b,c) reflects that the presence of RVCs is crucial for sentences to denote culminated events. I will distinguish the aspectual contribution made by post-verbal *le* from RVCs in the next chapter. Since *hao* ‘finished’ lexicalizes the result, the first-phase representation of (12) contains *resP*, as (14) shows.

(14)



According to Ramchand (2008: 53), the volitional subject is the UNDERGOER-INITIATOR of a creation event. Therefore, *wo* 'I' is the UNDERGOER-INITIATOR in (14), which initiated and carried out the writing event (cf., *John* in *John baked a cake* (10b) in Section 6.2). The DP object *xin* 'letter' is the holder of the result state "being finished" in (14), playing the RESULTEE role at the specifier of *resP* (Due to the projection of *resP*, *xin* 'letter' in (14) cannot take the complement of *proc* as the object *a cake* in (10b) does. The only possible position for *xin* 'letter' is the specifier of *resP*).

In (14), the Mandarin verb *xie* 'write' is associated with *init*, *proc* and *res*, while the completive RVC *hao* 'finished' is associated with the complement of *res*. *Xie* 'write' straightforwardly fills the positions of *init* and *proc* because it provides the information required for initiating and carrying out the writing event. A point which needs further explanation is why *xie* 'write' also identifies the content of *res*. Here are my reasons:

First, and importantly, assuming *xie* 'write' and *hao* 'finished' as sister nodes in *resP* neatly represents the fact that it is the combination of the two morphemes rather than anyone of them on its own which derives the

culminated interpretation. Recall that, in Section 6.1, (2) shows that *hao* means ‘good’ when used alone as an adjective. Furthermore, (13b, c) show that *xie* ‘write’ only bears the [init, proc] features when used independently. The fact that *xie* ‘write’ does not entail telicity is also reflected by the “zero-effect” shown in (15).

- (15) Ta yong mei mo de gangbi xie zi, shenme ye
 he use not ink DE pen write character anything too
 mei xie-cheng.
 not write-become.
 ‘He used a pen without ink to write characters, and nothing was
 written.’

(15) indicates that *xie* ‘write’ does not entail the result that something is written. In other words, the writing event causes the zero-effect.

Therefore, the entailment that something was in the result state of being written and the written thing was in the state of being finished only arises when *xie* ‘write’ and *hao* ‘finished’ are compounded. In the first-phase syntax, phrasal heads and their complements both predicate over the specifier, with the former acting as the main predicate and the latter providing more information about the subeventuality introduced by the former (recall Section 6.2). Placing *xie* ‘write’ at *res* and *hao* ‘finished’ at its complement accurately reflects the predicate-complement relation between them. Then, *xie* ‘write’ and *hao* ‘finished’ Merge into the mother node *res*’ that further Merges with the specifier *xin* ‘letter’, providing *xin* ‘letter’ with predicative content that it is in the state of being written and being finished. Consequently, *res*P encodes that the letter is being written and being finished, which is entailed by (12).¹⁶

The second reason is theory-internal and two-fold. Firstly, if *hao* ‘finished’ rather than *xie* ‘write’ identified *res*, the classical binary branching

¹⁶ My analysis is comparable to that of Sybesma (1999: 31–32), who proposes that the RVC is syntactically embedded in a small clause that complements the main verb and that the RVC raises to the main verb at the surface structure (if raising is possible). Sybesma’s small clause is comparable to *res*P.

would clash because nothing complemented *hao* ‘finished’. To rescue the structure, I assume that *xie* ‘write’ is associated with *res*. Also, adjectives cannot constitute phrasal heads such as *res* in the framework because they do not license specifiers as verbs do (see Section 6.2). Secondly, I cannot follow the *run-shoes-ragged* example (9b) to assume a null *res* head \varnothing_{π} for (14), because \varnothing_{π} connects two subeventualities temporally independent from each other but casually related through pragmatic inference. Here the writing event and the state of being finished are not temporally independent and they are semantically rather than pragmatically related. Since \varnothing_{π} is unavailable, I have to assume that *xie* ‘write’ constitutes *res*.

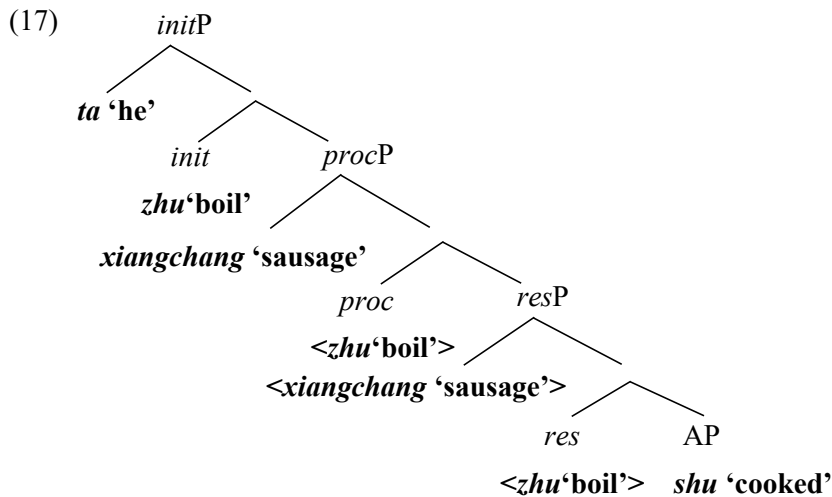
To sum up, Ramchand’s framework reflects a sharp compositional difference between English and Mandarin in terms of encoding telicity: Mandarin obligatorily uses *resP* to introduce telicity but English does not. The English sentence *I wrote a letter* would have a *resP*-free representation just like (10b), with *write* associated with *init* and *proc*, and *a letter* constituting the complement of *proc*. *A letter* as a bounded Path provides an endpoint to the writing process through monotonicity (recall Section 6.2). Telicity is derived from the quantizedness of *a letter*, introduced at the complement of *proc*. Nevertheless, although at first sight *xin* ‘letter’ in *Wo xie-hao xin* ‘I write-finished letter’ would play a bounded Path role as *a letter* does, actually it does not. Telicity is derived from the adjectival content of the RVC introduced at the complement of *res*. Here *xin* ‘letter’, despite referring to a specific letter (and thus having implied quantizedness), cannot render an endpoint to the writing process. The monotonic mechanism does not arise when the RVC is used.

Having analyzed the completive RVC, I move to result-state RVCs. Result-state RVCs qualitatively characterize the results of events, such as (16a) copied from (3e). The verb *zhu* ‘boil’ compounds with the result-state RVC *shu* ‘cooked’ in (16a). *Shu* ‘cooked’ specifies the final state the sausages obtained as a result of being boiled, namely being ready to eat.

(16) ID 26015

- a. Ta na-chu xiangchang, zai guo-li zhu-shu,
 he take-out sausage at pan-in boil-cooked
 you na-chu jiubei, panzi, dao-cha, liang-ping jiu.
 again take-out wine-glass plate knife-fork two-CL wine
 ‘He took out sausages, boiled them well in a pan, and took out
 glasses, plates, knives and forks and two bottles of wine.’
 [Mandarin: RVC]
- b. Ta na-chu xiangchang, ta zai guo-li zhu-shu
 he take-out sausage he at pan-in boil-cooked
xiangchang [...]
 sausage
 ‘He took out sausages, boiled them well in a pan, [...]’

In (16a) the clause *zai guo-li zhu-shu* omits the subject *ta* ‘he’ and the object *xiangchang* ‘sausage’ because they are introduced in the previous clause (“He took out sausages”). This omission is a discourse cohesion method to connect clauses. (16b) shows the full-fledged clause and (17) gives the first-phase representation. (17) ignores the PP *zai guo-li* ‘in the pan’, which specifies the location of boiling, given that Ramchand (2008) does not discuss the position of PP modification.



Importantly, although the result-state RVC *shu* ‘cooked’ is a closed-scale gradable adjective¹⁷ just like *clean*, it is not a bounded Path like *clean* in *John wiped the table clean* (11b), but rather a RESULTEE characterizing the result state, hence constituting the specifier of *resP* rather than the complement of *proc* (the Path position). Just like *xie* ‘write’, *zhu* ‘boil’ bears the features [init, proc] and does not entail culmination when used alone (cf. used in RVC compounds), see (18). I thus argue that *zhu* ‘boil’ constitutes *init*, *proc* and *res*, while *shu* ‘cooked’ constitutes the complement of *res*, based on the same reasons I gave for the completive RVC compound *xie-hao* ‘write-finished’ in (12).

- (18) Zhangsan zhu xiangchang yong shi tai duan,
 Zhangsan boil sausage use time too short,
 xiangshang mei shu.
 sausage not cooked
 ‘Zhangsan boiled sausages in too short a time and the sausages
 were not ready to eat.’

In (17), *xiangchang* ‘sausage’ is predicated by *zhu* ‘boil’, which asserts the result state of being boiled, and also by *shu* ‘cooked’, which elaborates on the state by asserting that it reaches the degree “ready-to-eat”. As for event participants, the volitional subject *he* is the INITIATOR. The object *xiangchang* ‘sausage’ is different from the object *xin* ‘letter’ in the writing example (12) because the sausages already existed before the boiling, whereas the letter was an outcome of the writing. Since the sausages underwent a property change and finally became ready-to-eat, *xiangchang* ‘sausage’ plays a composite role of RESULTEE-UNDERGOER, filling the specifiers of *procP* and of *resP* (cf. the analysis of *the potato* in *John baked the potato (for two hours)* in Ramchand (2008: 68–69)).

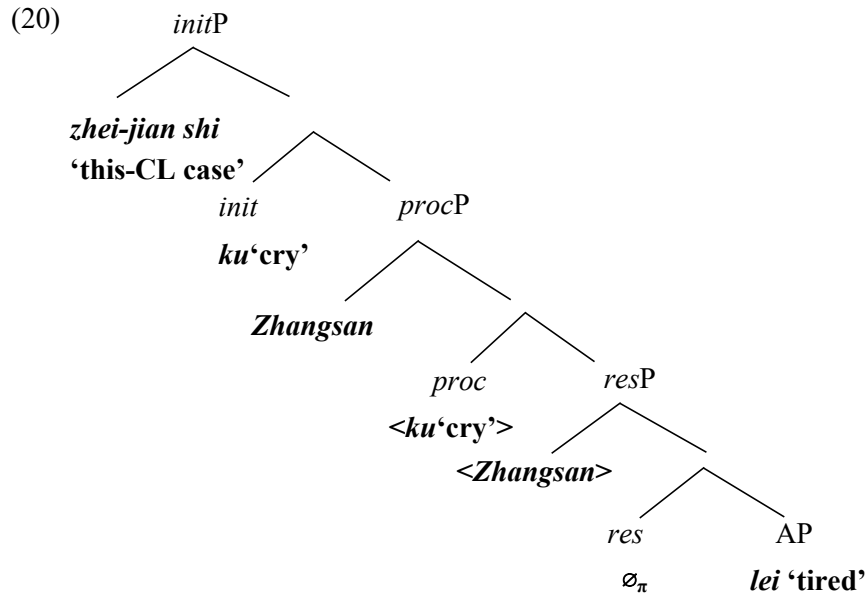
Interestingly, some result-state RVCs behave like mirror images of English secondary predicates. Although the Camus corpus does not include

¹⁷ The closed-scale gradable property of *shu* ‘cooked’ is indicated by its acceptance of proportional modifiers, such as *san-fen shu* ‘thirty percent cooked’, *quan shu* ‘completely cooked’, etc.

any RVCs in this use, (19) is an example copied from Sybesma (1999: 37) where the result-state RVC *lei* ‘tired’ mirrors *ragged* in (9a). The RVC compound *ku-lei* ‘cry-tired’ is marked by the post-verbal *le* but I will systematically ignore the marker in this chapter and analyze it in Chapter 7.

- (19) Zhei-jian shi ku-lei-le Zhangsan.
 this-CL case cry-tired-LE Zhangsan.
 ‘This thing got Zhangsan tired from crying.’

(19) conveys that a context-specific “thing” made Zhangsan cry so that Zhangsan became tired. The RVC compound *ku-lei* ‘cry-tired’ consists of the process verb *ku* ‘cry’ and the result-state RVC *lei* ‘tired’, which describes the final state of Zhangsan. World knowledge gives rise to the causality between the crying process and the tired state. (20) is the first-phase representation of (19), mirroring the representation (9b) for the English secondary predicate case (9a). *Ku* ‘cry’ is associated with *init* and *proc* because it does not encode the result. The adjectival RVC *lei* ‘tired’ constitutes the complement of *res* rather than *res* itself because, unlike verbal heads, APs cannot license specifiers (see Section 6.2). Ramchand argues that English secondary predicates need the possessional null *res* \varnothing_π to license the RESULTEE. Following Ramchand, I assume that *lei* ‘tired’ needs the support of \varnothing_π so that it can add result information just like the secondary predicate *ragged* in (9a). The subject *zhei-jian shi* ‘this-CL case’ is the INITIATOR causing the crying. Zhangsan experienced the crying process and obtained the result state “tired”, thus constituting a RESULTEE-UNDERGOER.



So far I have discussed completive and result-state RVCs. They contribute to eventuality descriptions by specifying result states. They constitute the complement of *res*, and some result-state RVCs are mirror images of English secondary predicates. Crucially, I argue that although telicity can be derived through the monotonicity between events and bounded Paths in English, this derivation of telicity is not attested in Mandarin. Instead, Mandarin needs *resP* to introduce telicity, even in sentences with elements which can function as bounded Paths, e.g., quantized objects or closed-scale gradable adjectives.¹⁸ Next, I will analyze another RVC subtype, namely directional RVCs.

6.3.2 RVC as *res* head

Section 6.1 introduced the fact that directional RVCs can indicate locational changes, such as the directional RVC *chu* 'out' in (4), copied in (21):

¹⁸ However, the monotonicity between events and bounded Paths can give rise to a culminated interpretation as a conversational implicature when verbs are marked by post-verbal *le*. I will discuss this phenomenon in Chapter 7.

(21) ID 26011

Ta na-chu xiangchang, zai guo-li zhu-shu,
 he take-out sausage at pan-in boil-cooked
 you na-chu jiubei, panzi, daocha, liang-ping jiu.
 again take-out wine-glass plate knife-fork two-CL wine
 ‘He took out sausages, boiled them well in a pan, and took out
 glasses, plates, knives and forks and two bottles of wine.’

[Mandarin: RVC]

The verb *na* ‘take’ only bears [init, proc] features, not entailing the culmination meaning that something ends up held in the subject’s hands, see (22).

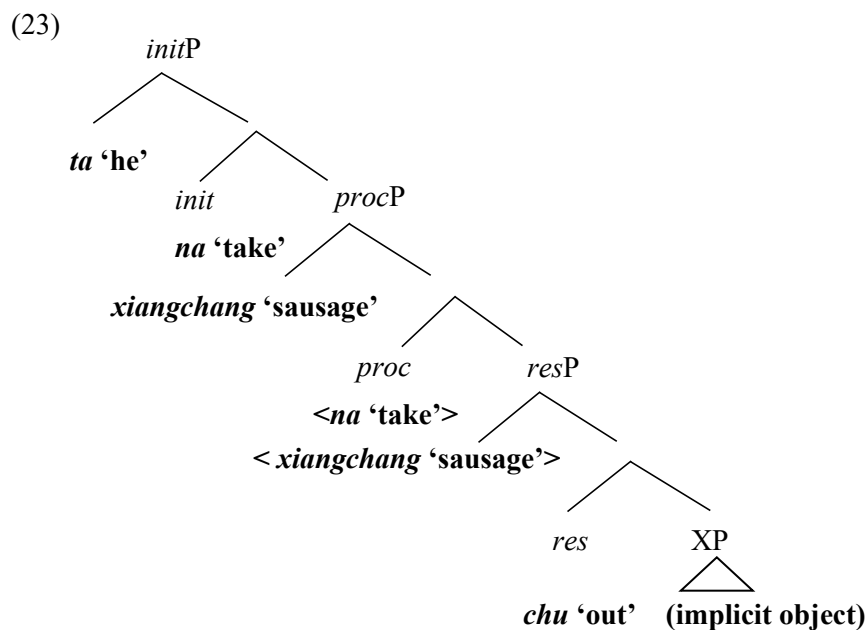
(22) Zhangsan na huaping shi bu xiaoxin
 Zhangsan take vase when not careful
 da-po-le huaping.
 beat-broken-LE vase
 ‘When Zhangsan took the vase he was not careful so that he broke
 the vase.’

The morpheme *chu* ‘out’ when used alone is a verb describing that something/somebody leaves the interior of some place. As a directional RVC in (21), *chu* ‘out’ loses its dynamicity and conveys the state “being out of”, predicating the final state obtained by the sausages which have undergone a spatial change. The storage place of the sausages is implicit.¹⁹ *Chu* ‘out’ is a mirror image of the English verbal particle *in* (see (8a) in Section 6.2). However, directional RVCs usually do not shift to post-object position as

¹⁹ The object of a directional RVC can be explicit, see the DP *na-jian wuzi* ‘that-CL room’ below:

Ta zou-chu na-jian wuzi.
 he walk-out that-CL room
 ‘He walked out of the room.’

English verbal particles do.²⁰ The first-phase representation of (21) is given in (23).



In (23), *na* ‘take’ constitutes *init* and *proc*. *Chu* ‘out’ as a verbal morpheme constitutes *res*, licensing the specifier of *resP*. What constitutes the complement of *res* is an implicit storage place from which the sausages were out of. As for the event participants, the subject *ta* ‘he’ is the INITIATOR. *Xiangchang* ‘sausage’ is the RESULTEE-UNDERGOER (Ramchand 2008: 126) as it experienced a locational change and obtained the state specified by *chu* ‘out’.

²⁰ The directional RVCs *lai* ‘come’ and *qu* ‘go’ are exceptions because they can shift to the post-object position, signaling whether the movement is “towards the speaker” or “away from the speaker” (Li & Thompson 1981: 59):

Ta song shu lai.
he send book come.
‘He sent over a book (towards the speaker).’

The mechanism of the shift requires further investigation but as far as I am concerned, the first-phase representation in (23) is applicable to the exceptional case.

Up till now I have discussed three subtypes of RVCs. Completive and result-state RVCs identify the complement of *res*, whereas directional RVCs identify *res* itself. Below I will analyze the fourth subtype of RVC, which contribute to frozen lexical items and are thus distinct from the aforementioned RVCs.

6.3.3 Frozen RVCs

Section 6.1 introduced the fact that some RVC compounds are frozen lexical items, such as (24), copied from (5e). The frozen RVC compound *kan-chu-lai* (literally ‘look-out-come’) means “realize”, describing a mental action distinct from the perceptive action described by *kan* ‘look’ (also, the name cannot “be looked”). The subordinate clause omits the subject *ta* ‘she’, see (25) for the full-fledged clause. Since the frozen RVC compound entails the result that something is realized, it functions as a telic verb, e.g., *enter* in (7a). Therefore the verb compound identifies *init*, *proc* and *res* in the first-phase representation (26). The complement of *res* is a CP which conveys the content of the realization.

(24) ID 26147

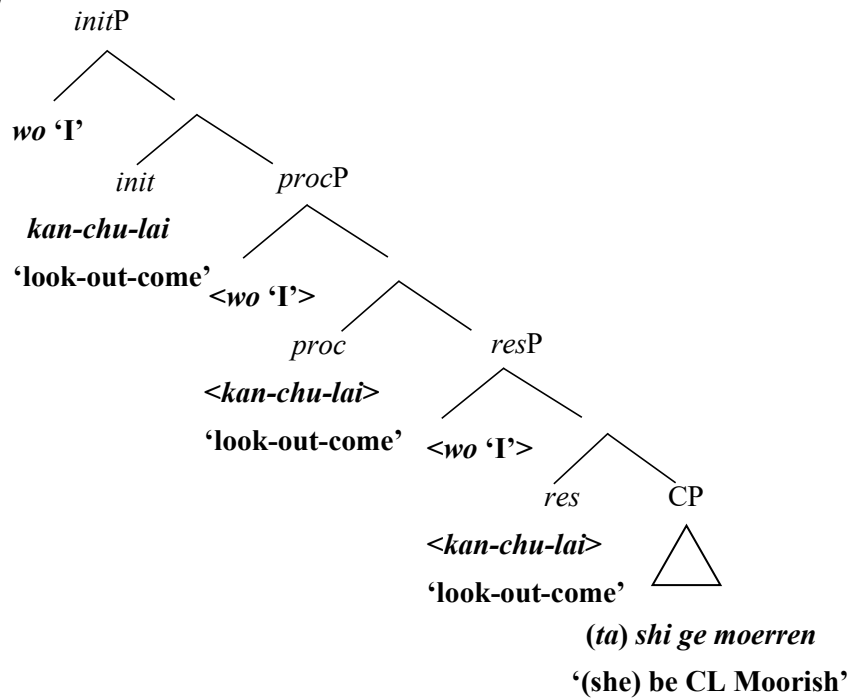
Ta	gaosu	wo	na	nüren	de	mingzi,
he	tell	me	that	woman	DE	name
wo	<u>kan-chu-lai</u>	shi	ge	moerren.		
I	look-out-come	be	CL	Moorish		

‘When he told me the girl’s name I realized she was Moorish.’

[Mandarin: RVC]

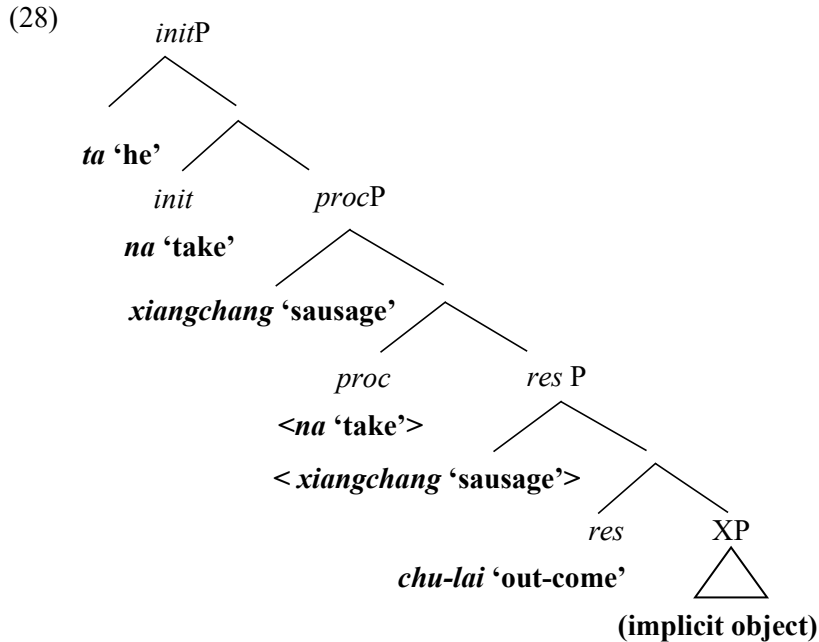
(25) Ta gaosu wo na nüren de mingzi,
 he tell me that woman DE name
 wo kan-chu-lai ta shi ge moerren.
 I look-out-come she be CL Moorish
 ‘When he told me the girl’s name I realized she was Moorish.’

(26)



It is worth noticing that *chu-lai* ‘out-come’ can also function as a directional RVC. For example, (27) revises (21) from Section 6.3.2 by replacing the directional RVC *chu* ‘out’ with *chu-lai* ‘out-come’. The replacement does not change the sentence’s meaning. In such a case, *chu-lai* ‘out-come’ should be analyzed in the same way as *chu* ‘out’, namely constituting *res* (28).

- (27) Ta na-chu-lai xiangchang, zai guo-li zhu-shu, [...]
 he take-out-come sausage at pan-in boil-cooked
 ‘He took out sausages, boiled them well in a pan, [...]



(26) and (28) indicate that some RVCs function differently when forming compounds with different verbs; e.g., the RVC *chu-lai* ‘out-come’ is part of a frozen RVC compound in (26) while in (28), it is a directional RVC.

This section has applied Ramchand’s framework to decompose all kinds of RVC compounds, and I conclude that RVCs contribute to eventuality descriptions by specifying the result states of events. The first-phase representations of RVC compounds always project a *resP* in which the RVCs reside. Specifically, directional RVCs identify *res*, mirroring English verbal particles. Completive RVCs and some result-state RVCs identify the complement of *res*, with *res* identified by verbs compounding with them. The other result-state RVCs, mirroring English secondary predicates, complement a null *res* (\emptyset_{π}) with a general possessive meaning. The null *res* mediates between the result-state RVC and the specifier of *resP* (i.e., the RESULTEE). Frozen RVC compounds are primitive verbal items used in the same way as simple telic verbs such as *dao* ‘arrive’ and *wangji* ‘forget’, identifying *init*, *proc*, and *res*. It should be noted that some RVC morphemes fall into different RVC subtypes when compounding with different verbs. Crucially, I argue that Mandarin

sentences which denote culminated events must project *resP*. This is reflected by the phenomenon that the combination of a creation verb and a quantized DP, which entails culmination in English, does not entail culmination in Mandarin unless an RVC is supplied to mark the verb.

Section 6.4 will introduce the semantics associated with the first-phase syntax and apply it to analyze the semantics of different RVC compounds based on the first-phase representations which were given for them in this section.

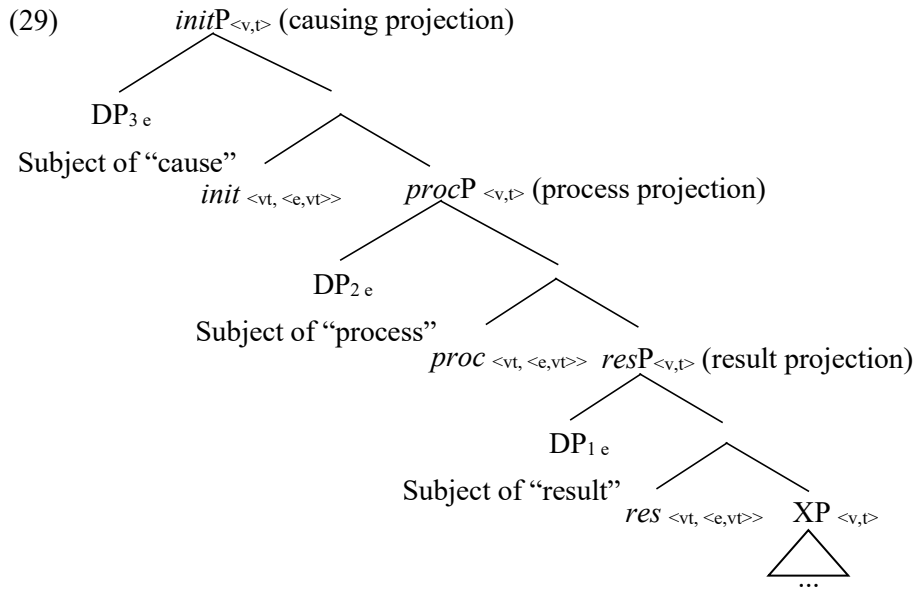
6.4 Analyzing RVC compounds with post-Davidsonian event semantics

This section first introduces the post-Davidsonian event semantics associated with the first-phase syntax and then uses it to analyze the semantics of RVC compounds. Constituents of sentences not discussed in the first-phase syntax such as tense markers, grammatical aspectual markers and determiners are ignored or simplified in the section.

6.4.1 Post-Davidsonian event semantics for the first-phase syntax

Ramchand equips the first-phase syntax with what she calls post-Davidsonian event semantics. This semantics is more fine-grained than the classical neo-Davidsonian event semantics (see Section 2.2) because the latter deals with semantic issues at sentential level, while the former, deals with issues within verbs (and thus decomposes eventualities into subeventualities). Despite the difference, the two are technically compatible.

In (29), I indicate the semantic types associated with the nodes in first-phase syntax. The *initP* domain corresponds to the canonical *vP* domain. *InitP*, *procP* and *resP* (type $\langle v, t \rangle$) are predicates over subeventualities. Every phrase consists of a specifier of type e , a head of type $\langle vt, \langle e, vt \rangle \rangle$ and a head complement, i.e., a subordinate phrase of type $\langle v, t \rangle$. The specifier is the semantic subject of the local phrase. The head predicates of the specifier and the head complement supplies information about the head.



The denotations of the phrasal heads are given below.

(30) Semantic denotations of phrasal heads:

- a. $[[res]] = \lambda P\lambda x\lambda e[P(e) \ \& \ res'(e) \ \& \ State(e) \ \& \ Subject(x,e)]$
- b. $[[proc]] = \lambda P\lambda x\lambda e \exists e_1,e_2[P(e_2) \ \& \ proc'(e_1) \ \& \ Process(e_1) \ \& \ e = (e_1 \rightarrow e_2) \ \& \ Subject(x, e_1)]$
- c. $[[init]] = \lambda P\lambda x\lambda e \exists e_1,e_2[P(e_2) \ \& \ init'(e_1) \ \& \ State(e_1) \ \& \ e = (e_1 \rightarrow e_2) \ \& \ Subject(x, e_1)]$

(Ramchand 2008: 194)

The arrow “ \rightarrow ” means “leads to”, denoting a causal relation and creating composite eventualities from simple eventualities of the same logical type (Ramchand 2008: 43). The expression “ $e = e_1 \rightarrow e_2$ ” is a primitive rule of event composition, meaning ‘ e consists of two subeventualities, e_1 , e_2 such that e_1 causally implicates e_2 (Ramchand 2008: 44). The arrow makes no direct commitment to the temporal relation between e_1 and e_2 . The subeventualities can temporally overlap or abut, constrained by *init-proc*

coherence and *proc-res* coherence, see Ramchand (2008: 130) for details. *Process* and *State* in (30) are predicates specifying the properties of eventualities.

The three heads have the same argument structure. Each head has three arguments: a predicate *P*, an individual *x* and an eventuality *e*.²¹ Heads are usually identified by verbal items²² whose lexical-encyclopedic content instantiates the abstract predicates *res*', *proc*', *init*' in (30), specifying the main predicative information of eventualities. The predicate argument *P*, which is instantiated by the head complement, adds extra predicative information to the eventuality *e*. Instantiated by the specifier, the individual argument *x* is the semantic subject (indicated by *Subject*) of the eventuality *e*. The three arguments are discharged in the hierarchical way specified by the first-phase syntax.

However, the heads differ in their predicative content. In (30a) the eventuality argument of *res* is a result state e^{23} whose property is specified by the complement of *res*. The individual argument of *res* is the state-holder of *e*, i.e., RESULTEE (DP₁). The denotations of *proc* (30b) and *init* (30c) are parallel, with the difference that e_1 is a process in $[[proc]]$ but a state in $[[init]]$. In $[[proc]]$ and $[[init]]$, the causative e_1 and the consequent e_2 are predicated by the head and its complement, respectively. E_1 and e_2 form a composite eventuality *e* that is the eventuality argument of the head.

Unfortunately, Ramchand (2008) does not illustrate all the denotations in (30) with a full semantic derivation of a relevant sentence.²⁴ To show how it works, I apply the denotations to the English example (9a). (9a) and its first-phase representation are copied in (31a) and (31b), respectively.

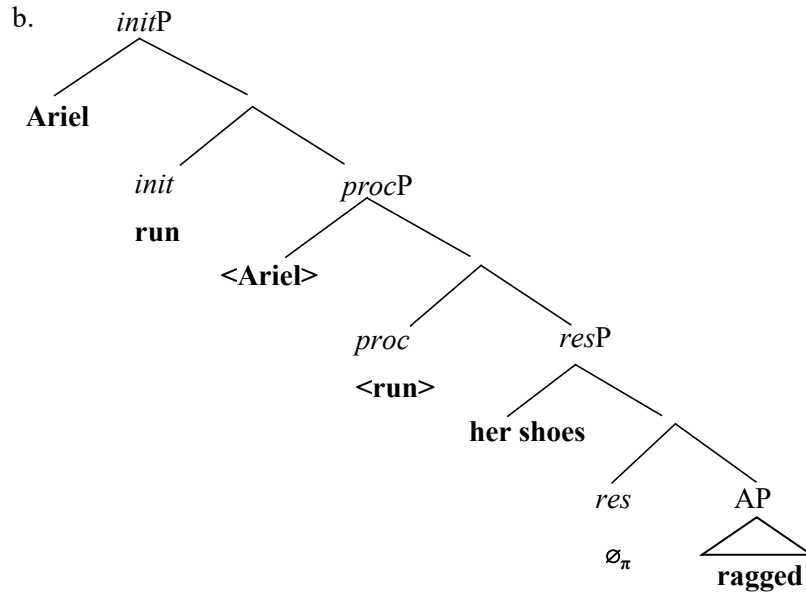
(31) a. Ariel ran her shoes ragged.

²¹ For simplicity, I do not specify the *sub-* prefix when applying the post-Davidsonian event semantics in the rest of the dissertation unless necessary (recall footnote 3 in Section 6.2).

²² *Res* can also be identified by abstract items such as the null head \varnothing_{π} (see Section 6.3).

²³ I follow Ramchand in using the type *e* for all kinds of eventualities, recall the notation explanation in Section 2.2.

²⁴ Ramchand only gives an implementation when no *resP* is projected (2008: 61–62).



Since *ragged* is an adjective, I assume it is a predicate over states:

$$(32) \quad [[\text{ragged}]] = \lambda e[\text{ragged}(e)]$$

Res is identified by the null head \emptyset_{π} whose semantics is “property possession” (Ramchand 2008: 124), I assume the lexical content of \emptyset_{π} is “possessive” (*poss*), which instantiates the abstract predicate *res*’ in (30a). Therefore the denotation of \emptyset_{π} is:

$$(33) \quad [[\text{res}]] = [[\emptyset_{\pi}]] = \lambda P \lambda x \lambda e [P(e) \ \& \ \text{poss}(e) \ \& \ \text{State}(e) \ \& \ \text{Subject}(x,e)]$$

Merging *res* with the AP complement *ragged* generates *res*’:

$$(34) \quad [[\text{res}']] = [[\text{res}]]([[AP]]) = \lambda x \lambda e [\text{ragged}(e) \ \& \ \text{poss}(e) \ \& \ \text{State}(e) \ \& \ \text{Subject}(x,e)]$$

Moreover, I assume that the RESULTEE *her shoes* and the UNDERGOER-INITIATOR *Ariel* have the individual type *e*. The abstract predicates *proc*’

and *init'* (see (30b,c)) are instantiated by the lexical-encyclopedic content of *run*. Hence the remaining derivation is as follows:

- (35) a. $[[resP]] = [[res']](\text{[[her shoes]])}$
 $= \lambda e [ragged(e) \ \& \ poss(e) \ \& \ State(e) \ \& \ Subject(\text{her shoes}, e)]$
- b. $[[proc]] = \lambda P \lambda x \lambda e \exists e_1, e_2 [P(e_2) \ \& \ run(e_1) \ \& \ Process(e_1) \ \& \ e = (e_1 \rightarrow e_2) \ \& \ Subject(x, e_1)]$
- c. $[[proc']] = [[proc]](\text{[[resP]])} = \lambda x \lambda e \exists e_1, e_2 [[ragged(e_2) \ \& \ poss(e_2) \ \& \ State(e_2) \ \& \ Subject(\text{her shoes}, e_2)] \ \& \ run(e_1) \ \& \ Process(e_1) \ \& \ e = (e_1 \rightarrow e_2) \ \& \ Subject(x, e_1)]$
- d. $[[procP]] = \lambda e \exists e_1, e_2 [[ragged(e_2) \ \& \ poss(e_2) \ \& \ State(e_2) \ \& \ Subject(\text{her shoes}, e_2)] \ \& \ run(e_1) \ \& \ Process(e_1) \ \& \ e = (e_1 \rightarrow e_2) \ \& \ Subject(\text{Ariel}, e_1)]$
- e. $[[init]] = \lambda P \lambda x \lambda e \exists e_3, e_4 [P(e_4) \ \& \ run(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(x, e_3)]$
- f. $[[init']] = [[init]](\text{[[procP]])} = \lambda x \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[ragged(e_2) \ \& \ poss(e_2) \ \& \ State(e_2) \ \& \ Subject(\text{her shoes}, e_2)] \ \& \ run(e_1) \ \& \ Process(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ Subject(\text{Ariel}, e_1)] \ \& \ run(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(x, e_3)]$
- g. $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[ragged(e_2) \ \& \ poss(e_2) \ \& \ State(e_2) \ \& \ Subject(\text{her shoes}, e_2)] \ \& \ run(e_1) \ \& \ Process(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ Subject(\text{Ariel}, e_1)] \ \& \ run(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(\text{Ariel}, e_3)]$

InitP (35g) is a predicate of events with internal complexity. Such an event has an initiating state of running (e_3) which leads to (represented by “ \rightarrow ”) a composite event e_4 . E_4 consists of a process of running (e_1) and a result state of being ragged (e_2). Ariel initiated and underwent the running process and consequently her shoes held the ragged state (tense ignored in the derivation, as noted at the beginning of this section).

So far I have demonstrated how the post-Davidsonian event semantics works for English. The following subsection will apply the semantics to RVC compounds.

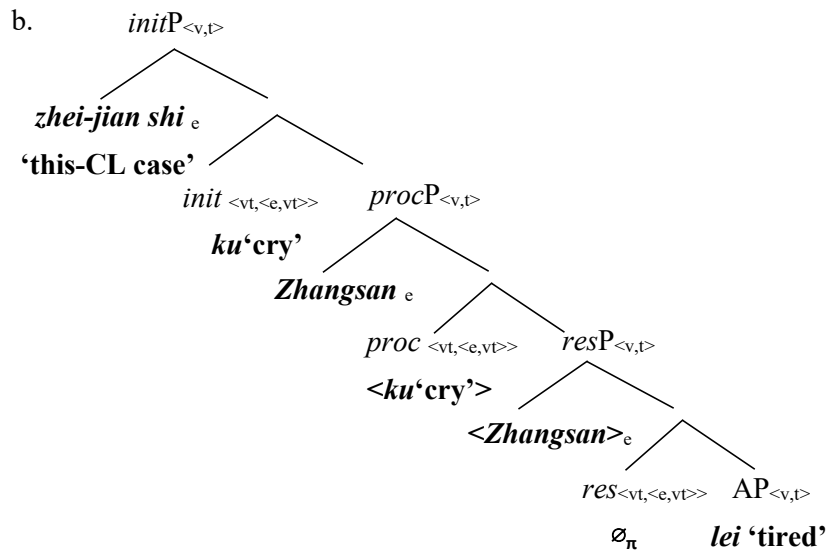
6.4.2 Semantics of RVC compounds

This subsection will spell out the semantic interactions between all kinds of RVCs and verbs. I will start with the result-state RVC compound which mirrors the English example (31a) in Section 6.4.1, and then move to other RVC compounds whose semantics show variants of the original semantics proposed by Ramchand.

6.4.2.1 RVC as the complement of *res*

Section 6.3 analyzed a sentence using the result-state RVC compound *ku-lei* ‘cry-tired’ (copied in (36a)) to convey that Zhangsan got tired because of crying. Its first-phase representation is copied in (36b), ignoring the post-verbal *le*.

- (36) a. Zhei-jian shi ku-lei-le Zhangsan.
 this-CL case cry-tired-LE Zhangsan.
 ‘This thing got Zhangsan tired from crying.’



Since I have argued that (36a) mirrors *Ariel ran her shoes ragged* (31a), the semantic derivation of (36a) can be modeled on that of the English example (see Section 6.4.1). I thus start with the adjectival RVC *lei* ‘tired’ (37):

$$(37) \quad [[AP]] = [[lei]] = \lambda e[tired(e)]$$

The denotation of null *res* \varnothing_π is copied from (33) in Section 6.4.1:

$$(38) \quad [[res]] = [[\varnothing_\pi]] = \lambda P\lambda x\lambda e[P(e) \ \& \ poss(e) \ \& \ State(e) \ \& \ Subject(x, e)]$$

The adjectival RVC Merges with \varnothing_π producing:

$$(39) \quad [[res']] = \lambda x\lambda e[tired(e) \ \& \ poss(e) \ \& \ State(e) \ \& \ Subject(x, e)]$$

The RESULTEE *Zhangsan* is an individual. It Merges with *res'*, giving:

$$(40) \quad [[resP]] = \lambda e[tired(e) \ \& \ poss(e) \ \& \ State(e) \ \& \ Subject(Zhangsan, e)]$$

(40) means the RESULTEE *Zhangsan* possesses the result state of tiredness.

Next I apply the denotations of *proc* (30b) and *init* (30c) by instantiating the abstract *proc'* and *init'* with the lexical-encyclopedic content of *ku* ‘cry’ (41a, d), and finish the remaining derivation:

$$(41) \quad \begin{array}{l} \text{a.} \quad [[proc]] = \lambda P\lambda x\lambda e \exists e_1, e_2 [P(e_2) \ \& \ cry(e_1) \ \& \ Process(e_1) \ \& \\ \quad \quad \quad e = (e_1 \rightarrow e_2) \ \& \ Subject(x, e_1)] \\ \text{b.} \quad [[proc']] = \lambda x\lambda e \exists e_1, e_2 [[tired(e_2) \ \& \ poss(e_2) \ \& \ State(e_2) \ \& \\ \quad \quad \quad Subject(Zhangsan, e_2)] \ \& \ cry(e_1) \ \& \ Process(e_1) \ \& \ e = (e_1 \rightarrow e_2) \ \& \\ \quad \quad \quad Subject(x, e_1)] \\ \text{c.} \quad [[procP]] = \lambda e \exists e_1, e_2 [[tired(e_2) \ \& \ poss(e_2) \ \& \ State(e_2) \ \& \\ \quad \quad \quad Subject(Zhangsan, e_2)] \ \& \ cry(e_1) \ \& \ Process(e_1) \ \& \ e = (e_1 \rightarrow e_2) \\ \quad \quad \quad \ \& \ Subject(Zhangsan, e_1)] \end{array}$$

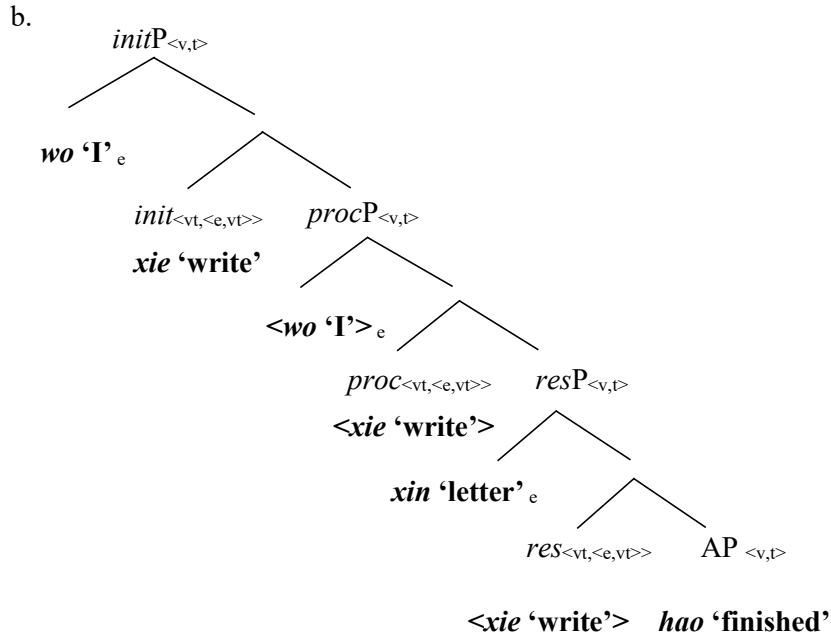
- d. $[[init]] = \lambda P \lambda x \lambda e \exists e_3, e_4 [P(e_4) \& cry(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(x, e_3)]$
- e. $[[init']] = \lambda x \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[tired(e_2) \& poss(e_2) \& State(e_2) \& Subject(Zhangsan, e_2)] \& cry(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(Zhangsan, e_1)] \& cry(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(x, e_3)]$
- f. $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[tired(e_2) \& poss(e_2) \& State(e_2) \& Subject(Zhangsan, e_2)] \& cry(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(Zhangsan, e_1)] \& cry(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(this\ case, e_3)]$

The denotation of *initP* (41f) is a predicate of events which have internal complexity. Such an event is composite, consisting of an initiating state of crying (e_3) and its consequent eventuality (e_4). E_3 is initiated by “this case”. E_4 is also composite, consisting of a crying process (e_1) and its result state of tiredness (e_2). Zhangsan underwent the crying process and held the tired state.

Below I move to the completive RVC *hao* ‘finished’. Just like the result-state RVC *lei* ‘tired’, *hao* ‘finished’ identifies the complement of *res*. Its example is copied in (42a) and its first-phase representation in (42b). *Hao* ‘finished’ in (42a) compounds with the verb *xie* ‘write’, indicating the letter was fully written.

(42) ID 26151

- a. Wo xie-hao xin.
 I write-finished letter.
 ‘I wrote the letter.’



Hao 'finished' describes a result state of being finished (43a). *Res* is identified by *xie* 'write' which describes a result state of being written, so the abstract predicate *res*' in the general denotation of *res* (30a) is instantiated by *written* (43b). Merge *hao* 'finished' (43a) with *xie* 'write' (43b) giving *res*' (43c). *Res*' being a predicate-complement structure combines with the RESULTEE *xin* 'letter', producing *resP*:

- (43) a. $[[hao]] = \lambda e [finished(e)]$
 b. $[[res]] = [[xie]] = \lambda P \lambda x \lambda e [P(e) \ \& \ written(e) \ \& \ State(e) \ \& \ Subject(x,e)]$
 c. $[[res']] = \lambda x \lambda e [finished(e) \ \& \ written(e) \ \& \ State(e) \ \& \ Subject(x,e)]$
 d. $[[resP]] = \lambda e [finished(e) \ \& \ written(e) \ \& \ State(e) \ \& \ Subject(letter, e)]$

The remaining derivation can be modeled on the aforementioned *cry-lei* 'cry-tired' example:

- (44) a. $[[proc]] = \lambda P \lambda x \lambda e \exists e_1, e_2 [P(e_2) \& write(e_1) \& Process(e_1) \& e = (e_1 \rightarrow e_2) \& Subject(x, e_1)]$
- b. $[[proc']] = \lambda x \lambda e \exists e_1, e_2 [[finished(e_2) \& written(e_2) \& State(e_2) \& Subject(letter, e_2)] \& write(e_1) \& Process(e_1) \& e = (e_1 \rightarrow e_2) \& Subject(x, e_1)]$
- c. $[[procP]] = \lambda e \exists e_1, e_2 [[finished(e_2) \& written(e_2) \& State(e_2) \& Subject(letter, e_2)] \& write(e_1) \& Process(e_1) \& e = (e_1 \rightarrow e_2) \& Subject(I, e_1)]$
- d. $[[init]] = \lambda P \lambda x \lambda e \exists e_3, e_4 [P(e_4) \& write(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(x, e_3)]$
- e. $[[init']] = \lambda x \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[finished(e_2) \& written(e_2) \& State(e_2) \& Subject(letter, e_2)] \& write(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(I, e_1)] \& write(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(x, e_3)]$
- f. $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[finished(e_2) \& written(e_2) \& State(e_2) \& Subject(letter, e_2)] \& write(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(I, e_1)] \& write(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(I, e_3)]$

(44f) denotes the set of events such that every event consists of a state e_3 , the initiating state of writing, and its consequent eventuality e_4 . E_3 is carried out by the protagonist 'I'. E_4 consists of a writing process e_1 and its result state of being finished e_2 . 'I' carried out e_1 and a context-specific letter is the holder of e_2 .

Section 6.3.1 also analyzed another RVC compound *zhu-shu* 'boil-cooked' (17) whose first-phrase representation is in the same configuration as *xie-hao* 'write-finished' (42b). Hence its semantic derivation is similar to that of *xie-hao* 'write-finished' and I do not spell it out for considerations of space. Having analyzed the semantics of RVCs identifying the complement of *res*, below I will move to the directional RVC which identifies *res*.

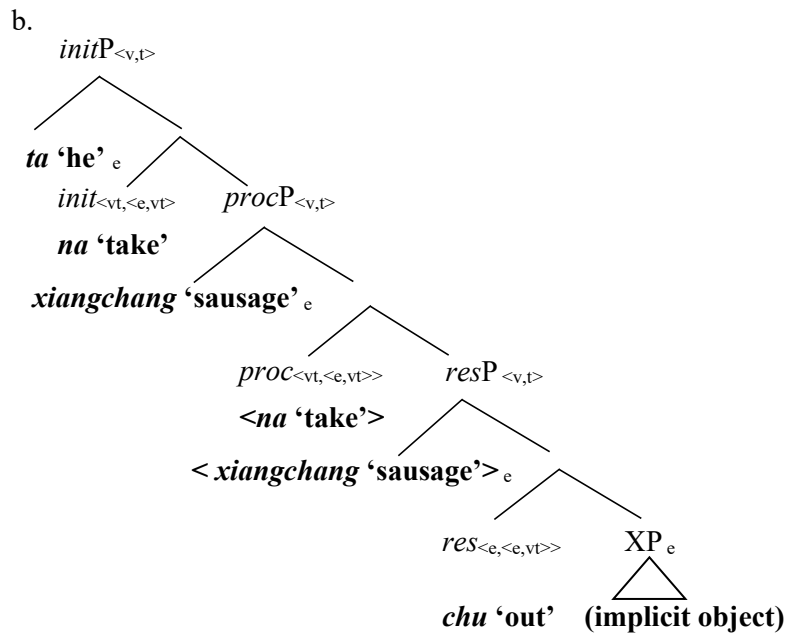
6.4.2.2 RVC as *res* head

(45a) copies the example of the directional RVC compound *na-chu* ‘take-out’. The first-phrase representation of (45a) is in (45b). As Section 6.3.2 noted, the RVC *chu* ‘out’ loses its verbal dynamicity and conveys a stative meaning, namely “being out of”.

(45) ID 26011

- a. Ta na-chu xiangchang, zai guo-li zhu-shu,
 he take-out sausage at pan-in boil-cooked
 you na-chu jiubei, panzi, daocha, liang-ping jiu.
 again take-out wine-glass plate knife-fork two-CL wine
 ‘He took out sausages, boiled them well in a pan, and took out
 glasses, plates, knives and forks and two bottles of wine.’

[Mandarin: *RVC*]



In (45b) *chu* ‘out’ constitutes *res* and has an implicit complement which is the object of *chu* ‘out’, i.e., the storage place out of which the sausages were taken (see Section 6.3.2). Hence I assume that the XP has the individual type *e* with the following denotation: $[[XP]] = \text{storage place}$. Due to this

assumption about XP, Ramchand's denotation of *res* (copied in (46a)) does not apply to *chu* 'out' because of a type mismatch between *res* and the nominal complement XP. Since Ramchand only discusses the case when *res* is a 1-place predicate (a property), I have to propose a variant version for *res*, namely a 2-place predicate res_n (a relation) in (46b). Res_n is a relation (type: $\langle e, \langle e, vt \rangle \rangle$) between the subject RESULTEE and the object XP. (46b) differs from (46a) in that the elaboration of *res* (i.e., $P(e)$) is replaced by the object information (i.e., Object (y, e)).

- (46) a. $[[res]] = \lambda P \lambda x \lambda e [P(e) \ \& \ res'(e) \ \& \ State(e) \ \& \ Subject(x, e)]$
 b. $[[res_n]] = \lambda y \lambda x \lambda e [res'(e) \ \& \ State(e) \ \& \ Subject(x, e) \ \& \ Object(y, e)]$

Applying the lexical-encyclopedic content of *chu* 'out' to (46b) gives the denotation (47a). Merging XP with res_n produces *res'* (47b). *Res'* further Merges with the RESULTEE *xiangchang* 'sausage', giving *resP* (47c).

- (47) a. $[[res_n]] = [[chu]] = \lambda y \lambda x \lambda e [being-out-of(e) \ \& \ State(e) \ \& \ Subject(x, e) \ \& \ Object(y, e)]$
 b. $[[res']] = \lambda x \lambda e [being-out-of(e) \ \& \ State(e) \ \& \ Subject(x, e) \ \& \ Object(storage \ place, e)]$
 c. $[[resP]] = \lambda e [being-out-of(e) \ \& \ State(e) \ \& \ Subject(sausages, e) \ \& \ Object(storage \ place, e)]$

The remaining derivation can be modeled on the derivation of *xie-hao* 'write-finished' so I just spell out the denotation of *initP* in (48).

- (48) $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[being-out-of(e_2) \ \& \ State(e_2) \ \& \ Subject(sausages, e_2) \ \& \ Object(storage \ place, e_2)] \ \& \ take(e_1) \ \& \ Process(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ Subject(sausages, e_1)] \ \& \ take(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(he, e_3)]$

(48) denotes the set of events such that every event consists of an initiating state of taking (e_3) and its consequent eventuality (e_4). E_3 is implemented by a context-specific person "he". E_4 consists of a taking process (e_1) and its

result state of being out (e_2). Sausages are the semantic subject of e_1 and e_2 because it is the RESULTEE-UNDERGOER.

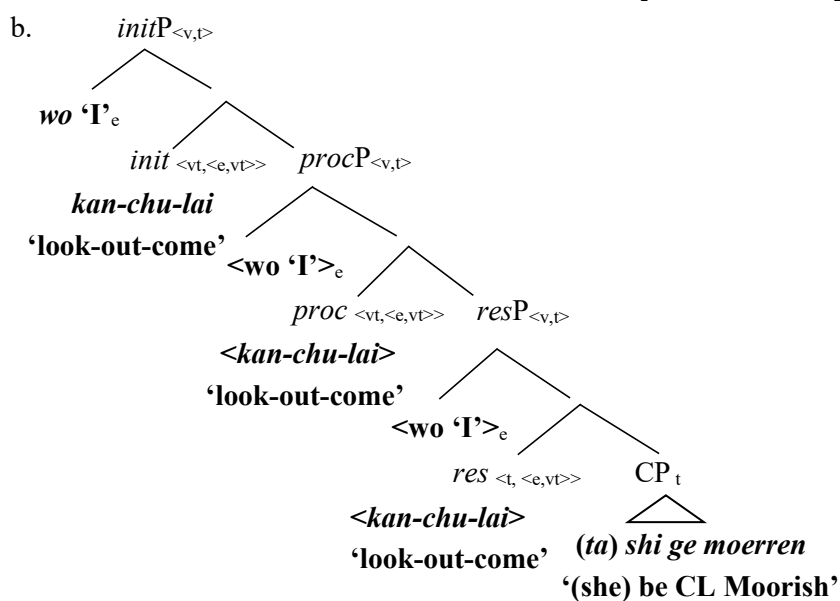
Different from all the RVCs I have discussed above, frozen RVCs are unanalyzable because they are an integral part of primitive lexical items. I will discuss this special RVC subtype immediately.

6.4.2.3 Frozen RVC

In Section 6.3.3, I presented the frozen RVC compound *kan-chu-lai* ‘look-out-come’, which functions as a telic verb meaning ‘realize’. Here the RVC *chu-lai* ‘out-come’ is an unanalyzable component. See the example copied in (49a), with the omitted subject *ta* ‘she’ indicated, and its first-phase representation in (49b).

(49) ID 26147

- a. Ta gaosu wo na nüren de mingzi,
 He tell me that woman DE name
 wo kan-chu-lai (ta) shi ge moerren.
 I look-out-come (she) be CL Moorish
 ‘When he told me the girl’s name I realized she was Moorish.’
 [Mandarin: RVC]



The frozen RVC has a clause complement. For simplicity, I propose the following denotation for the complement:

$$(50) \quad [[CP]] = [[(Ta) shi ge moerren]] = [[Moorish(she)]]$$

However, the *res* denotation (30a) does not suit (49b) where the complement of *res* is a clause. To tackle the problem, I propose res_c (51a) as another variant version of *res*. The clause is introduced to $resP$ through the relation “Complement”. Res_c is similar to res_n (see (46b)), the variant *res* I proposed for the directional RVC example, because both are 2-place relations mediating between the RESULTEE and the complement of *res*. Furthermore, the abstract *res*’ in (51a) is instantiated by the lexical content of *kan-chu-lai* ‘look-out-come’ (51b).

$$(51) \quad \begin{array}{l} \text{a. } [[res_c]] = \lambda p \lambda x \lambda e [res'(e) \ \& \ \text{State}(e) \ \& \ \text{Subject}(x, e) \ \& \\ \quad \quad \quad \text{Complement}(p, e)] \\ \text{b. } [[res_c]] = [[kan-chu-lai]] = \lambda p \lambda x \lambda e [realize(e) \ \& \ \text{State}(e) \ \& \\ \quad \quad \quad \text{Subject}(x, e) \ \& \ \text{Complement}(p, e)] \end{array}$$

Res_c Merges with the CP producing res' (52a) where p is instantiated by ‘Moorish(She)’. Res' combines with the RESULTEE, *wo* ‘I’, giving $resP$ (52b):

$$(52) \quad \begin{array}{l} \text{a. } [[res']] = [[res_c]] ([[CP]]) = \lambda x \lambda e [realize(e) \ \& \ \text{State}(e) \ \& \\ \quad \quad \quad \text{Subject}(x, e) \ \& \ \text{Complement}(\text{Moorish}(\text{She}), e)] \\ \text{b. } [[resP]] = \lambda e [realize(e) \ \& \ \text{State}(e) \ \& \ \text{Subject}(I, e) \ \& \\ \quad \quad \quad \text{Complement}(\text{Moorish}(\text{She}), e)] \end{array}$$

Below is the remaining derivation which applies *proc* (30b) and *init* (30c):

$$(53) \quad \begin{array}{l} \text{a. } [[proc]] = \lambda P \lambda x \lambda e \exists e_1, e_2 [P(e_2) \ \& \ realize(e_1) \ \& \ \text{Process}(e_1) \ \& \\ \quad \quad \quad e = (e_1 \rightarrow e_2) \ \& \ \text{Subject}(x, e_1)] \\ \text{b. } [[proc']] = \lambda x \lambda e \exists e_1, e_2 [[realize(e_2) \ \& \ \text{State}(e_2) \ \& \ \text{Subject}(I, e_2) \ \& \\ \quad \quad \quad \text{Complement}(\text{Moorish}(\text{She}), e_2)] \ \& \ realize(e_1) \ \& \ \text{Process}(e_1) \ \& \\ \quad \quad \quad e = (e_1 \rightarrow e_2) \ \& \ \text{Subject}(x, e_1)] \end{array}$$

- c. $[[procP]] = \lambda e \exists e_1, e_2 [[realize(e_2) \& State(e_2) \& Subject(I, e_2) \& Complement(Moorish(She), e_2)] \& realize(e_1) \& Process(e_1) \& e = (e_1 \rightarrow e_2) \& Subject(I, e_1)]$
- d. $[[init]] = \lambda P \lambda x \lambda e \exists e_3, e_4 [P(e_4) \& realize(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(x, e_3)]$
- e. $[[init']] = \lambda x \lambda e \exists e_3, e_4 [\exists e_1, e_2 [realize(e_2) \& State(e_2) \& Subject(I, e_2) \& Complement(Moorish(She), e_2)] \& realize(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(I, e_1)] \& realize(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(x, e_3)]$
- f. $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [realize(e_2) \& State(e_2) \& Subject(I, e_2) \& Complement(Moorish(She), e_2)] \& realize(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(I, e_1)] \& realize(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(I, e_3)]$

InitP (53f) is a predicate over events such that every event consists of an initiating state e_3 , which initiates the realization event, and a composite eventuality e_4 . The protagonist “I” initiated the state e_3 which led to e_4 that included a process of realizing (e_1) and its result state (e_2). “I” underwent the process and reached the result state, namely knowing the fact that a context-specific “she” is a Moor.

So far I have shown that Ramchand’s post-Davidsonian event semantics accounts well for all kinds of RVC compounds if it is enriched by including variants of the *res* head. Specifically, result-state and completive RVCs, which constitute the complement of *res*, combine with *res* to jointly predicate the RESULTEE. They can be properly analyzed by the original version of Ramchand’s semantics. The directional RVC and the frozen RVC constitute *res* (the latter also constitutes *init* and *proc* as an unanalyzable part of the frozen RVC compound), and the corpus examples I investigated indicate that they require variant versions of the *res* head because they can take complements not investigated by Ramchand (2008). One issue deserves further attention: as stated in Section 6.3, RVC morphemes may function differently when compounding with different verbs, so the semantic analysis of RVC compounds can better be treated case by case.

Ramchand’s framework enables me to qualitatively analyze the semantics of all kinds of RVC compounds. Despite the diversity of RVCs,

they are always embedded in *resP* and give rise to telicity by specifying the result states of events. With the insights that Ramchand's framework sheds upon RVC compounds, Section 6.5 will revisit the hypothesis on RVC compounds which was not straightforwardly supported by the results of the quantitative association test in Chapter 4.

6.5 Hypothesis on RVC compounds revisited

In Chapter 2, according to the lines of Li & Thompson (1981), I drew up Hypothesis 1, according to which a RVC compound denotes a culminated event plus result state. The hypothesis was not straightforwardly supported by the results of the association test in Chapter 4: in Section 4.5.5, although the descriptive statistics showed that 41 out of all the 65 Mandarin datapoints using RVC compounds appeared in contexts instantiating the eventive Past Perfective tuple (in line with Hypothesis 1), only a weak association (rather than a strong association expected by Hypothesis 1) was found between RVCs and the eventive tuple (NPMI=0.1). Up till now, the RVC compounds I have analyzed in this chapter all occur in contexts instantiating the Past Perfective tuple (as noted in Section 6.1). The examples are accounted by the hypothesis because they all denote culminated events with result states, as their spelled-out semantics indicated (see Section 6.4). Among the 24 RVC cases other than the 41 eventive cases, 9 translate the French eventive tense-aspect form *passé composé*, which is expected by Hypothesis 1 (recall the preliminary test in Section 3.2). Therefore, to properly interpret the NPMI score, this section will zoom into the remaining 15 RVC cases and check whether they are explained by Hypothesis 1.

3 cases of RVC are used to translate French clauses marked by *plus-que-parfait* (Perfect form in the past), e.g., (54). The covering event (denoted by *s'était recouvert*) in (54a) is translated by the directional RVC compound *dai-shang* 'wear-ascend' (54b). (54b) is in line with Hypothesis 1 because the putting-on event had culminated and the hat was in the result state of being on the head of the old man. The other cases are similar to (54b) and are also accounted for by the hypothesis.

(54) ID 32232

- a. Le petit vieux, qui s' était recouvert, a de nouveau ôté son
chapeau. [French: *plus-que-parfait*]
- b. Xiao laotou benlai yi dai-shang maozi,
little old man at first already wear-ascend hat
zhe-shi you zhai-xia-lai le.
this moment again pick-descend-come LE
'The little old man, who'd already put his hat on, took it off again.'
[Mandarin: *RVC*]

In addition, one completive RVC compound *kan-jian* 'look-see' translates a seeing event (denoted by *verra*) in a French clause marked by *futur simple* (55a). The seeing event denoted by (55b) will culminate in the future, with the result that "I" will be seen by the man in the context. Therefore, (55b) is covered by Hypothesis 1.

(55) ID 31961

- a. Mais il le fera sans doute après-demain, quand il me verra en
deuil. [French: *futur simple*]
- b. Buguo, houtian ta kan-jian wo
but the day after tomorrow he look-see me
dai-xiao de-shihou, yiding hui anwei
wear-mourning DE-time definitely will console
wo de.
me PRT
'But he probably will do the day after tomorrow, when he sees me
in mourning.'
[Mandarin: *RVC*]

Surprisingly, the other occurrences of RVC compounds are used to translate stative French clauses marked by *imparfait* (N=10) or *présent* (N=1). With closer observation, I found that 4 RVC compounds used to translate *imparfait* are negated by *bu* 'not' or *mei-you* 'not-have', and the negation words map the culminated events denoted by RVC compounds to states. See (56b) which translates the negative French sentence (56a). The RVC

compound *liu-dong* ‘flow-move’ denotes that the tears flowed and thus had themselves moved on the face. The eventive meaning is negated by *bu* ‘not’. Due to the intervention of negation, (56b) receives a stative interpretation but the use of *liu-dong* ‘flow-move’ is explained by Hypothesis 1. The other negative cases are not counterexamples for the same reason.

(56) ID 32295

- a. Mais, à cause des rides, elles ne s’écoulaient pas. [French: *imparfait*]
- b. Danshi, youyu zhouwen-de guanxi, leishui
 but because wrinkle-DE relation tear
 jing liu-bu-dong. [Mandarin: *RVC*]
 unexpectedly flow-not-move
 ‘But because of the wrinkles, tears didn’t even run off.’²⁵

The remaining 7 cases of RVC compounds used to translate *imparfait* or *présent* cases all involve freedom of translation, where the stative French clauses are translated into eventive Mandarin clauses. See the example (57a) where the state of bending (denoted by *se baissait*) is translated by the directional RVC compound *wan-xia* ‘bend-descend’ denoting a culminated bending event with the priest’s spatial position lowered. Hence (57b) is accounted for by Hypothesis 1. Similar to (57b), the other 6 cases are not exceptions against Hypothesis 1 due to the freedom of translation.

(57) ID 32209

- a. [...] le prêtre se baissait vers lui [...] [French: *imparfait*]
- b. [...] shenfu wan-xia yao [...] [Mandarin: *RVC*]
 priest bend-descend waist
 ‘[...] the priest bent over [...]’²⁶

²⁵ I produced the translation for accuracy. Here is the English translation equivalent in the Camus corpus: *But because of all the wrinkles, they didn’t run off.*

²⁶ I produced the translation for accuracy. The Mandarin translation omits the French phrase *vers lui* ‘towards him’.

To sum up, none of my RVC data are real counterexamples against Hypothesis 1. I thus conclude that the hypothesis is in line with my data. Based on the case-by-case investigation, I can properly interpret the low NPMI score between RVCs and the Past Perfective tuple. Due to the noise caused by negation and freedom of translation, RVCs do not exclusively occur in contexts instantiating the Past Perfective tuple, which lowers the NPMI score between the two. The second and more important factor is that RVCs, post-verbal *le* and other telicity-indicating methods proposed in Chapter 5 are all associated with Past Perfective (recall Section 4.5). The competition among the three as eventive markers lowered the NPMI score between RVCs and Past Perfective because the latter was not exclusively associated with RVCs. In Chapter 7, I will investigate the semantics of post-verbal *le* and uncover the alternation between post-verbal *le* and RVCs. Below I will exploit the first-phase syntax to analyze other telicity-indicating methods that can be analyzed by the template of the syntax, namely those functioning within clauses just like RVCs.

6.6 Alternative telicity-indicating methods functioning within clauses

Chapter 5 proposed that *de*-resultatives, endpoint-indicating phrases and a consequent state in the causative construction are alternative telicity-indicating methods functioning within the clausal domain. Given the internal complexity of the methods, I will only apply Ramchand's first-phase syntax to analyze them in this section and leave their semantics for future studies.

De-resultatives are introduced in Chapter 5 as degree modifiers which are similar to RVCs. Specifically, Sybesma (1999: 31) argues that *de* projects a degree phrase (ExtP) sandwiched between a main verb and a small clause, closing off "the unbounded range of the degreeability in the predicate". He also claims that the difference between the degree structure expressed by *de*-resultatives and the result structure expressed by RVCs (or cluster resultatives in his term) is pragmatic rather than semantic. (58) is an

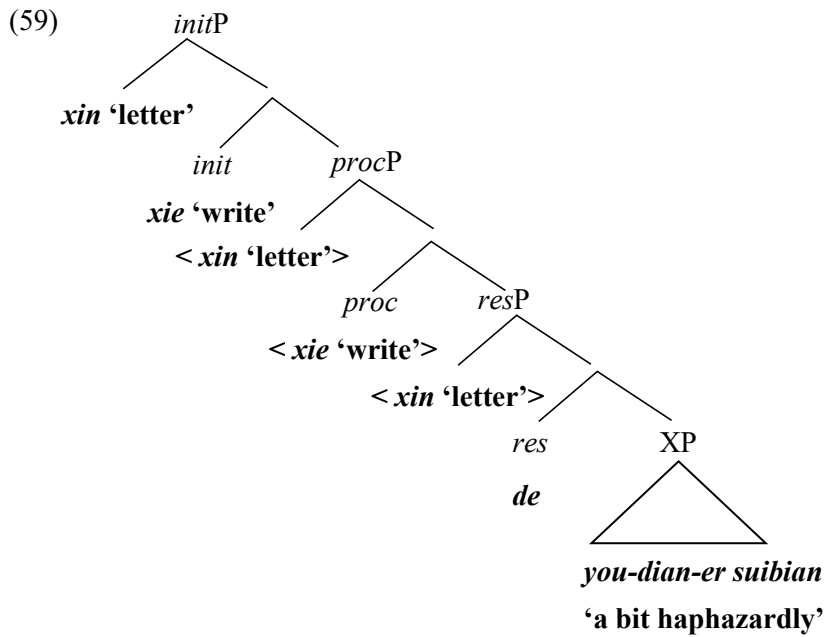
example copied from Section 5.6.1, where *de* introduces the degree “a bit haphazardly”, modifying the verb *xie* ‘write’.

(58) ID 26155

Xin xie-de you-dian-er suibian, [...]
 letter write-De have-a bit haphazardly
 ‘The letter was written a bit haphazardly.’

[Mandarin: *marked(de-resultative)*]

Given the similarity between RVCs and *de*-resultatives, *de* can be analyzed as *res* and the degree expression *you dian-er suibian* “a bit haphazardly” as the complement of *res*. The first-phase representation of (58) is in (59).



Here the verb *xie* ‘write’ (59) requires explanation. It is an intransitive verb in (58) but a transitive [init, proc] verb in (13b,c), recall Section 6.3. The dual uses of verbs is cross-linguistically common. For example, some English transitive verbs with [init, proc] features also have intransitive alternants, see (60a,b) for the dual uses of *melt* (Ramchand 2008: 85).

- (60) a. Karena melted the butter.
 b. The butter melted.

The intransitive alternant can be analyzed in three ways (Ramchand 2008: 85–88). First, by adding a mechanism to isolate the alternating class from the transitive one, the verb can still be analyzed as having [init, proc] features just like the transitive version, and the single argument (*the butter*) takes the composite role UNDERGOER-INITIATOR. Second, the verb is analyzed as only having a [proc] feature and the *init* is identified by a null causative head which takes *the butter* as its specifier (i.e., INITIATOR). Third, the verb can be analyzed as having an optional *init* feature [(init), proc] and its intransitive alternant does not project *init*P. Ramchand prefers the second option for theory-internal consideration: the option is theoretically economical by only postulating a null causative head, saving the effort to require an additional mechanism to isolate the alternating class or to explain the optionality of the feature. Furthermore, it nicely fits into Ramchand’s constructional view on causativization.

I assume that the three options are open to Mandarin for analyzing the intransitive *xie* ‘write’. Since any choice does not change my analysis for *de*-resultatives, for simplicity I chose the first option to unify the analysis of *xie* ‘write’ in this chapter. Hence in (59), *xie* ‘write’ constitutes *init* and *proc* and the subject *xin* ‘letter’ is the RESULTEE-UNDERGOER-INITIATOR. I will leave aside the question as to whether Mandarin has a null causative *init* for future studies.

Besides *de*-resultatives, endpoint-indicating phrases also function within clauses. Consider the example (61) copied from Section 5.6.1.

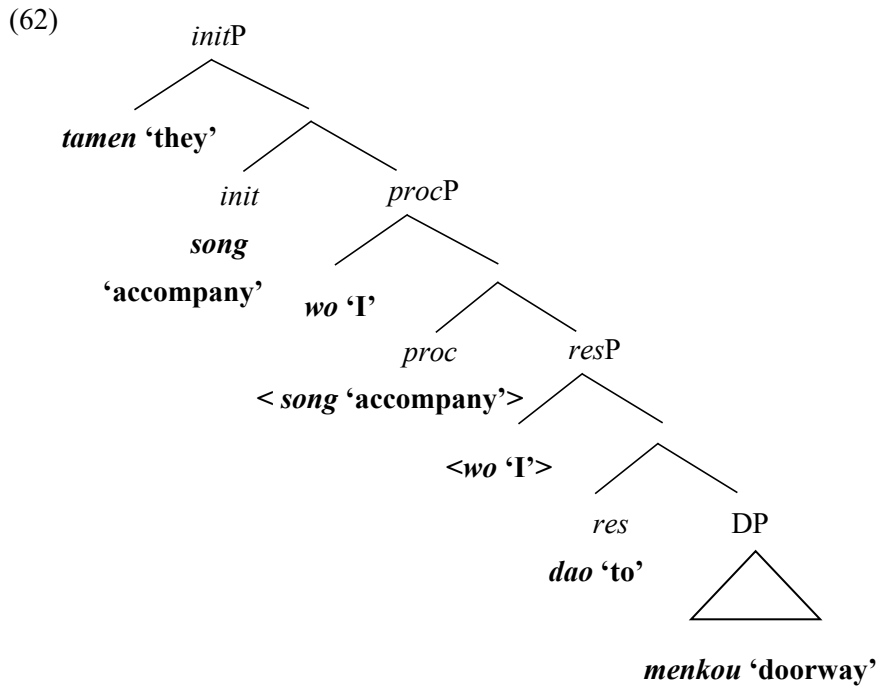
(61) ID 24678

Wo	zou	de	shihou,	tamen	yizhi
I	leave	DE	moment	they	all the way
<u>song</u>	wo	dao	menkou.		
accompany	me	to	doorway		

‘When I left, they accompanied me to the door.’

[Mandarin: *marked(endpoint-indicating phrase)*]

Ignoring the adverb *yizhi* ‘all the way’ and the *when*-clause (because such modifiers are not discussed in Ramchand (2008)), the first-phase representation of (61) could be (62).



The process verb *song* ‘accompany’ identifies *init* and *proc*. The morpheme *dao* ‘to’ means “arrive” when used alone as a verb (63), but here it is like a preposition introducing the final location “I” arrived at.

- (63) Lisi dao Beijing le.
 Lisi arrive Beijing LE.
 ‘Lisi has arrived in Beijing.’

Therefore I assume that the verbal morpheme *dao* ‘to’ identifies *res*, just like the directional RVC *chu* ‘out’. The complement of *dao* ‘to’ is the locational DP *menkou* ‘doorway’. *Tamen* ‘they’ who initiated the accompanying event is the INITIATOR, and *wo* ‘I’ is the RESULTEE-UNDERGOER who

experienced the company and reached the final location. The first-phase representation in (62) is similar to that of the directional RVC compound *na-chu* ‘take-out’ (see Section 6.3.2).

A consequent state in the causative construction is the third telicity-indicating method functioning within clauses. Although it is not attested in the Camus corpus, Chapter 5 introduced an elicited example (copied below).

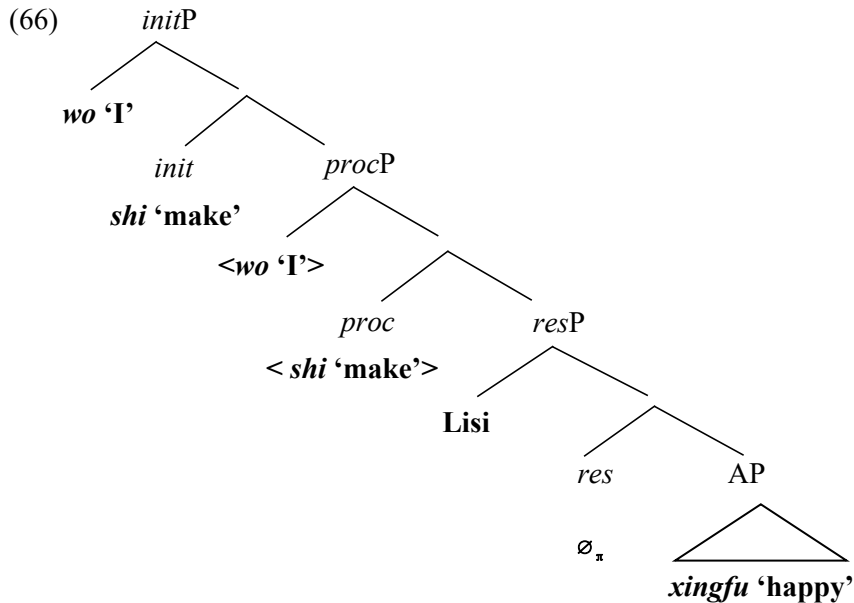
- (64) Wo shi Lisi hen xingfu.
 I make Lisi very happy
 ‘I made Lisi very happy.’

(64) has a causative interpretation: I did something (e.g., buying Lisi a gift) that made Lisi become happy. The result “being happy” is known as an indirect resultative (Levin & Rappaport-Hovav 1999; Ramchand 2008: 129) as it is temporally and lexically independent from the process (i.e., “I” doing something) that led to it. Ramchand (2008: 177–178) analyzes a Hindi/Urdu example containing an indirect causativization marker *-vaa* (65): the marker Merges *init* (identified by *-aa*) and *proc* (identified by *-v*), and the root verb *ban* which expresses the result identifies *res*. The “subject” of the causative *-vaa* (Anjum) is a volitional UNDERGOER-INITIATOR.

- (65) Anjum-ne (mazdurō-se) makaan ban-vaa-yaa
 Anjum-ERG labourers-INSTR house be.made-*vaa*-PERF.M.SG
 ‘Anjum had a house built by the labourers.’

(65) mirrors (64), although the Mandarin indirect causativization is conveyed in an analytical rather than a morphological way. This is unsurprising as Ramchand (2008: 188) claims that subparts of the first phase can be expressed synthetically, morphologically, or analytically due to cross-linguistic variation in grammar and the lexicon. In (64), the causativization is expressed by the causative verb *shi* ‘make’ plus a subject-predicate structure *Lisi xingfu* ‘Lisi happy’ that instantiates *res*P. (64) is thus represented by (66) where the *res* is assumed to be identified by the

null possessive head, and the verb *shi* ‘make’ identifies *init* and *proc*. “I” is the UNDERGOER-INITIATOR²⁷ and Lisi is the RESULTEE.



To sum up, sentences using the telicity-indicating methods working within clauses (i.e., RVCs and the ones analyzed in this section) all denote culminated events by having *resP* projected, and the methods constituting *res* or the complement of *res*.

Ramchand’s framework turns out to be a powerful tool for analyzing Mandarin sentences using telicity-indicating methods, regardless of whether the telicity is lexically encoded or is derived compositionally. I conclude that in Mandarin, telicity can be lexically encoded by verbs (e.g., *dao* ‘arrive’, *faxian* ‘discover’, *diushi* ‘lose’ and frozen RVC compounds *kan-chu-lai* ‘look-out-come’) or compositionally derived by combining verbs with telicity-indicating methods projecting *resP*.

²⁷ Alternatively, *Lisi xingfu* ‘Lisi happy’ could be a clause constituting the complement of *res*. However, I did not opt for this analysis because it would require “I” to be the RESULTEE-UNDERGOER-INITIATOR. This would be odd because, according to my intuition, “I” does not have a RESULTEE interpretation in (64).

6.7 Conclusions

This chapter has decomposed RVC compounds through Ramchand's (2008) first-phase syntax and spelled out their semantics by exploiting the post-Davidsonian event semantics associated with the syntax, revealing the interaction between the two components of RVC compounds, i.e., the verb and the RVC itself. My case-by-case investigation indicated that my data is in line with Hypothesis 1, namely that a RVC compound denotes a culminated event plus a result state. My qualitative analysis showed that RVCs contribute to eventuality descriptions by specifying the result states of events and, in this way, render endpoints to events as a telicity-indicating method. RVC compounds always project *resP*, where RVCs either identify *res* (directional RVCs), or the complement of *res* (completive RVCs and result-state RVCs). Frozen RVC compounds are primitive lexical items featuring [*init, proc, res*], functioning in the same way as simple telic verbs.

The chapter showed that Ramchand's (2008) first-phase syntax which is cross-linguistically supported by English, Russian, etc., is also applicable to Mandarin, a language which is typologically and morphologically very different from European languages. My analysis uncovered the commonalities between verbs and verbal constructions in Mandarin and English. Studies (Vendler 1957; Verkuyl 1972, 1993) have shown that telicity can be encoded lexically or derived compositionally in English. Both ways are borne out in Mandarin: Mandarin not only has telic verbs (including frozen RVC compounds), which bundle *init, proc* and *res* features, but also systematically derives telicity via combining dynamic verbs with telicity-indicating methods such as RVCs. Specifically, directional RVCs mirror English verb-particles, while some result-state RVCs mirror English secondary predicates. However, different from English, Mandarin sentences cannot entail culmination by resorting to mereological monotonicity between events and bounded Paths, namely by combining creation/consumption verbs with bounded Path objects (e.g., quantized DP objects or closed-scale adjectives). As Chapter 7 will show, the monotonicity which gives culmination as an entailment in English sentences only makes Mandarin sentences without *resP* receive a culmination interpretation as a conversational implicature.

Moreover, I drew the generalization that to denote culminated events, Mandarin sentences obligatorily project *resP*. RVCs, *de*-resultatives, endpoint-indicating phrases, and a consequent state in the causative construction are telicity-indicating methods introducing *resP*. Sentences which use any of the methods denote culminated events.

Recall that in Section 6.5 I argued that post-verbal *le* is a competitor of RVCs and that their competition is an important factor causing the low NPMI score between RVCs and the eventive Past Perfective tuple. Therefore the next chapter will investigate the semantics of post-verbal *le*, which takes a syntactically higher position than RVCs, and the competition will be picked up in my comparison of RVCs and post-verbal *le*.

Chapter 7

The semantics of *le1* (post-verbal *le*)

7.1 Introduction

In Chapter 6, I investigated the semantics of RVCs and found that as aspectual expressions, they have competition with post-verbal *le* in terms of making sentences have an eventive interpretation. Post-verbal *le* is semantically controversial, and based on previous studies, I formulated two competing hypotheses in Chapter 2 for post-verbal *le*: it is a Perfective marker (Hypothesis 2a, along the lines of Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014) or a resultative Perfect marker (Hypothesis 2b, along the lines of Lin 2006). The statistical association study in Chapter 4 does not straightforwardly support either of them. Therefore, this chapter will qualitatively analyze post-verbal *le* data in the Camus corpus and try to reconcile both hypotheses by proposing an aspectual duality analysis of post-verbal *le*. The analysis, as I will show, further helps me account for the competition between post-verbal *le* and RVCs.

Specifically, the aspectual duality analysis of post-verbal *le* marries Lin's (2006) analysis for post-verbal *le* with Ramchand's (2008) framework introduced in Chapter 6 (the first-phase syntax and the associated post-Davidsonian event semantics). To be specific, Lin argues that

post-verbal *le* is a tense-aspect marker¹ showing aspectual duality: it simultaneously asserts opposite viewpoint aspects for different internal phases of eventualities. Therefore, verbs denoting eventualities with different internal structures (hereafter called “event structures”, following the conventional terminology in event semantics) interact with post-verbal *le* in different ways, leading to different interpretations of sentences marked by post-verbal *le*. Given that the event structure assumed by Lin is coarse-grained, while Ramchand’s (2008) framework develops a fine-grained event structure, marrying their works can give rise to a more sophisticated semantics for post-verbal *le*. Also, the marrying enables me to make a semantic comparison between post-verbal *le* and RVCs within one theoretical framework. Since this chapter zooms into the Camus corpus data where *le1* is used to annotate post-verbal *le* (recall the annotation rule in Section 4.3.1 that defines *le1* as the *le* morpheme used at the post-verbal position in the middle of sentence), for notational consistency, I will use the label *le1* in the rest of the chapter and only use the term “post-verbal *le*” when the differentiation is relevant.

The chapter is organized as follows. Section 7.2 introduces all kinds of verbs (i.e., eventuality descriptions) that are marked by *le1* in the corpus and then elaborates on the syntactic-semantic proposal of *le1* by marrying Lin’s and Ramchand’s works as well as explaining how it reconciles Hypotheses 2a and 2b. Section 7.3–Section 7.7 apply the syntactic-semantic proposal to analyze different occurrences of *le1*. Specifically, Section 7.3 and Section 7.4 analyze the cases where *le1* marks atelic verbs, i.e., state and process verbs, respectively. Section 7.5 tackles the case when *le1* marks a telic RVC compound. The case picks up an issue noted in Section 4.3.2.2, the stacking of tense-aspect forms (RVC and *le1*). Section 7.6 discusses the alternative use between *le1*, RVCs, and the stacking of RVC and *le1* in eventive sentences. Although most occurrences of *le1* are used to translate eventive French data, which are dealt with in Sections 7.2–7.6, *le1* also translates

¹ The tense-aspect marker analysis of post-verbal *le* is also adopted by Sun (2014) who proposes that the post-verbal *le* not only denotes Perfective aspect but also specifies the run time of an event preceding a local evaluative time (in the default case, speech time). Since Lin’s proposal works well for my data (as this chapter will show), I leave the comparison between Lin’s and Sun’s proposals for future study.

stative French data and these cases are discussed in Section 7.7. Section 7.8 revisits Hypotheses 2a and 2b by reflecting on the analysis of *leI* given in the previous sections. Finally, Section 7.9 concludes the chapter.

7.2 Syntactic-semantic proposal of *leI*

As mentioned above in Section 7.1, Lin (2006) argues that sentences marked by *leI* vary in their interpretations because verbs marked by *leI* denote eventualities that vary in event structure. To write a sophisticated semantics for *leI*, I need to investigate the relations between the kinds of verbs marked by *leI* and the interpretations of *leI*-marked sentences. Previously, Chapter 4 found that the Camus corpus contains 59 Mandarin cases marked by *leI* and, moreover, confirmed that *leI* operates on all kinds of eventualities (i.e., states, processes, and events).² The verbs or verb compounds marked by *leI* can be atelic (not bearing a [res] feature), or telic (bearing a [res] feature). The former includes state verbs bearing an [init] feature (e.g., *mingbai* ‘understand’ in (1e)) and process verbs bearing [init, proc] features³ (e.g., *chou* ‘smoke’ in (2e)). The latter includes simple telic verbs (e.g., *yin* ‘win’ in (3e)) and RVC compounds (e.g., *zhai-diao* ‘take-off’ in (4e)), both bearing [init, proc, res] features. Below I will illustrate all kinds of verbs marked by *leI* with corpus data.

(1e) translates the French sentence (1a) by using *leI* to mark a state verb *mingbai* ‘understand’. (1e) means the protagonist “I” suddenly understood something at the seeing moment, and “I” held the state of understanding afterwards.

(1) ID 25583

- a. En le voyant avec sa femme, j’ai compris pourquoi dans le quartier on disait de lui qu’il était distingué. [French: *passé composé*]

² *LeI* cannot apply to a limited group of state verbs, e.g., *dengyu* ‘equal’ and *xiwang* ‘hope’, see Section 2.5.1.

³ Verbs carrying [init, proc] features are called initiation-process verbs in Ramchand’s framework.

- b. Seeing him with his wife, I understood why local people said he was distinguished. [English: *simple past*]
- c. Und als ich ihn mit seiner Frau sah, habe ich begriffen, warum man im Viertel von ihm sagte, er wäre vornehm. [German: *Perfekt*]
- d. Al verlo con su mujer, comprendí por qué en el barrio se decía que era una persona distinguida. [Spanish: *pretérito indefinido*]
- e. Kan-dao ta he ta laopo zai iqi, wo
 look-arrive he and his wife at together I
mingbai-le weishenme zhe-yi-dai-de-ren dou
 understand-LE why the-local-place-DE-people all
 shuo ta yitaibufan.
 say he distinguished
 ‘Seeing him with his wife, I understood why local people said he was distinguished.’
 [Mandarin: *leI*]

As the translation of (2a), (2e) denotes that “I” smoked two cigarettes completely. The process verb *chou* ‘smoke’ marked by *leI* in (2e) encodes the information about the initiation and process of the smoking event.

(2) ID 25619

- a. J’ ai fumé deux cigarettes, [...] [French: *passé composé*]
- b. I smoked a couple of cigarettes, [...] [English: *simple past*]
- c. Ich habe zwei Zigaretten geraucht, [...] [German: *Perfekt*]
- d. Fumé dos cigarrillos, [...] [Spanish: *pretérito indefinido*]
- e. Wo chou-le liang-zhi yan, [...] [Mandarin: *leI*]
 I smoke-LE two-CL cigarette
 ‘I smoked two cigarettes, [...]’

(3a) is translated by (3e) which indicates that “we” thrashed “them”, and the winning state held at the shouting moment. In (3e), the telic verb *yin* ‘win’ is marked by *leI*.

(3) ID 25651

- a. L'un m' a même crié: «On les a eus. » [French: *passé composé*]
- b. One of them even shouted to me, 'We thrashed them.'
[English: *simple past*]
- c. Einer hat mir sogar zugerufen: «Wir haben sie fertiggemacht. »
[German: *Perfekt*]
- d. Uno gritó incluso: «Les hemos ganado».
[Spanish: *pretérito indefinido*]
- e. Qizhong you yi-ge shenzhi dui wo han:
among them there-be one-CL even to me shout
“Women yin-le tamen.”
we win-LE them
‘One of them even shouted to me, “We thrashed them.”’
[Mandarin: *le1*]

(4a) is translated by (4e). The sentence in the parenthesis of (4e) expresses that a context-specific man took off his hat when the coffin passed by, and the hat was kept off his head for some unspecified time. The sentence contains a verb *zhai* ‘take’ that compounds with a completive RVC *diao* ‘off’. The whole RVC compound is marked by *le1*.⁴

(4) ID 25262

- a. Il avait un feutre mou à la calotte ronde et aux ailes larges (il l' a ôté quand la bière a passé la porte), [...] [French: *passé composé*]
- b. He was wearing a soft felt hat with a round crown and a wide brim (he took it off when the coffin came through the gate), [...] [English: *simple past*]
- c. Er trug einen weichen Filzhut mit runder Kappe und breiter Krempe (er hat ihn abgenommen , als der Sarg durch das Tor gekommen ist), [...] [German: *Perfekt*]

⁴ According to the form-based methodology (see Chapter 4), cases containing both RVCs and *le1* were annotated by *le1* in the corpus. See Section 4.3.2.2 for the discussion on annotation challenges.

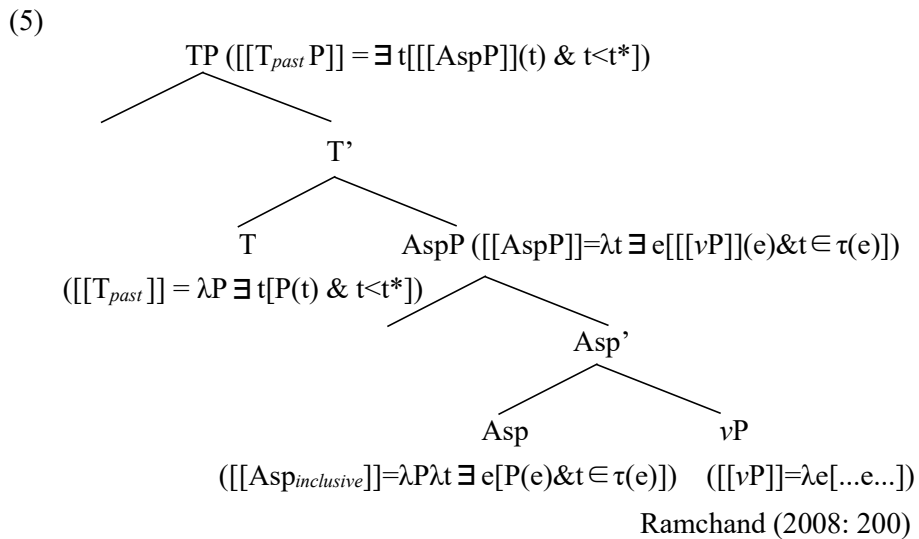
- d. Llevaba un fieltro blando de copa redonda y ala ancha (se destocó cuando el ataúd pasó delante de la puerta), [...]
 [Spanish: *pretérito indefinido*]
- e. Ta dai-zhe yi-ding yuan-ding kuan-yan ruan
 he wear-ZHE one-CL round-top wide-brim soft
 zhanmao (Guancai jingguo de-shihou,
 felt hat coffin pass-by DE-time
 ta zhai-diao-le maozi), [...] [Mandarin: *lel*]
 he take-off-LE hat
 ‘He was wearing a soft felt hat with a round crown and a wide brim
 (he took it off when the coffin passed by), [...]

The Mandarin examples in (1)–(4) all have an eventive interpretation. To prepare for analyzing the eventive Mandarin cases marked by *lel* in depth, Section 7.2.1 will discuss the position of *lel* in the hierarchical phrase structure agreed on by Ramchand (2008) and Lin (2006), paving the way to analyze the semantic derivations of *lel*-marked sentences. Then Section 7.2.2 will elaborate on Lin’s (2006) proposal for the semantics of *lel*, and I will enrich it by incorporating Ramchand’s framework. The enriched proposal will be checked against my *lel* data in Sections 7.3–7.7.

7.2.1 The phrase-structural position of *lel*

Remember Chapter 6 argued that RVC compounds always project a maximal event structure consisting of *initP*, *procP*, and *resP*, which constitutes the full-fledged syntax of first phase in Ramchand’s (2008) framework. The fact that some Mandarin sentences contain RVC compounds marked by *lel*, e.g., (4e), gives the inference that *lel* does not fill any position underneath the node *initP* because no room is left for *lel* within the first-phase syntax. The follow-up question is: where is *lel* situated in a hierarchical phrase structure? The answer can be found in the extended phrasal structure above the first phase (Ramchand 2008: 199–200); see (5) for the representation (with minor changes for notational consistency). The Asp head (Ramchand’s Assertion time head) takes *initP* as its complement and binds the free eventuality

variable of *initP* (*initP* is represented in (5) by its analogue *vP*, the canonical term in the literature). Particularly, Ramchand argues that the *Asp* head introduces a temporal variable *t* (reference time in Ramchand’s terminology, or topic time in Klein (1994), see Section 2.3.2) and specifies the temporal relation between *t* and the run time of the eventuality variable of *initP*. The temporal relation is determined by the contents of the item constituting *Asp*. Above *AspP*, there is a Tense phrase (*TP*) relating the free time variable *t* to speech time in a particular way. To be concrete, Ramchand chose a default inclusive *Asp* head and the past tense T_{past} for illustration (t^* : speech time, τ : temporal trace function).



In (5), *Asp_{inclusive}* indicates that the reference time is included in the run time of the eventuality, expressing the Imperfective aspect (recall Section 2.3.2). The reference time is bound by *TP* where the T_{past} specifies the reference time as preceding speech time, giving a past tense meaning. The denotation of *TP* encodes an eventuality which has a past Imperfective interpretation.

Ramchand’s phrase structure (5) suggests that the potential hosting position for *lel* could be the *Asp* head or the Tense head. I just assume that *lel* constitutes the *Asp* head because this is in line with Lin (2006), who argues that Mandarin has the following phrase structure [*CP* ... [*IP* ... [*ModalP* ...

[_{AspP} ... [_{VP} ...]]], where no TP but AspP is projected (Lin's VP node corresponds to Ramchand's *initP* node). I leave open the question of whether Mandarin syntax has TP (recall Section 2.1) because this dissertation focuses on Mandarin aspect. With the phrase-structure position of *lel* in place, Section 7.2.2 will elaborate on Lin's semantic proposal of *lel* and incorporate Ramchand's framework into it.

7.2.2 Marrying Lin's (2006) proposal for *lel* and Ramchand's (2008) first-phase syntax

Previously, I briefly introduced Lin's (2006) proposal for *lel* in Section 2.5.1. In this subsection, I will explain it in detail.

According to Lin, *lel* is sensitive to event structure. Following Caudal (1999), Lin assumes that “(the time of) an eventuality canonically breaks down into (the time of) Inner Stage and (the time of) Result State.”⁵ In Lin's proposal, the Inner Stage of dynamic eventuality is the development phase of eventuality, and the Inner Stage of a state is the state itself. Lin's Result State is similar to Parsons' (1990: 235) “target state”: some Result States cease lasting (e.g., a window being closed) while others last forever ever since their existence (e.g., a theorem being proven). Using the Vendlerian classification of eventualities, Lin assumes that accomplishments and achievements have inherent Result States (accomplishments and achievements are telic, recall Section 2.3.1). Activities and states have “empty Result States”, which Lin assumes to “exist in all times after the eventuality has occurred”. For example, if Mary ate breakfast, then the eating has an empty Result State of Mary's having eaten breakfast. Proposing the “empty Result State” enables Lin to give a unified semantics for *lel* no matter it marks what class of verb.

To accurately describe the Inner Stage and Result State, Lin proposes the functions *Istage* and *Rstate*. They give “the inner time and result state time” of eventuality *P* at time *t* respectively:

⁵ Inner Stage and Result State are capitalized where specifically referencing Lin's (2006) framework, following the source's convention.

- (6) a. $Istage(t, P)$ is defined if $P(t) = 1$, in which case
 (i) if P is telic, $Istage(t, P) = t$ minus the last point of t ;
 (ii) if P is atelic, $Istage(t, P) = t$.
- b. $Rstate(t, P)$ is defined if $P(t) = 1$, in which case
 (i) if P is telic, $Rstate(t, P) =$ the interval at which the result state of P exists.
 (ii) if P is atelic, $Rstate(t, P) =$ the interval consisting of every moment after t .

According to Lin, the Inner Stage and the Result State each has “an independent time at which they are asserted to be true”. In other words, they each have an independent topic time.⁶ The topic time for the Inner Stage is also the topic time of the sentence, which can be existentially bound or obtain a value from an adverbial indicating the time anchoring the sentence. However, the topic time for the Result State is an anaphor-like variable that must be bound by an overt topic time or given a value from the context. *LeI* is then argued as a “[P]erfective/[I]mperfective” marker: it denotes the Perfective aspect of the Inner Stage of eventuality and the Imperfective aspect of the Result State of eventuality. Further, *leI* also denotes the relative past, namely the topic time of the sentence preceding the evaluation time of the sentence (with speech time as the default). The Perfective/Imperfective meaning plus the relative past meaning constitute the semantics of *leI*, making it an aspect-tense particle. Lin formally defines the semantics of *leI* as (7) by taking the two-component approach to aspect (remember Section 2.3.2):

$$(7) \quad [[le]] = \lambda P_{\langle i, t \rangle} \lambda t_{Top} \lambda t_0 \exists t [P(t) \wedge Istage(t, P) \subseteq t_{Top} \wedge t_{Top} < t_0 \wedge t_{ana} \subseteq Rstate(t, P)]$$

(7) has three temporal variables: t_{Top} and t_{ana} are the topic times for the Inner Stage and the Result State, respectively, and t_0 the evaluation time. Dealing with the out-of-the-blue data, Lin assumes “speech time is assigned as the

⁶ Lin uses the term “topic time” proposed by Klein (1994), which corresponds to Ramchand’s “reference time”. I follow Lin’s terminology hereafter.

default value of evaluation time or topic time at the root level”. Arguing that Mandarin does not have TP, Lin assumes that the topic time variable is bound at IP (“for an expression of type $\langle i, \langle i, t \rangle \rangle$, an unfilled topic time is existentially closed at IP”).⁷ Accordingly, when no explicit cue of time anchoring appears in a sentence, t_{top} is implicit and existentially bound. However, t_{ana} as an anaphor-like variable, which cannot be bound by the implicit topic time, obtains its value from the context (e.g., speech time as the default). When there is a temporal frame adverbial indicating the time anchoring of the sentence, t_{top} and t_{ana} obtain their values (which are the same) from the adverbial: t_{top} is assigned a value by the adverbial, while t_{ana} takes the adverbial as its antecedent. The temporal semantics of *lel* is not deictic, since the evaluation time of an embedded *lel*-clause is not speech time but the matrix event time.

To marry Lin’s formalization with Ramchand’s framework, I translate (6) into (8) with Ramchand’s assumption that verbs have eventuality arguments rather than time arguments. In fact, Lin (2006) notes that it is possible to assume verbs have eventuality arguments and to use the temporal trace function to introduce time variables. His footnote 16 thus gives an alternative formalization where *Istage* is no longer a binary relation between time and predicate (see (6a)) but a unitary function taking eventuality as its argument.

- (8) a. *Istage*(e) is defined if $P(e) = 1$, in which case
 (i) if P is telic, $\tau(\text{Istage}(e)) = \tau(e)$ minus the last point of $\tau(e)$;
 (ii) if P is atelic, $\tau(\text{Istage}(e)) = \tau(e)$.
- b. *Rstate*(e) is defined if $P(e) = 1$, in which case
 (i) if P is telic, $\tau(\text{Rstate}(e)) =$ the interval at which the result state of P exists.
 (ii) if P is atelic, $\tau(\text{Rstate}(e)) =$ the interval consisting of every moment after $\tau(e)$.

⁷ This is inconsistent with Ramchand (2008: 200), who claims that topic time is bound by the T head. I leave open the question of whether Mandarin has TP (recall Section 7.2.1), and I ignore the inconsistency because such a detail does not influence the semantic derivations in the chapter.

Accordingly, I translate Lin's denotation (7) into (9):

$$(9) \quad [[le]] = \lambda P_{\langle v, t \rangle} \lambda t_{Top} \lambda t_0 \exists e_{is} \exists e_{rs} \exists e [P(e) \ \& \ \text{Istage}(e) = e_{is} \ \& \ \tau(e_{is}) \subseteq t_{Top} \ \& \ t_{Top} < t_0 \ \& \ \text{Rstate}(e) = e_{rs} \ \& \ t_{ana} \subseteq \tau(e_{rs})]$$

The Perfective component of *lel* is shown by the condition that the run time of the Inner Stage is included in t_{Top} . Meanwhile, the Imperfective component of *lel* is shown by the condition that the run time of the Result State includes t_{ana} . Further, the relative past meaning of *lel* is indicated by the condition that t_{Top} precedes the evaluation time of the sentence (t_0).

Crucially, (8) reflects the event structure adopted by Lin. Based on (8), I argue that Lin's Inner Stage of eventuality equals the union of the initiation and the process of eventuality in Ramchand's framework, while Lin's Result State corresponds to Ramchand's result of event. For transparency, hereafter I will use the variable e_1 to represent the process of eventuality and variables e_2 and e_3 for the result and the initiation of eventuality, respectively. Hence Lin's $\text{Istage}(e)$ and $\text{Rstate}(e)$ are translated as follows:

$$(10) \quad \begin{aligned} \text{Istage}(e) &= e_{is} = e_1 \cup e_3 \\ \text{Rstate}(e) &= e_{rs} = e_2 \end{aligned}$$

Also, I do not assume Lin's empty Result State because in Ramchand's framework, the empty Result State means no *resP* projection. Particularly, when no *resP* is projected (e.g., in the case of process verbs, see Section 7.4), the variables e_{rs} and t_{ana} and their related conditions shall be removed from *lel*'s denotation (9). To adapt Lin's verb classes (i.e., Vendlerian verb classes) for Ramchand's framework, this chapter will use the translation mentioned in Section 6.2 (Ramchand 2008: 196): states are [init] verbs, while activities are [init, proc] or [proc] verbs. Achievements are [init, proc, res] or [proc, res] verbs, while accomplishments are [init, proc] verbs with Path complements.

The last issue worth attention is my data choice and its influence on temporal anchoring. Unlike Lin exploiting the out-of-the-blue data, I use data chosen from narrative discourse. Specifically, they are contexts from the first three chapters of Camus' diary-style novel *L'Étranger*. In the chapters,

the protagonist Meursault narrates the sequence of events he experienced on different days. The chapters are written chronologically to follow the development of the story. I hence assume that topic time in the novel generally moves forward with the unfolding of the story, following the dynamic account of reference time in the standard DRT (Kamp & Reyle 1993). Frame temporal adverbials like *aujourd'hui* ‘today’ and *l’après-midi* ‘afternoon’ in the novel indicate the evaluation times of the contexts by anchoring them to the time axis. The references of deictic expressions such as *today* and *now* change in the chapters, thus being context-specific. Other devices are also used to temporally anchor eventualities, including temporal clauses introduced by *quand* ‘when’, adverbial connectives such as *alors* ‘then’ and *ensuite* ‘afterwards’, and prepositional expressions such as *vers la fin de la séance* ‘towards the end of the film’. I will adopt the “moving forward” temporal assumption of narration and exploit all the explicit temporal expressions to interpret my data.

So far, the advantage of marrying Lin’s proposal with Ramchand’s framework becomes more concrete: the two are complementary to each other. On the one hand, Lin offers the insights that *lel* interacts with different internal phases of eventualities, but his description of the internal structure of eventualities is preliminary. Fortunately, Ramchand’s framework spells out the internal structure of eventualities, making explicit the phases that *lel* operates on. On the other hand, Lin’s proposal enables me to extend my analysis of the compositionality of Mandarin aspect from the domain of Ramchand’s first-phase syntax to AspP. The marrying reconciles Hypotheses 2a and 2b in the following way: *lel* functions as a Perfective marker (Hypothesis 2a) when marking atelic verbs, as the verbs do not project *resP* such that only the Perfective component of *lel* has lexical inputs; *lel* functions as a resultative Perfect marker (Hypothesis 2b) when marking telic verbs, as the verbs project *resP* such that both the Perfective and Imperfective components of *lel* have lexical inputs. In Sections 7.3–7.7, I will apply the aspectual duality analysis of *lel* by marrying Lin’s and Ramchand’s works to analyze how the different interpretations of *lel*-marked sentences are derived from the interactions between *lel* and all kinds of verbs (or verb compounds).

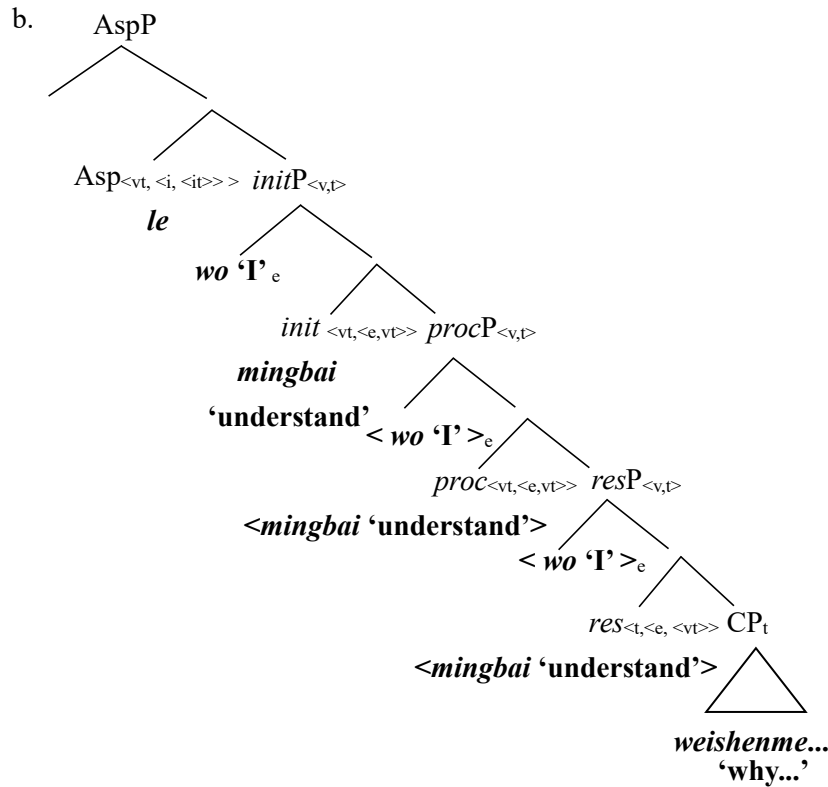
7.3 *Le1* with a state verb

In Section 7.2, (1e) indicates that *le1* can mark state verbs such as *mingbai* ‘understand’; see the example copied in (11a). (11a) has an inchoative interpretation that “I” changed from the state of not understanding to understanding. According to Lin (2006), when *le1* marks a state verb, the verb is “type-coerced” into an achievement verb and thus is “tinted with dynamicity”, making the sentence have an inchoative interpretation. Applying that to (11a), *mingbai* ‘understand’ is coerced from an [init] verb to an [init, proc, res] verb. Aspectual coercion is not unique to Mandarin; recall that Section 2.3.2 mentioned the French coercion example: (*Soudain*,) *Jeanne sut la réponse* ‘(Suddenly,) Jeanne knew the answer’. The tense-aspect form *passé simple* only operates on events and thus has an aspectual conflict against the state verb *sut* ‘knew’. The conflict is solved by the coercion operator C_{he} that coerces the state denoted by *sut* ‘knew’ into a knowing event that *passé simple* can operate on. Similar to C_{he} , *le1* can coerce states into events. The representation of (11a) is shown by (11b), where *mingbai* ‘understand’ takes a CP (denoted by the *why*-clause) as its complement.

(11) ID 25583

- a. Kan-dao ta he ta laopo zai yiqi,
 look-arrive he and his wife at together
 wo mingbai-le weishenme zhe-yi-dai-de-ren
 I understand-LE why the-local-place-DE-people
 dou shuo ta yitaibufan.
 all say he distinguished
 ‘Seeing him with his wife, I understood why local people said he
 was distinguished.’

[Mandarin: *le1*]



(11b) has the same configuration as the representation of the frozen RVC example *kan-chu-lai* 'look-out-come' (49b) in Section 6.4.2.3: both contain an [init, proc, res] verb taking a CP complement, and the subject is simultaneously the INITIATOR, UNDERGOER, and RESULTEE. The semantic derivation of (11a) is parallel to that of *kan-chu-lai* 'look-out-come'. Specifically, the *why*-clause is represented by "p_{why}" in (12a). (12b) uses the denotation of *res*. (51a) proposed for *kan-chu-lai* 'look-out-come'.⁸ It is a variant of Ramchand's *res* denotation (see (30a) in Section 6.4.1) and used when *res* takes a clausal complement.

(12) a. [[CP]] = p_{why}

⁸ The same assumptions for *res* and CP have been made for the example of frozen RVC compound *kan-chu-lai* 'look-out-come' in Section 6.4.2.3. In this example, the RVC compound also takes a clause as its complement.

- b. $[[res.]] = \lambda p \lambda x \lambda e [understand(e) \& State(e) \& Subject(x,e) \& Complement(p,e)]$
- c. $[[res']] = \lambda x \lambda e [understand(e) \& State(e) \& Subject(x,e) \& Complement(p_{why},e)]$
- d. $[[wo]] = I$
- e. $[[resP]] = \lambda e [understand(e) \& State(e) \& Subject(I,e) \& Complement(p_{why},e)]$
- f. $[[proc]] = \lambda P \lambda x \lambda e \exists e_1, e_2 [P(e_2) \& understand(e_1) \& Process(e_1) \& e = (e_1 \rightarrow e_2) \& Subject(x, e_1)]$
- g. $[[proc']] = \lambda x \lambda e \exists e_1, e_2 [[understand(e_2) \& State(e_2) \& Subject(I, e_2) \& Complement(p_{why}, e_2)] \& understand(e_1) \& Process(e_1) \& e = (e_1 \rightarrow e_2) \& Subject(x, e_1)]$
- h. $[[procP]] = \lambda e \exists e_1, e_2 [[understand(e_2) \& State(e_2) \& Subject(I, e_2) \& Complement(p_{why}, e_2)] \& understand(e_1) \& Process(e_1) \& e = (e_1 \rightarrow e_2) \& Subject(I, e_1)]$
- i. $[[init]] = \lambda P \lambda x \lambda e \exists e_3, e_4 [P(e_4) \& understand(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(x, e_3)]$
- j. $[[init']] = \lambda x \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[understand(e_2) \& State(e_2) \& Subject(I, e_2) \& Complement(p_{why}, e_2)] \& understand(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(I, e_1)] \& understand(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(x, e_3)]$
- k. $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[understand(e_2) \& State(e_2) \& Subject(I, e_2) \& Complement(p_{why}, e_2)] \& understand(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(I, e_1)] \& understand(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(I, e_3)]$

InitP (12k) denotes a predicate of events. Such an event has internal complexity: it consists of the initiating state and the (punctual) process of understanding, and the result state of understanding. “I” initiated and experienced the understanding event and held the result state. *InitP* then Merges with *le1* that constitutes *Asp* (denotation in (13a), copied from (9)),

producing Asp' (13b):

- (13) a. $[[/e]] = \lambda P \lambda t_{\text{Top}} \lambda t_0 \exists e_{is} \exists e_{rs} \exists e [P(e) \ \& \ \text{Istage}(e) = e_{is} \ \& \ \tau(e_{is}) \subseteq t_{\text{Top}} \ \& \ t_{\text{Top}} < t_0 \ \& \ \text{Rstate}(e) = e_{rs} \ \& \ t_{\text{ana}} \subseteq \tau(e_{rs})]$
- b. $[[\text{Asp}']] = \lambda t_{\text{Top}} \lambda t_0 \exists e_{is} \exists e_{rs} \exists e [\exists e_3, e_4 [\exists e_1, e_2 [\text{understand}(e_2) \ \& \ \text{State}(e_2) \ \& \ \text{Subject}(I, e_2) \ \& \ \text{Complement}(p_{\text{why}}, e_2)] \ \& \ \text{understand}(e_1) \ \& \ \text{Process}(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ \text{Subject}(I, e_1)] \ \& \ \text{understand}(e_3) \ \& \ \text{State}(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ \text{Subject}(I, e_3)] \ \& \ \text{Istage}(e) = e_{is} \ \& \ \tau(e_{is}) \subseteq t_{\text{Top}} \ \& \ t_{\text{Top}} < t_0 \ \& \ \text{Rstate}(e) = e_{rs} \ \& \ t_{\text{ana}} \subseteq \tau(e_{rs})]$

The terminology translation (10) is copied in (14). Applying (14) to (13b) gives (15) where the variables e_{is} and e_{rs} are removed.

- (14) $\text{IStage}(e) = e_{is} = e_1 \cup e_3$
 $\text{Rstate}(e) = e_{rs} = e_2$
- (15) $[[\text{Asp}']] = \lambda t_{\text{Top}} \lambda t_0 \exists e [\exists e_3, e_4 [\exists e_1, e_2 [\text{understand}(e_2) \ \& \ \text{State}(e_2) \ \& \ \text{Subject}(I, e_2) \ \& \ \text{Complement}(p_{\text{why}}, e_2)] \ \& \ \text{understand}(e_1) \ \& \ \text{Process}(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ \text{Subject}(I, e_1)] \ \& \ \text{understand}(e_3) \ \& \ \text{State}(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ \text{Subject}(I, e_3)] \ \& \ \text{Istage}(e) = e_1 \cup e_3 \ \& \ \tau(e_1 \cup e_3) \subseteq t_{\text{Top}} \ \& \ t_{\text{Top}} < t_0 \ \& \ \text{Rstate}(e) = e_2 \ \& \ t_{\text{ana}} \subseteq \tau(e_2)]$

The values of the time variables t_{Top} , t_0 , and t_{ana} in (15) have not been assigned. According to the discourse where (11a) is embedded, I make the following assumptions for the variables:

(i) I assume that the evaluation time t_0 is the time “now” when the narrator (the protagonist Meursault) narrates (11a), and I name it the protagonist’s speech time (represented by now_M , hereafter). It is neither the real time when Camus wrote the source sentence of (11a) nor the real time when a reader reads (11a) in the novel.

(ii) Remember Section 7.2.2 noted that the topic time of the narrative discourse moves forward as the story unfolds. (11a) appears in a paragraph describing what the protagonist saw on a Sunday afternoon. Although (11a)

has no explicit temporal cue, pragmatically it is inferred that the understanding event happened immediately after the seeing event because the latter caused the former. Hence, I propose that t_{Top} , the topic time for the Inner Stage, is an implicit time within a time interval of that afternoon, immediately after the seeing event. For concreteness, I represent its value as t_c ;

(iii) Recall Lin argues that t_{ana} , the topic time of the Result State, is an anaphor-like variable which receives its antecedent from the context or from an overt topic time (see Section 7.2.2). Since (ii) assumes t_{Top} in (15) is implicit, t_{ana} cannot take t_{Top} as its antecedent, so the only proper antecedent is t_0 , which is salient due to the narrating action. Therefore, t_{ana} obtains the value now_M (remember (i) assumes $t_0 = now_M$).

Based on the assumptions (i)–(iii), the denotation of (11a) is:

- (16) $\exists t_c \exists e [\exists e_3, e_4 [\exists e_1, e_2 [[understand(e_2) \& State(e_2) \& Subject(I, e_2) \& Complement(p_{why}, e_2)] \& understand(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(I, e_1)] \& understand(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(I, e_3)] \& Istage(e) = e_1 \cup e_3 \& \tau(e_1 \cup e_3) \subseteq t_c \& t_c < now_M \& Rstate(e) = e_2 \& now_M \subseteq \tau(e_2)]$

(16) denotes an inchoative interpretation that “I” experienced an understanding event before “now” and the state of understanding holds at “now”. What “I” understood is described by the *why*-clause. Crucially, the inclusive condition “ $\tau(e_1 \cup e_3) \subseteq t_c$ ” means the run time of the initiation and the process of understanding is included in t_c (some time in that afternoon). The inclusive relation (the Perfective component of *lel*) renders the understanding action a temporal endpoint, making (11a) a qualified translation of the eventive French sentence (1a). Compared to (1a), (11a) entails an extra meaning asserted by the condition “ $now_M \subseteq \tau(e_2)$ ”, which means the understanding state holds at “now” (the Imperfective component of *lel*). The extra meaning can be pragmatically inferred in (1a).

To sum up, sentences marking a state verb with *lel* have an eventive interpretation because the state verb is coerced into an [init, proc, res] verb by *lel*. Next, I will probe into the case where *lel* marks a process verb.

7.4 *LeI* with a process verb

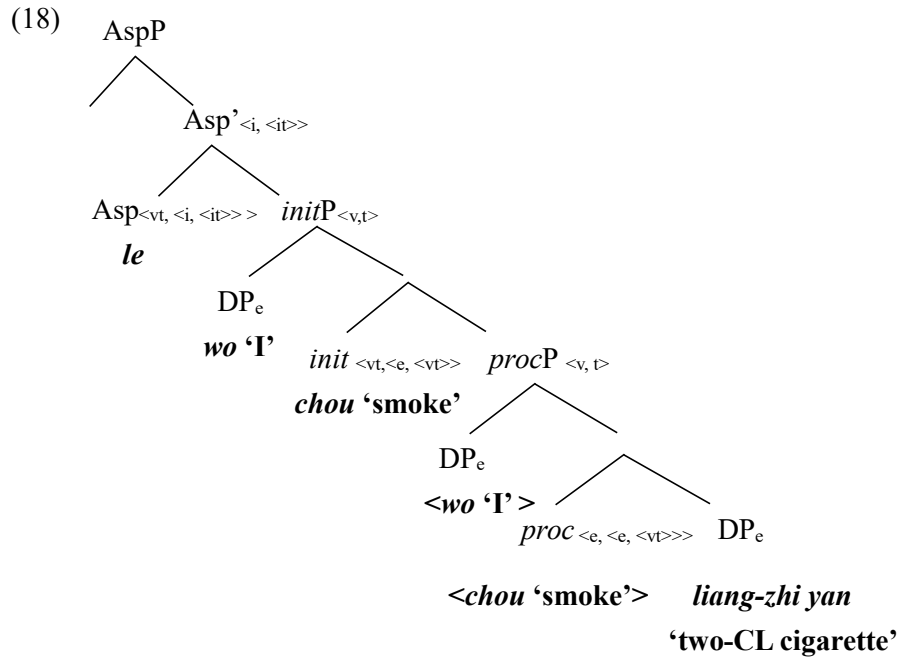
LeI is found to mark process verbs that have [init, proc] features. (2e) is an example (copied in (17b)) where *leI* marks the verb *chou* ‘smoke’.

(17) ID 25619

- | | | |
|----|--|---------------------------------|
| a. | J' ai <u>fumé</u> deux cigarettes, [...] | [French: <i>passé composé</i>] |
| b. | Wo <u>chou-le</u> liang-zhi yan, [...] | [Mandarin: <i>leI</i>] |
| | I smoke-LE two-CL cigarette | |
| | ‘I smoked two cigarettes, [...] | |

The source French sentence (17a) entails a smoking event where two cigarettes were consumed. The verb-argument structure *fumer deux cigarettes* ‘smoke two cigarettes’ denotes an accomplishment in which the change of the material extent of two cigarettes measures out the process of smoking. Remember in Section 2.3.1, Krifka (1989) technically characterizes this as the part-whole structure of the two cigarettes being homomorphic with that of the smoking process, and the culmination of the smoking event is indicated by the entire consumption of the cigarettes. In Ramchand’s framework, the quantized DP *deux cigarettes* ‘two cigarettes’ plays a bounded Path role in the event, taking the complement position of *proc* (see Section 6.2). The first-phase representation of (17a) can be modeled on that of *John baked a cake* (10b) in Section 6.2.

As the Mandarin translation of (17a), (17b) also conveys a smoking event where the two cigarettes were entirely consumed. The first-phase representation of (17b) mirrors that of (17a), as (18) shows. The quantized DP *liang-zhi yan* ‘two-CL cigarette’ constitutes the complement of *proc*. The verb *chou* ‘smoke’ constitutes *init* and *proc*. *LeI* constitutes Asp. The subject *wo* ‘I’ is the UNDERGOER-INITIATOR.



Below I will spell out the semantic derivation of (17b). I assume the denotation of *liang-zhi yan* ‘two-CL cigarette’ is a sum of two cigarette individuals (c_1 and c_2). For simplicity, I assume the sum has the individual type e (the summing operation represented by \oplus).

(19) $[[\textit{liang-zhi yan}]] = c_1 \oplus c_2$

Importantly, Ramchand (2008: 51, 61, 195) proposes another denotation for *proc* (20) when *proc* combines with a Path complement. (20) differs from the one introduced in Section 6.4.1 (see (30b) in that section), which is used when *proc* takes a *resP* as its complement (e.g., (12f) in Section 7.3).

(20) $[[\textit{proc}]] = \lambda y \lambda x \lambda e [\text{Path}(y, e) \ \& \ \textit{proc}'(e) \ \& \ \text{Process}(e) \ \& \ \text{Subject}(x, e)]$

Path is formally defined as a relation between an entity x and an event e (Ramchand 2008: 50–51):

$$(21) \text{ Path}(x, e) =_{\text{def}} \exists R \exists D_x [\forall e, d, d' [R(e, d) \ \& \ d' \leq d \rightarrow \exists e' [e' \subseteq e \ \& \ R(e', d')]] \ \& \ \forall e, e', d [R(e, d) \ \& \ e' \subseteq e \rightarrow \exists d' [d' \leq d \ \& \ R(e', d')]]$$

D_x is a set of ordered measures (the measure represented by d) for the entity x . (21) is inspired by Krifka (1989), modeling the monotonic relation (in the same spirit of the homomorphic relation) between the event e and the scale structure of the measures.⁹ R is a relation held between the part of event and the part of object. (21) is dubbed by Ramchand “Measure-to-Event Mapping” and “Event-to-Measure Mapping”. The measures measure a property of the entity x , and the property is restrained by x and the context, see the definition in (22) given by Ramchand (2008: 50).

$$(22) \ \Pi_C(x) \text{ is the property determined by } x \text{ and the selectional context } C, \text{ which is monotonic on } x.$$

Based on $\Pi_C(x)$, Ramchand (2008: 50) defines the set of measures D_x as:

$$(23) \ \text{Let } \mu \text{ be a function which gives a measure of } \Pi. \\ \text{Let } D = \{ d \in \mu(\Pi(x)) : \forall x' \subseteq x \ \mu(\Pi(x')) = d \} \\ \text{Let } \leq \text{ be a relation that determines a linear order on } D, \text{ such that if} \\ \mu(\Pi(x_1)) = d_1 \text{ and } \mu(\Pi(x_2)) = d_2, \ d_1 \leq d_2, \ \text{iff } x_1 \subseteq x_2. \\ \mu \text{ and } \leq \text{ will exist if the property in question really is monotonic with} \\ \text{respect to the part-whole structure of the entity.}$$

Here are some explanations for the aforementioned notions. Since the Path object constitutes the complement of *proc*, Path is actually a relation held between the subeventuality introduced by *proc*, i.e., a (sub-)process,¹⁰ and

⁹ Ramchand (2008: 50) introduces the definition for monotonicity as:

Let $f: P \rightarrow Q$ be a function between two sets P and Q where each set carries a partial order (denoted by \leq , for convenience). The function f is monotone if, whenever $x \leq y$, $f(x) \leq f(y)$. An informal interpretation of a monotonic relation is that it maps the member of one set to the other and meanwhile preserves the ordering from the former set to the latter set.

¹⁰ Recall my introduction to Ramchand’s framework in Section 6.2 (see footnote 3 in that section), I usually do not add the *sub-* prefix to the three subeventualities in the first-phase syntax for simplicity, unless the clarification is necessary.

the entity x denoted by the Path object (e.g., two cigarettes) such that a property of x is monotonic with the part-whole structure of the process (e.g., the process of smoking). Specifically, the property is measured by a function μ (e.g., the function measures the number of cigarettes) that gives rise to D_x , the set of ordered measures (e.g., the set of natural numbers $\{0, 1, 2, \dots\}$). The ordered measures form a scale that is monotonic with the part-whole structure of the *proc*-introduced (sub-)process. The monotonicity between the scale and the process enables the latter to obtain a mereological bound from the maximal quantity carried by x . The bound is linguistically interpreted as the endpoint of the (macro-)event. The set of measure D_x obligatorily mediates between x and the (sub-)process because it is the property (not necessarily the material part-whole structure) of x that has monotonicity with the part-whole structure of the process.¹¹ The property is not simply regulated by x but also by the context under pragmatic restriction (see my explanation for the baking-cake example in Section 6.2).

Applying (21) to (20), I obtain the full-fledged denotation of *proc* (24):

$$(24) \quad \begin{aligned} [[proc]] &= \lambda y \lambda x \lambda e [\text{Path}(y, e) \ \& \ \text{proc}'(e) \ \& \ \text{Process}(e) \ \& \ \text{Subject}(x, e)] \\ &= \lambda y \lambda x \lambda e [\exists R \exists D_y [\forall e, d, d' [R(e, d) \ \& \ d' \leq d \rightarrow \exists e' [e' \subseteq e \ \& \ R(e', d')] \\ &\quad \& \ \forall e, e', d [R(e, d) \ \& \ e' \subseteq e \rightarrow \exists d' [d' \leq d \ \& \ R(e', d')] \ \& \ \text{proc}'(e) \ \& \\ &\quad \text{Process}(e) \ \& \ \text{Subject}(x, e)]] \end{aligned}$$

Since the DP *liang-zhi yan* ‘two-CL cigarette’ is a Path object, the *proc* denotation in (24) is applied and Merges with the DP, producing:

$$(25) \quad \begin{aligned} [[proc']] &= \lambda x \lambda e [\exists R \exists D_{c1 \oplus c2} [\forall e, d, d' [R(e, d) \ \& \ d' \leq d \rightarrow \exists e' [e' \subseteq e \\ &\quad \& \ R(e', d')] \ \& \ \forall e, e', d [R(e, d) \ \& \ e' \subseteq e \rightarrow \exists d' [d' \leq d \ \& \ R(e', d')] \\ &\quad \& \ \text{smoke}(e) \ \& \ \text{Process}(e) \ \& \ \text{Subject}(x, e)]] \end{aligned}$$

The verb *chou* ‘smoke’ provides the lexical-encyclopedic content of the

¹¹ For example, Ramchand (2008: 48) notes that “in the context of Hansel and Gretel leaving a trail, *3 miles of breadcrumbs* also works and measures length”. Here, it is not the part-whole structure of the breadcrumbs but the 3 miles, a context-dependent property of the breadcrumbs, that measures the trail.

relation R between the entity (i.e., the sum of two cigarettes) and the smoking process. R associates the smoking process with the consumption of the cigarettes.

The remaining derivation is as follows:

- (26) a. $[[procP]] = \lambda e [\exists R \exists D_{c1 \oplus c2} [\forall e, d, d' [R(e, d) \ \& \ d' \leq d \rightarrow \exists e' [e' \subseteq e \ \& \ R(e', d')] \ \& \ \forall e, e', d [R(e, d) \ \& \ e' \subseteq e \rightarrow \exists d' [d' \leq d \ \& \ R(e', d')] \ \& \ smoke(e) \ \& \ Process(e) \ \& \ Subject(I, e)]]]]$
- b. $[[init]] = \lambda P \lambda x \lambda e \exists e_3, e_1 [P(e_1) \ \& \ smoke(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_1) \ \& \ Subject(x, e_3)]]$
- c. $[[init']] = \lambda x \lambda e \exists e_3, e_1 [[\exists R \exists D_{c1 \oplus c2} [\forall e_1, d, d' [R(e_1, d) \ \& \ d' \leq d \rightarrow \exists e_1' [e_1' \subseteq e_1 \ \& \ R(e_1', d')] \ \& \ \forall e_1, e_1', d [R(e_1, d) \ \& \ e_1' \subseteq e_1 \rightarrow \exists d' [d' \leq d \ \& \ R(e_1', d')] \ \& \ smoke(e_1) \ \& \ Process(e_1) \ \& \ Subject(I, e_1)] \ \& \ smoke(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_1) \ \& \ Subject(x, e_3)]]]]$
- d. $[[initP]] = \lambda e \exists e_3, e_1 [[\exists R \exists D_{c1 \oplus c2} [\forall e_1, d, d' [R(e_1, d) \ \& \ d' \leq d \rightarrow \exists e_1' [e_1' \subseteq e_1 \ \& \ R(e_1', d')] \ \& \ \forall e_1, e_1', d [R(e_1, d) \ \& \ e_1' \subseteq e_1 \rightarrow \exists d' [d' \leq d \ \& \ R(e_1', d')] \ \& \ smoke(e_1) \ \& \ Process(e_1) \ \& \ Subject(I, e_1)] \ \& \ smoke(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_1) \ \& \ Subject(I, e_3)]]]]$
- e. $[[le]] = \lambda P \lambda t_{Top} \lambda t_0 \exists e_{is} \exists e [P(e) \ \& \ Istage(e) = e_{is} \ \& \ \tau(e_{is}) \subseteq t_{Top} \ \& \ t_{Top} < t_0]]$

Crucially, since no *resP* is projected in (18), (26e) does not include the conditions “ $Rstate(e) = e_{rs} \ \& \ t_{ana} \subseteq \tau(e_{rs})$ ” in the original denotation of *leI* (9) because the smoking example does not involve a lexical result state e_{rs} and its topic time t_{ana} . Merging *initP* (26d) with *leI* (26e) gives the denotation of *Asp'*:

$$(27) \quad \begin{aligned} \llbracket [\text{Asp}'] \rrbracket &= \lambda t_{\text{Top}} \lambda t_0 \exists e_{is} \exists e [\exists e_3, e_1 [\llbracket \exists R \exists D_{c_1 \oplus c_2} \\ &\quad [\forall e_1, d, d' [R(e_1, d) \ \& \ d' \leq d \rightarrow \exists e_1' [e_1' \subseteq e_1 \ \& \ R(e_1', d')]] \ \& \\ &\quad \forall e_1, e_1', d [R(e_1, d) \ \& \ e_1' \subseteq e_1 \rightarrow \exists d' [d' \leq d \ \& \ R(e_1', d')]] \ \& \textit{smoke}(e_1) \ \& \\ &\quad \textit{Process}(e_1) \ \& \ \textit{Subject}(I, e_1)] \ \& \textit{smoke}(e_3) \ \& \ \textit{State}(e_3) \ \& \\ &\quad e = (e_3 \rightarrow e_1) \ \& \ \textit{Subject}(I, e_3)] \ \& \ \textit{Istage}(e) = e_{is} \ \& \ \tau(e_{is}) \subseteq t_{\text{Top}} \ \& \\ &\quad t_{\text{Top}} < t_0] \end{aligned}$$

Recall Section 7.2.2 assumes that the Inner Stage of event is equivalent to the union of the initiation and the process of the event (namely, $\textit{Istage}(e) = e_{is} = e_1 \cup e_3$). Given this assumption, (27) is translated into:

$$(28) \quad \begin{aligned} \llbracket [\text{Asp}'] \rrbracket &= \lambda t_{\text{Top}} \lambda t_0 \exists e [\exists e_3, e_1 [\llbracket \exists R \exists D_{c_1 \oplus c_2} [\forall e_1, d, d' [R(e_1, d) \ \& \\ &\quad d' \leq d \rightarrow \exists e_1' [e_1' \subseteq e_1 \ \& \ R(e_1', d')]] \ \& \forall e_1, e_1', d [R(e_1, d) \ \& \\ &\quad e_1' \subseteq e_1 \rightarrow \exists d' [d' \leq d \ \& \ R(e_1', d')]] \ \& \textit{smoke}(e_1) \ \& \ \textit{Process}(e_1) \ \& \\ &\quad \textit{Subject}(I, e_1)] \ \& \textit{smoke}(e_3) \ \& \ \textit{State}(e_3) \ \& \ e = (e_3 \rightarrow e_1) \ \& \\ &\quad \textit{Subject}(I, e_3)] \ \& \ \textit{Istage}(e) = e_3 \cup e_1 \ \& \ \tau(e_3 \cup e_1) \subseteq t_{\text{Top}} \ \& \ t_{\text{Top}} < t_0] \end{aligned}$$

The discourse of (17a) indicates that the smoking event happened on a Sunday afternoon. I assume that the topic time t_{Top} obtains an implicit value t_c which is included in the time span of that afternoon. Again, similar to the *mingbai* ‘understand’ example (11a), the evaluation time t_0 is the protagonist’s “now” (\textit{now}_M). The representation of (17b) is (29).

$$(29) \quad \begin{aligned} \exists t_c \exists e [\exists e_3, e_1 [\llbracket \exists R \exists D_{c_1 \oplus c_2} [\forall e_1, d, d' [R(e_1, d) \ \& \ d' \leq d \rightarrow \exists e_1' \\ &\quad [e_1' \subseteq e_1 \ \& \ R(e_1', d')]] \ \& \forall e_1, e_1', d [R(e_1, d) \ \& \ e_1' \subseteq e_1 \rightarrow \exists d' [d' \leq d \ \& \\ &\quad R(e_1', d')]] \ \& \textit{smoke}(e_1) \ \& \ \textit{Process}(e_1) \ \& \ \textit{Subject}(I, e_1)] \ \& \textit{smoke}(e_3) \\ &\quad \ \& \ \textit{State}(e_3) \ \& \ e = (e_3 \rightarrow e_1) \ \& \ \textit{Subject}(I, e_3)] \ \& \ \textit{Istage}(e) = e_3 \cup e_1 \ \& \\ &\quad \tau(e_3 \cup e_1) \subseteq t_c \ \& \ t_c < \textit{now}_M] \end{aligned}$$

(29) means that there is a composite event e which consists of an initiating state of smoking (e_3) with “I” as the INITIATOR, and a process of smoking (e_1) with “I” as the UNDERGOER. The smoking action had an endpoint indicated by the entire consumption of two cigarettes, since the part-whole

structure of the smoking process is monotonic with that of the two cigarettes. The Inner Stage of the smoking event is the union of the initiating state e_3 and the process e_1 , and the union is temporally included in the topic time t_c (Perfective meaning of *lel*) that is before the protagonist's "now" (relative past meaning of *lel*).

Recall Chapter 6 drew the conclusion that *resP* is obligatorily projected by Mandarin sentences that entail culminated events. The *resP*-free configuration (18) indicates that the *lel*-marked sentence (17b) does not entail culmination. Remember Section 2.4.1 and Section 6.3.1 already noted that the combination of a creation/consumption verb and a quantized DP object does not entail a culminated event in Mandarin (Tai 1984; Smith 1997; Xiao & McEnery 2004; Lin 2017; among others). In fact, the culmination interpretation of (17b) that the two cigarettes were entirely consumed is a conversational implicature (Grice 1975) that can be canceled, according to Smith (1997: 265). See the contrastive examples from Lin (2017). Lin (2017) claims that by default, (30a) expresses that the letter was completely written, but it can also express that the letter was partially written in the context shown by (30b).¹² (30b) denotes a non-culminated event, i.e., a temporally bounded process which terminated at an "arbitrary endpoint" (Smith 1997: 129, 264) rather than an inherent endpoint.

- (30) a. Wo zuotian xie-le yi-feng xin.
 I yesterday write-LE one-CL letter
 'I wrote a letter yesterday.'
- b. Wo zuotian xie-le yi-feng xin, keshi mei xie-wan.
 I yesterday write-LE one-CL letter but not write-finished
 'I wrote part of a letter yesterday but I did not finish it.'

Lin (2017) attributes the culmination interpretation of (30a) to the pragmatic inference that *yi-feng xin* 'one-CL letter' is interpreted as a completely written letter by default, and the context in (30b) forces it to be interpreted as a partially written letter.¹³ Crucially, Lin argues that in both cases a

¹² I made the gloss because Lin (2017) is written in Chinese.

¹³ The non-culminated interpretation is not always attainable. For example,

homomorphic relation is held between the contents of the letter (no matter whether they are complete or partial) and the writing process. Intuitively, I agree with Lin in that the interpretation of the sentence depends on the interpretation of the object DP. However, I propose that the extra *keshi* ‘but’-sentence in (30b) implies an intensional interpretation of *yi-feng xin* ‘one-CL letter’ in (30b): it refers to an envisaged fully-written letter in another possible world rather than in the real one. (30b) can be more precisely articulated as (31a) where the verb *changshi* ‘try’ indicates the intensional meaning that *yi-feng xin* ‘one-CL letter’ exists in a possible world different from the real one. In contrast, since no cue in the discourse where (17b) is embedded indicates the cigarettes were not completely consumed, (17b) obtains the default extensional interpretation. I argue that only under the extensional interpretation, the quantized DP is qualified as a bounded Path that gives rise to the culmination as a conversational implicature.

Interestingly, my intuition indicates that nominal phrases containing measure units such as *yi-sheng jiu* ‘one-liter wine’(31b) less easily give rise to non-culminated events. I believe this is because the units of measure have more specific and objective definitions than conventional classifiers, e.g., *feng* and *zhi*; thus they less easily receive an intensional interpretation.

- (31) a. Wo zuotian changshi xie yi-feng xin. Xin mei
 I yesterday try write one-CL letter letter not
 xie-wan, wo zhi xie-le yi-bufen.
 write-finished I only write-LE one-part
 ‘I tried to write a letter yesterday. The letter was not finished,
 and I only wrote a part of it.’
- b. ? Wo he-le yi-sheng jiu, danshi mei he-wan.
 I drink-LE one-liter wine, but not drink-finished.

Sybesma (1999: 91) reports that a contradiction is found in the following case which uses the consumption verb *chi* ‘eat’ and the quantized DP *yi-tiao yu* ‘one-CL fish’.

- *Wo chi-le yi-tiao yu, keshi mei-you chi-wan.
 I eat-LE one-CL fish but not-have eat-finished
 *‘I ate a fish, but I did not finish it.’

Since Ramchand's (2008) framework only deals with extensional semantics, it suffices to analyze the smoking example (17b) but cannot properly analyze (30b) or (31a). The question of how to extend it to include intensional semantics is too complex to be tackled here.

This section analyzed the interaction between *lel* and process verbs. Particularly, I spelled out how a culminated event is derived as a conversational implicature through the monotonicity between a process and a bounded Path. The phenomenon will be revisited in Section 7.6 where I compare it with the culminated events denoted by sentences using RVCs. Given that Sections 7.3–7.4 spelled out the interaction between *lel* and atelic verbs, Section 7.5 will look into the interaction between *lel* and telic verbs, particularly by taking the RVC compound as an example of the latter.

7.5 *LeI* with a telic verb (compound)

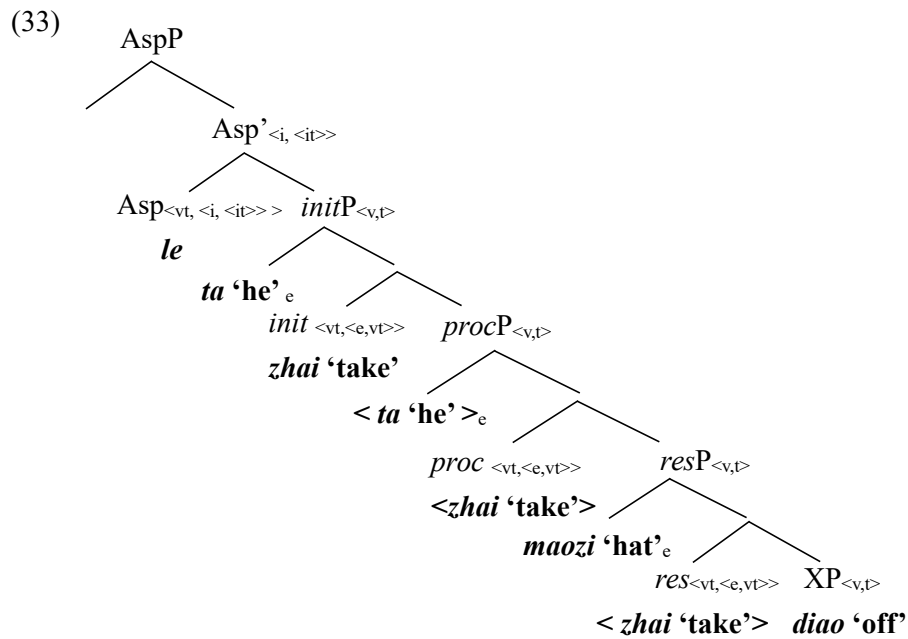
LeI also marks telic verbs, i.e., simple verbs such as *yin* 'win' (3e) or RVC compounds such as *zhai-diao* 'take-off' (4e). The simple verb can be analyzed just as the state verb *mingbai* 'understand' (11a), because the latter is coerced into a telic verb when marked by *leI*. Thus, this section will focus on the interaction between telic RVC compounds and *leI* (4e), copied in (32b). Such a case involves a stacking of aspectual expressions.

(32) ID 25262

- a. Il avait un feutre mou à la calotte ronde et aux ailes larges (il l' a
 ôté quand la bière a passé la porte), [...] [French: *passé composé*]
- b. Ta dai-zhe yi-ding yuan-ding kuan-yan ruan
 he wear-ZHE one-CL round-top wide-brim soft
 zhanmao, (Guancai jingguo de-shihou,
 felt hat coffin pass-by DE-time
 ta zhai-diao-le maozi), [...] [Mandarin: *leI*]
 he take-off-LE hat
 'He was wearing a soft felt hat with a round crown and a wide
 brim (he took it off when the coffin passed by), [...]'

The morpheme *diao* means "drop" when used as an independent verb but it is a completive RVC describing the state of "being off" in the compound

zhai-diao ‘take-off’ (32b). The RVC compound is marked by *le1*. The *le1*-marked clause in (32b) is represented by (33), based on my analysis of completive RVCs in Section 6.3.1. The representation ignores the *when*-clause (the *de-shihou* ‘DE-time’ clause) because Ramchand (2008) does not analyze temporal adverbial clauses.



In the taking-off event, *ta* ‘he’ is the UNDERGOER-INITIATOR who changed the location of the RESULTEE *maozi* ‘hat’. The verb *zhai* ‘take’ gives information about the kinds of actions required for initiating and executing a taking event. Its compounding with *diao* ‘off’ gives rise to a composite result state where something is taken and being off. *Le1* identifies Asp. According to my analysis of completive RVC compound in Section 6.4.2.1, the semantic derivation of (32b) is spelled out as follows:

- (34) a. $[[diao]] = \lambda e[being-off(e)]$
 b. $[[res]] = \lambda P\lambda x\lambda e [P(e) \ \& \ taken(e) \ \& \ State(e) \ \& \ Subject(x,e)]$
 c. $[[res']] = \lambda x\lambda e [being-off(e) \ \& \ taken(e) \ \& \ State(e) \ \& \ Subject(x,e)]$

- d. $[[resP]] = \lambda e[being-off(e) \ \& \ taken(e) \ \& \ State(e) \ \& \ Subject(hat, e)]$
- e. $[[proc]] = \lambda P \lambda x \lambda e \exists e_1, e_2 [P(e_2) \ \& \ take(e_1) \ \& \ Process(e_1) \ \& \ e = (e_1 \rightarrow e_2) \ \& \ Subject(x, e_1)]$
- f. $[[proc']] = \lambda x \lambda e \exists e_1, e_2 [[being-off(e_2) \ \& \ taken(e_2) \ \& \ State(e_2) \ \& \ Subject(hat, e_2)] \ \& \ take(e_1) \ \& \ Process(e_1) \ \& \ e = (e_1 \rightarrow e_2) \ \& \ Subject(x, e_1)]$
- g. $[[procP]] = \lambda e \exists e_1, e_2 [[being-off(e_2) \ \& \ taken(e_2) \ \& \ State(e_2) \ \& \ Subject(hat, e_2)] \ \& \ take(e_1) \ \& \ Process(e_1) \ \& \ e = (e_1 \rightarrow e_2) \ \& \ Subject(he, e_1)]$
- h. $[[init]] = \lambda P \lambda x \lambda e \exists e_3, e_4 [P(e_4) \ \& \ take(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(x, e_3)]$
- i. $[[init']] = \lambda x \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[being-off(e_2) \ \& \ taken(e_2) \ \& \ State(e_2) \ \& \ Subject(hat, e_2)] \ \& \ take(e_1) \ \& \ Process(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ Subject(he, e_1)] \ \& \ take(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(x, e_3)]$
- j. $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[being-off(e_2) \ \& \ taken(e_2) \ \& \ State(e_2) \ \& \ Subject(hat, e_2)] \ \& \ take(e_1) \ \& \ Process(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ Subject(he, e_1)] \ \& \ take(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(he, e_3)]$

InitP (34j) is a predicate of events with internal complexity. Such an event has an initiating state e_3 which leads to a composite eventuality e_4 . E_4 consists of a taking process e_1 which leads to a “taken” state e_2 held by the hat, and the hat also holds the state of being off, predicated by the RVC. A context-specific “he” initiated and underwent the taking-off event.

Apply the denotation of *lel*:

$$(35) \quad [[le]] = \lambda P \lambda t_{Top} \lambda t_0 \exists e_{is} \exists e_{rs} \exists e [P(e) \ \& \ Istage(e) = e_{is} \ \& \ \tau(e_{is}) \subseteq t_{Top} \ \& \ t_{Top} < t_0 \ \& \ Rstate(e) = e_{rs} \ \& \ t_{ana} \subseteq \tau(e_{rs})]$$

Merging *initP* (34j) with *lel* (35) gives the denotation of *Asp'*.

$$(36) \quad [[\text{Asp}']] = \lambda t_{\text{Top}} \lambda t_0 \exists e_{is} \exists e_{rs} \exists e [\exists e_3, e_4 [\exists e_1, e_2 \\
[[\text{being-off}(e_2) \& \text{taken}(e_2) \& \text{State}(e_2) \& \text{Subject}(\text{hat}, e_2)] \& \text{take}(e_1) \\
\& \text{Process}(e_1) \& e_4 = (e_1 \rightarrow e_2) \& \text{Subject}(\text{he}, e_1)] \& \text{take}(e_3) \& \\
\text{State}(e_3) \& e = (e_3 \rightarrow e_4) \& \text{Subject}(\text{he}, e_3)] \& \text{Istage}(e) = e_{is} \& \\
\tau(e_{is}) \subseteq t_{\text{Top}} \& t_{\text{Top}} < t_0 \& \text{Rstate}(e) = e_{rs} \& t_{\text{ana}} \subseteq \tau(e_{rs})]]$$

According to (10), e_{is} is equivalent to the union of the process e_1 and the initiating state e_3 while e_{rs} equals the result state e_2 . (36) is therefore translated into (37):

$$(37) \quad [[\text{Asp}']] = \lambda t_{\text{Top}} \lambda t_0 \exists e [\exists e_3, e_4 [\exists e_1, e_2 [[\text{being-off}(e_2) \& \text{taken}(e_2) \& \\
\text{State}(e_2) \& \text{Subject}(\text{hat}, e_2)] \& \text{take}(e_1) \& \text{Process}(e_1) \& \\
e_4 = (e_1 \rightarrow e_2) \& \text{Subject}(\text{he}, e_1)] \& \text{take}(e_3) \& \text{State}(e_3) \& \\
e = (e_3 \rightarrow e_4) \& \text{Subject}(\text{he}, e_3)] \& \text{Istage}(e) = e_1 \cup e_3 \& \tau(e_1 \cup e_3) \subseteq t_{\text{Top}} \\
\& t_{\text{Top}} < t_0 \& \text{Rstate}(e) = e_2 \& t_{\text{ana}} \subseteq \tau(e_2)]]$$

The *de-shihou* clause, i.e., *guancai jingguo de shihou* ‘when the coffin passed by’, is a temporal clause indicating the topic time of the clause, which assigns a value to t_{Top} in (37). For concreteness, I use t_{cl} to represent the value. Hence, in (37), $\tau(e_1 \cup e_3) \subseteq t_{cl}$, i.e., the hat-taking action temporally finished within the passing-time of the coffin. According to Lin, the topic time for the result state (t_{ana}), which is an anaphor-like variable, would take the overt sentence topic time as its antecedent (Recall Section 7.2.2), namely $t_{\text{ana}} = t_{cl}$. Applying this to (37) gives rise to $t_{cl} \subseteq \tau(e_2)$. Furthermore, based on the condition $\tau(e_1 \cup e_3) \subseteq t_{cl}$, we could infer that $\tau(e_1 \cup e_3) \subseteq \tau(e_2)$. However, the inference contradicts Lin’s translated definitions (8ai) and (8bi) which require that $\tau(e_1 \cup e_3)$ immediately precedes $\tau(e_2)$.¹⁴ To deal with the

¹⁴ In fact, the entailment can also be inferred by the two conditions “ $e = (e_3 \rightarrow e_4)$ ” and “ $e_4 = (e_1 \rightarrow e_2)$ ” in (37). Although Ramchand’s framework does not refer to the time variable at all, Ramchand (2008: 130) proposes two temporal constraints on *init-proc* coherence and *proc-res* coherence (see Section 6.4.1). The latter coherence constraint specifies that the result state must not temporally overlap the process, but the two may share a transition point. The constraint gives a stipulation very similar to Lin’s temporal constraints for *Rstate* and *Istage*.

contradiction, I suggest a different interpretation of t_{ana} than Lin when overt expressions of sentential topic time appear in sentences: t_{ana} obtains its value through t_{cl} by being included in t_{cl} (i.e., $t_{ana} \subseteq t_{cl}$) rather than being identical to it. Given the other condition “ $t_{ana} \subseteq \tau(e_2)$ ”, my adapted interpretation requires that $\tau(e_2)$ and t_{cl} at least have the intersection of t_{ana} ($t_{ana} \subseteq t_{cl}$ and $t_{ana} \subseteq \tau(e_2)$), whereas Lin requires t_{cl} to be included in $\tau(e_2)$ ($t_{cl} = t_{ana} \subseteq \tau(e_2)$). Informally, my interpretation requires that the result state temporally overlap the time span denoted by the temporal clause, but Lin requires the former temporally include the latter.¹⁵ How to interpret the temporal adverbial is non-trivial, but I have to leave it open because I do not have enough relevant corpus data to explore. Since my adapted interpretation solves the aforementioned contradiction, it suffices for the example (37). As for the evaluation time t_0 , I assume it is the protagonist’s “now” (now_M) again. Finally, the denotation of the clause *Ta zhai-diao-le maozi* ‘He take-off-LE hat’ (32b) is:

- (38) $\exists t_{cl} \exists e [\exists e_3, e_4 [\exists e_1, e_2 [[\text{being-off}(e_2) \ \& \ \text{taken}(e_2) \ \& \ \text{State}(e_2) \ \& \ \text{Subject}(\text{hat}, e_2)] \ \& \ \text{take}(e_1) \ \& \ \text{Process}(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ \text{Subject}(\text{he}, e_1)] \ \& \ \text{take}(e_3) \ \& \ \text{State}(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ \text{Subject}(\text{he}, e_3)] \ \& \ \text{Istage}(e) = e_1 \cup e_3 \ \& \ \tau(e_1 \cup e_3) \subseteq t_{cl} \ \& \ t_{cl} < now_M \ \& \ \text{Rstate}(e) = e_2 \ \& \ t_{ana} \subseteq \tau(e_2) \ \& \ t_{ana} \subseteq t_{cl}]$

(38) denotes that there is a composite taking-off event e which consists of an initiating state of taking e_3 and another composite event e_4 . E_4 comprises a

¹⁵ Here is another example using a frame adverbial in Lin (2006):

Lisi shang-ge yue die-duan-le tui.
 Lisi last-CL month fall-broken-LE leg
 ‘Lisi broke his leg last month.’

Lin claims that the sentence asserts “the leg-breaking event occurred last month and the state of the leg being broken was true then” without specifying whether the result state still holds at speech time. Here t_{ana} is the last month. According to Lin, the result state temporally includes t_{ana} , which means the leg must still be broken at the last moment of the last month. However, my intuition for the example allows the leg to recover at some later time in the last month, which is in line with my adapted interpretation of t_{ana} which only requires that the result state temporally overlaps the last month.

process of taking (e_1) and a result state (e_2) i.e., something being off and being taken. The taking-off event was initiated and carried out by “he”. The result state was held by a hat. The Inner Stage of the taking-off event, namely the union of the initiation and the process of taking, occurred within the temporal interval when the coffin passed by (t_{cl}). The taking-off event has a past interpretation because t_{cl} precedes the protagonist’s “now”. The result state (e_2) immediately follows the taking process (e_1) and temporally includes t_{ana} . Since t_{ana} is also included in the coffin-passing-by interval(t_{cl}), the result state temporally overlaps the interval.

So far, I have spelled out the semantic interactions between *lel* and all kinds of verbs (including RVC compounds) in Sections 7.3–7.5. My analyses indicate that the aspectual duality analysis of *lel*, by enriching Lin’s proposal with Ramchand’s framework, can explain how the eventive interpretation of Mandarin sentences using telic/atelic verbal items marked by *lel* is compositionally derived. To sum up, *lel* relates the subeventualities of eventuality denoted by the verbal item to two independent topic times, the topic time for the union of the initiation and the process of eventuality (t_{top}) and the anaphoric topic time for the result state (t_{ana}), if there is a result state. Moreover, *lel* asserts the Perfective aspect for the union of the initiation and the process, thus making sentences denote events, and simultaneously asserts the Imperfective aspect for the result state (if any). It also specifies that the topic time (t_{top}) precedes the evaluation time (t_0), expressing the relative past. Given that the eventuality variable of *initP* is existentially bound by *lel*, it is understandable why *lel* is described as having the function of “assertion” (Klein *et al.* 2000).

Remember at the beginning of this chapter, I mentioned that Chapter 6 pointed out that *lel* and RVCs are competitors in term of making sentences denote events, as the NPMI scores in Chapter 4 indicated that they were both associated with the eventive Past Perfective tuple. Additionally, this section has shown that Mandarin allows the stacking of RVC and *lel* in an eventive sentence. Therefore, Section 7.6 will probe into the alternative use of *lel*, RVCs, and the stacking of RVC and *lel* in eventive sentences.

7.6 The alternation between *le1*, RVCs, and the stacking of *le1* and RVC in eventive sentences

Based on the semantics developed for *le1* and RVCs in this and the previous chapter, this section will reflect on the alternation between *le1*, RVCs, and the stacking of *le1* and RVC in minimally comparable eventive sentences in the Camus corpus. Given that the number of such sentences is rather limited, my analysis about the factors governing the alternation is not intended to be exhaustive. The Mandarin corpus data used in this section all occur in contexts instantiating the eventive Past Perfective tuple, and for simplicity, I only quote the French source sentences (but no other European sentences) below.

I start with the alternation between *le1* and RVCs. Chapter 6 concludes that Mandarin sentences entailing culminated events obligatorily project *resP*. In Section 7.4, I have shown a sentence that uses *le1* to mark the combination of a process verb and a quantized DP functioning as a bounded Path can convey a culminated event as a conversational implicature, if the discourse gives the DP an extensional interpretation. For example, both (39a) and (39b) have a culmination interpretation. (39a) lexicalizes the result that the wine was finished but (39b) not.

- (39) a. Wo he-wan yi-dian jiu.
 I drink-finished a-bit wine
 ‘I drank up a bit of wine.’
- b. Wo he-le yi-dian jiu.
 I drink-LE a-bit wine
 ‘I drank a bit of wine.’

The presence of the quantized object is crucial for (39b) to obtain a culmination interpretation because the culmination is transferred from the quantized feature of the object through monotonicity between the object and the drinking event (as spelled out in Section 7.4). When a bare NP rather than a quantized DP occurs as the object, an RVC rather than *le1* is used to express the culmination. See (40) and (41): they appear in a scene where the

protagonist and his neighbor were drinking wine together. They finally drank up two bottles of wine. The French eventive sentence (40a) appears in the preceding context of (41a). (40a) and (41a) are translated into (40b) and (41b). Particularly, (40b) uses *le1* and a quantized DP *dian jiu* ‘a bit of wine’, while (41b) uses an RVC *wan* ‘finished’ and a bare NP *jiu* ‘wine’.

(40) ID 26103

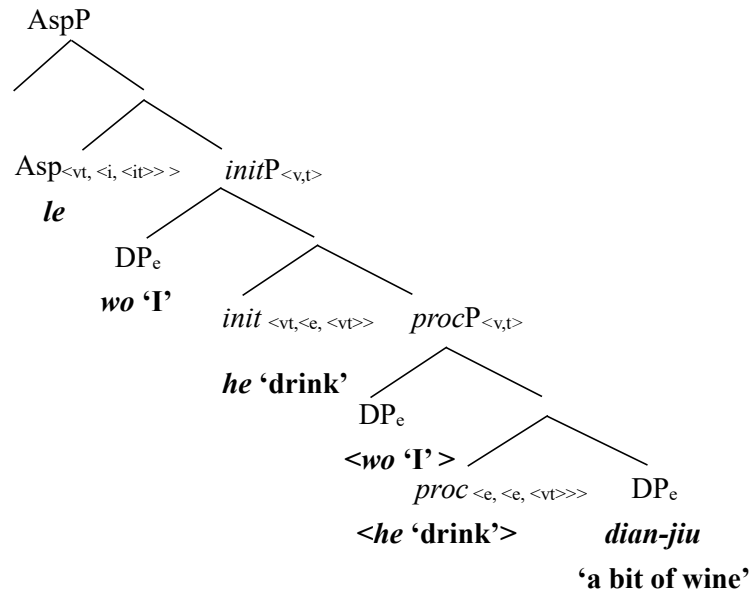
- a. J'ai encore bu un peu de vin. [French: *passé composé*]
 b. Wo you he-le dian jiu. [Mandarin: *le1*]
 I again drink-LE a bit wine
 ‘I drank a bit more wine.’

(41) ID 26199

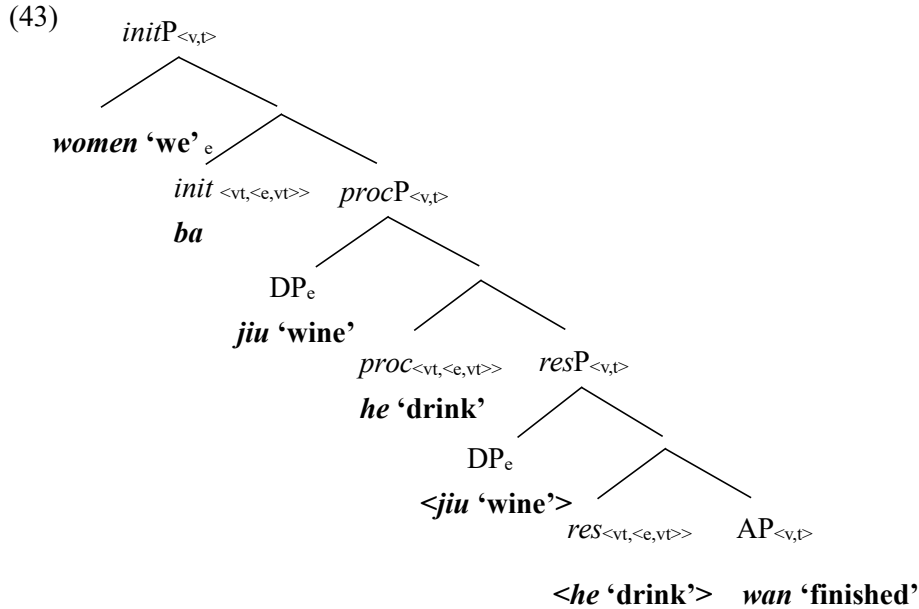
- a. Il a cacheté la lettre et nous avons fini le vin. [French: *passé composé*]
 b. Ta feng-shang xin, women ba jiu he-wan.
 he close-ascend letter we BA wine drink-finished
 ‘He put the letter in the envelope, and we finished off the wine.’
 [Mandarin: *RVC*]

The quantized DP *un peu de vin* ‘a bit of wine’ in (40a) is translated by the quantized DP object *dian jiu* ‘a bit of wine’ in (40b). The reference of the DP is a portion of the two bottles of wine in the scene. *Dian jiu* ‘a bit of wine’ is a bounded Path, and the monotonicity between the drinking process and the quantized wine gives (40b) an implicature of culmination. (42) is the first-phase representation of (40b), with the adverb *you* ‘again’ omitted given that Ramchand’s framework does not discuss such an adverb.

(42)



Interestingly, the definite French DP *le vin* ‘the wine’ in (41a), which refers to the two bottles of wine, is translated by the bare noun *jiu* ‘wine’ in (41b). Mandarin bare NPs are known to have ambiguous interpretations (generic, definite or indefinite, specific or non-specific) and need to be interpreted within the context (Sybesma 1999: 173). Due to the presence of the completive RVC *wan* ‘finished’, which introduces the culmination of drinking by specifying the wine was completely consumed, *jiu* ‘wine’ has to take the definite two bottles of wine as its reference. This is because as the RESULTEE, the reference of *jiu* ‘wine’ should have a definite quantity that makes the “finished” property applicable. The two bottles of wine is the only salient candidate of RESULTEE in the discourse, thus becoming the reference of *jiu* ‘wine’. For the first-phase representation of (41b), see (43).



The morpheme *ba* (originally meaning “take”),¹⁶ also signals the definiteness of *jiu* ‘wine’. *Ba* gives a “disposal” interpretation by highlighting the influence that the subject exerts upon the object so that the object, also known as the *ba*-NP (the NP preceded by *ba*, *jiu* ‘wine’ in my case), is interpreted as “affected”¹⁷ (Sybesma 1999: 132). Sybesma (1999: 176) notes that the *ba*-NP obtains definiteness and affectedness due to the aspectual property of the predicate in the *ba*-sentence. This is in line with my analysis that *wan* ‘finished’ makes the *ba*-NP *jiu* ‘wine’ obtain the-two-bottle-of-wine reference. The definite and affected meaning is reflected by the composite role RESULTEE-UNDERGOER played by *jiu* ‘wine’, which was a definite entity holding the result state “being finished” and underwent the change of quantity. I represent *ba* as *init* based on Sybesma’s (1999: 179–180) analysis that *ba* is a dummy head inserted at the head of CAUSP which dominates VP (I assume the counterparts of CAUSP

¹⁶ See Chen (1983) for the historical development of the *ba*-construction.

¹⁷ A *ba*-sentence is paraphrased by Sybesma (1999: 180) as follows: “the subject brings about (“causes”) a new state of affairs characterizable as the result of the event denoted by the verb.”

and VP in Ramchand's framework are *initP* and *procP*, respectively).¹⁸ The two copies of *jiu* 'wine' in (43) are also in line with Sybesma's (1999: 179) analysis that the *ba*-NP (here *jiu* 'wine') is actually the subject of the small clause complement of verb (corresponding to RESULTEE) but moves to its surface structure position (corresponding to UNDERGOER).¹⁹

By comparing (40b) and (41b), I conclude that sentences using RVCs obligatorily entail culminated events but sentences using atelic verbs which are marked by *lel* only convey culminated events as a conversational implicature when the sentences contain bounded Path objects. Whether an object can be counted as a bounded Path is constrained by the context and the semantics of the object, e.g., whether the object has a quantized property monotonic with the process denoted by the verb and whether it has an extensional interpretation (recall Section 7.4). When a bounded Path is present in a sentence, an RVC is used when the speaker needs to specify the result state, otherwise *lel* is used. For sentences using telic verbs which are marked by *lel*, they always denote culminated events, e.g., (3e) and (4e).

However, *lel* has one use that RVCs lack, namely, to make sentences denote non-culminated events. For example, the eventive French sentence (44a) is translated into (44b) where the process verb *kan* 'look' (with [init, proc] features) is marked by *lel*. The adverbial *yihuier* 'a while' specifies the duration of the looking event. The looking event in (44b) has an endpoint but it does not involve a change of state such that no result state is entailed. (44b) shows that *lel* can make sentences denote non-culminated events.

¹⁸ The Underassociation rule (Ramchand 2008: 98, 171–176) allows the root *he* 'drink' to have its *init* feature underassociated, since that feature is identified by *ba* and is linked to the underassociated feature of *he* 'drink' by Agree. *Ba* has a causativization effect similar to *-aa* of Hindu/Urdu. Roots in Hindu/Urdu can have *init* feature underassociated when *-aa* is inserted under *init*. For the discussion of *-aa*, see Ramchand (2008: 171–176).

¹⁹ Although Sybesma (1999: 137–138) notes that the sentence *Ta ba jiu he-le* 'He finished his glass' is grammatical in the out-of-the-blue context, he analyzes it as having a post-verbal empty complement of result. He further argues that a CAUSP only co-occurs with predicates involving a result state (Sybesma 1999: 201). His analysis shares the consensus with mine that the RVC (or the result complement) contributes to the interpretation of the *ba*-construction which contains a bare noun.

(44) ID 25202

- a. A un moment, il a observé : « Voilà déjà le curé de Marengo.[...] »
[French: *passé composé*]
- b. Ta kan-le yihuier, shuo: “Malangge de shenfu lai-le. [...]
he look-LE a while say Marengo DE priest come-LE
‘He looked for a while, saying “Here comes the priest from
Marengo.[...]’²⁰
- [Mandarin: *le1*]

The fact that (44b) does not entail a result state is confirmed by (45) where the context negates that the looking event has a result state.

- (45) Ta kan-le yihuier, shuo: “Wo shenme dou mei kan-jian.”
he look-LE a while say I anything all not look-see”
‘He looked for a while, saying “I did not see anything”.’

In contrast, the ungrammaticality of (46) indicates that *jian* ‘see’ cannot replace *le1* to convey a non-culminated event as described by (44b).

- (46) * Ta kan-jian yihuier, shuo: “Malangge de shenfu lai-le. [...]
he look-see a while say Marengo DE priest come-LE

In fact, when *kan* ‘look’ is marked by the RVC *jian* ‘see’, the completive RVC compound entails the result state that something was seen. For example, *kan-jian* ‘look-see’ (47b) is used to translate the eventive French sentence predicated by *ai vu* ‘see’ (47a).

(47) ID 25723

- a. J’ ai fermé mes fenêtres et en revenant j’ ai vu dans la glace un
bout de table où ma lampe à alcool voisinait avec des morceaux
de pain. [French: *passé composé*]

²⁰ I produced the translation here for accuracy. The English translation equivalent in the Camus corpus is *After a while he remarked, ‘Here comes the priest from Marengo.[...]’*.

- b. Wo guan-shang chuanghu, hui-lai de shihou, zai
 I close-ascend window return-come DE time at
 jingzi-li kan-jian zhuozi de yi-jiao-shang bai-zhe
 mirror-in look-see desk DE one-corner-on place-ZHE
 jiujingdeng he mianbao-kuai.
 spirit-lamp and bread-chunk
 ‘So I closed my windows and as I was coming back inside I saw
 reflected in the mirror a corner of my table where my spirit-lamp
 was standing beside some pieces of bread.’
 [Mandarin: RVC]

To sum up, *lel* can be used in eventive sentences with or without culmination meaning, but RVCs are only used in eventive sentences with culmination meaning.

Although RVCs and *lel* have competition as aspectual expressions for eventive sentences, they can co-occur in one sentence, as Section 7.5 showed. I call this phenomenon the stacking of *lel* and RVC. Here is another example (48b) using the completive RVC *jian* ‘see’ and *lel*. It translates the eventive French sentence (48a). (48b) is minimally comparable with the examples (44b), marked by *lel* only, and (47b), marked by *jian* ‘see’. The three examples are all used to translate eventive French sentences marked by *passé composé*. I will first illustrate (48b) and then compare the three cases.

(48) ID 25422

- a. J’ai retrouvé dans l’eau Marie Cardona, une ancienne dactylo de
 mon bureau [...]. [French: *passé composé*]
- b. Wo zai shui-li kan-jian-le Malikaduona, [Mandarin: *lel*]
 I at water-in look-see-LE Marie Cordona
 women congqian zai yi-ge bangongshi gongzuo,
 we previously at one-CL office work
 ta shi daziyuan, [...]
 she be typewriter
 ‘In the water I saw Marie Cordona, who used to be a typist at the
 office. [...]²¹

²¹ The English translation equivalent in the Camus corpus is *In the water I met*

In (48b), the locational phrase *zai shui-li* ‘in the water’ implies a temporal interval during which “I” was in the water and the seeing event occurred. The in-the-water interval is the topic time of the sentence using *kan-jian-le* ‘look-see-LE’, functioning just like the *when*-clause (i.e., the clause introduced by *de-shihou*) in (32b) in Section 7.5. For concreteness, I represent the in-the-water interval as t_w . The sentence using *kan-jian-le* ‘look-see-LE’ in (48b) is represented by (49), modeled on my analysis for (32b). The locational phrase is ignored for simplicity.

- (49) $\exists t_w \exists e [\exists e_3, e_4 [\exists e_1, e_2 [[\text{seen}(e_2) \ \& \ \text{looked}(e_2) \ \& \ \text{State}(e_2) \ \& \ \text{Subject}(\text{Marie Cordona}, e_2)] \ \& \ \text{look}(e_1) \ \& \ \text{Process}(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ \text{Subject}(I, e_1)] \ \& \ \text{look}(e_3) \ \& \ \text{State}(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ \text{Subject}(I, e_3)] \ \& \ \text{Istage}(e) = e_1 \cup e_3 \ \& \ \tau(e_1 \cup e_3) \subseteq t_w \ \& \ t_w < \text{now}_M \ \& \ \text{Rstate}(e) = e_2 \ \& \ t_{\text{ana}} \subseteq \tau(e_2) \ \& \ t_{\text{ana}} \subseteq t_w]$

(49) indicates that the initiation and the process of seeing ($e_1 \cup e_3$) happened within the in-the-water interval (t_w). Meanwhile the result state of Marie being seen (e_2) started after the seeing process (e_1), and the time span of the result extended over some time and overlapped the in-the-water interval (due to the conditions “ $t_{\text{ana}} \subseteq \tau(e_2) \ \& \ t_{\text{ana}} \subseteq t_w$ ”).

Compared with (44b), (48b) contains an extra RVC *jian* ‘see’ which makes the interpretation of (48b) differ from that of (44b): (48b) entails the result that someone (Marie) was seen, while (44b) does not entail any result, as (45) indicates. The distinction between the two reflects that the stacking of RVC and *lel* rather than the single marker *lel* is used when the result state has to be specified.

Furthermore, (47b) and (48b) both contain the RVC compound *kan-jian* ‘look-see’, but (48b) also includes *lel*. The interpretation difference between (47b) and (48b) is subtle. They both convey a seeing event, as reflected by their source sentences (47a) and (48a). However, the Imperfective component of *lel* makes (48b) semantically richer than its source sentence

Marie Cordona [...], I changed the verb in the translation from *met* to *saw* for accuracy.

(48a) by adding the meaning that the result state, i.e., Marie being seen, holds at the protagonist's "now". Using *leI* besides the RVC compound *kan-jian* 'look-see' emphasizes the duration of the result state and makes Marie, the holder of the result state (the RESULTEE), salient. This strengthens discourse cohesion because Marie is a topic further elaborated on in the following context (*She used to be a typist*); see (48b). Nevertheless, the RESULTEE in (47b), the spirit-lamp and the bread, are trivial as they are no longer referred back to in the discourse. Therefore, (47b) does not use *leI* to emphasize them.

The other stacking example (32b) in Section 7.5 can be accounted for in a similar way. The stacking of *leI* and RVC in (32b) also emphasizes the duration of the result state that the hat was taken off, which makes the pragmatic meaning of the hat-taken-off event salient: to pay respect to the dead person in the coffin. If *leI* is deleted from (32b) so that the sentence only uses *zhai-diao* 'take off', then the sentence only describes a completed hat-taking event, losing the emphasis of the pragmatic meaning. Hence, I propose that the stacking of *leI* and RVC is preferred over a single RVC in narrative discourse when the duration of the result state needs to be highlighted for cohesive or pragmatic consideration.

Up till now I have only discussed stacking cases in narrative discourse. Additionally, Sun (2014) observes that sentences only predicated by RVC compounds are ungrammatical to stand alone in the out-of-the-blue context unless they are marked by *leI*. My hypothesis for the phenomenon is that the node of *initP* has a free eventuality variable, which requires being bound by *leI* in the out-of-the-blue context. However, the issue is left open since there is no real out-of-the-blue data in the Camus corpus, and the hypothesis waits to be tested by more empirical data.

This section has discussed that the alternative use between *leI*, RVCs, and the stacking of *leI* and RVC in eventive sentences. RVCs are used to specify the result states of events so they are only used in sentences denoting culminated events. *LeI* is used in eventive sentences with or without culmination meaning, and sentences denoting non-culminated events must use *leI*. The stacking of *leI* and RVC can be used when the duration of result states needs highlighting for discourse cohesion or pragmatic consideration.

Up till now, the *le1*-marked sentences that have been analyzed in Sections 7.3–7.6 are of eventive interpretation, which is reflected by their occurring in contexts instantiating the eventive Past Perfective tuple. The aspectual duality analysis of *le1* turns out to account well for the sentences, as the Perfective component of *le1* makes them qualified to translate eventive French source data. However, besides the 43 *le1* cases occurring in contexts instantiating the Past Perfective tuple, there are 16 cases occurring in other contexts (recall Section 4.4.1). Specifically, seven of them translate French data marked by *passé composé* (N=5) or *passé simple* (N=2), which is expected by Hypothesis 2a or 2b (recall the preliminary test in Section 3.2). As Section 7.2.2 explained, both hypotheses are reconciled by the aspectual duality analysis of *le1* such that the seven cases are in line with the analysis. Additionally, two cases of *le1* translate French data marked by *plus-que-parfait*, the French form of Perfect in the past. They can also be accounted for by the aspectual duality analysis in the same way as the *passé composé* cases because *le1* has a relative past meaning: the evaluation time of *le1*-marked sentences translating *plus-que-parfait* is a context-specific past time while the evaluation time of sentences translating *passé composé* is speech time (the protagonist’s “now”).

The next section will zoom into the remaining seven cases of *le1*. As I will show, they translate stative French data, and the Imperfective component of *le1* becomes more evident in these cases.

7.7 *Le1* in stative sentences

Seven occurrences of *le1* are used to translate French data marked by tense-aspect forms of stative interpretation (recall Section 2.3.2), namely *imparfait* (N=6) and *présent* (N=1). This section will discuss them.

Remember Section 2.5.3 noted that sentences using *le1* or the Imperfective marker *zhe* can describe the duration of a result state, especially when the sentences are predicated by positional verbs; see (50) copied from that subsection. (50) describes the laying state of a book, no matter whether *le1* or *zhe* is used to mark the positional verb *fang* ‘put’.

- (50) Chuang-shang fang-zhe/-le yi-ben shu.
 bed-on put- ZHE/-LE one-CL book
 ‘On the bed lay a book.’

Du (1999)

The translation of one French *imparfait* sentence (51a) also uses *le1* to mark a positional verb *pu* ‘pave’:

(51) ID 32298

- a. Elles s’*étaient*, se rejoignaient et formaient un vernis d’eau sur ce visage détruit. [French: *imparfait*]
 b. Leishui [...] zai na-zhang xingrong da bian de
 tear at that-CL appearance great change DE
 lian-shang pu-LE yi-ceng shui. [Mandarin: *le1*]
 face-on pave-LE one-CL water
 ‘Tears [...] have paved a layer of water on that face whose appearance greatly changed.’²²

What (51a) describes includes a state of tears forming a layer of water on the face. It is translated by (51b), conveying that tears paved a layer of water, and the water still stays on the face at the protagonist’s “now” (now_M). *Pu* ‘pave’ is a process verb with [init, proc] features, as it is compatible with the Progressive marker *zai* (52).

- (52) Zhangsan zai pu chuang.
 Zhangsan ZAI pave bed
 ‘Zhangsan is making the bed.’

To account for the interpretation of (51b), I argue that *le1* coerces *pu* ‘pave’ into an event verb carrying [init, proc, res] features (recall *le1* can also

²² I produced the literal translation to show the use of *pu* ‘pave’. The English translation equivalent in the Camus corpus is *They just spread out and ran together again, forming a watery glaze over his battered old face.*

coerce the state verb *mingbai* ‘understand’ into an event verb in (11a)).²³ Therefore, the main clause of (51b) thus has a resultative Perfect interpretation accountable by the aspectual duality of *le1*: *le1* asserts a composite eventuality in which the initiation and the process of paving were completed (the effect of the Perfective component of *le1*), and its result state (i.e., being paved) is held at the evaluation time “now” (the effect of the Imperfective component of *le1*). Compared with *le1*, *zhe* only asserts that the result state holds at the evaluation time, saying nothing about what caused the state.

Similar to *pu* ‘pave’ in (51b), the process verb *zhuan* ‘turn’²⁴ is coerced into an [init, proc, res] verb in (53b) that translates another *imparfait* example (53a). The result state encoded by *zhuan* ‘turn’ offers the lexical input of the Imperfective component of *le1* so that (53b) entails the stative meaning that the road had a bend (in addition to the eventive meaning that the road bent, due to the contribution of the Perfective component of *le1*).

(53) ID 32278

a. J’ai constaté aussi que devant moi la route tournait.

[French: *imparfait*]

b. Wo zhuyi-dao qianmian da lu zhuan-le ge wan.

I notice-arrive ahead big road turn-LE CL bend

‘I noticed that the big road has turned a bend.’²⁵

[Mandarin: *le1*]

Another two *imparfait* cases are translated into Mandarin sentences with the stacking of *le1* and RVC. Take (54a) as an example; it describes a state of

²³ Alternatively, it can be argued that *pu* ‘pave’ is ambiguous between [init, proc] and [init, proc, res] verbs.

²⁴ This is shown by the fact that the Progressive marker *zai* applies to *zhuan* ‘turn’:

Zhe-ge fengche zai zhuan.

this-CL windmill ZAI turn

‘This windmill is turning.’

²⁵ I produced the literal translation to show the use of *zhuan* ‘turn’. The English translation equivalent in the Camus corpus is *I also noticed that there was a bend in the road ahead*.

salty tang being brought to the deictic “here” and it is translated into (54b), which contains the RVC compound *dai-lai* ‘take-come’ and *lel*:

(54) ID 32172

- a. Et le vent qui passait au-dessus d’elles apportait ici une odeur de sel. [French: *imparfait*]
- b. Cong shan-shang chui guo de feng
 from hill-over blow GUO DE wind
dai-lai-le yi-gu yan-wei. [Mandarin: *lel*]
 take-come-LE one-CL salt-tang
 ‘The wind which has blown over the hills has taken here a salty tang.’²⁶

The verb *lai* means “come” when used independently, but as a directional RVC in (54b), it conveys a deictic meaning of “toward the speaker” (Li & Thompson 1981: 59) by specifying the result state “being-here”. The Imperfective component of *lel* particularly operates on the result state by asserting that it temporally includes its anaphoric topic time (t_{ana}). The topic time of (54b) obtains its value from the context (represented by t_c), given that (54b) has no overt temporal adverbial. Since t_c is implicit and thus unable to bind t_{ana} , t_{ana} has to take the evaluation time as its antecedent, i.e., the protagonist’s “now” (now_M). For the denotation of (54b) see (55), with the attributive clause marked by *guo* ignored for Ramchand’s (2008) does not analyze this kind of clause.

- (55) $\exists t_c \exists e [\exists e_3, e_4 [\exists e_1, e_2 [[\text{being-here}(e_2) \ \& \ \text{taken}(e_2) \ \& \ \text{State}(e_2) \ \& \ \text{Subject}(\text{salty tang}, e_2)] \ \& \ \text{take}(e_1) \ \& \ \text{Process}(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ \text{Subject}(\text{wind}, e_1)] \ \& \ \text{take}(e_3) \ \& \ \text{State}(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ \text{Subject}(\text{wind}, e_3)] \ \& \ \text{Istage}(e) = e_1 \cup e_3 \ \& \ \tau(e_1 \cup e_3) \subseteq t_c \ \& \ t_c < now_M \ \& \ \text{Rstate}(e) = e_2 \ \& \ now_M \subseteq \tau(e_2)]$

²⁶ I produced the literal translation to show the use of *dai-lai* ‘take-come’. The English translation equivalent in the Camus corpus is *And the breeze coming up over the hills had a salty tang to it.*

(55) means that the wind initiated and implemented the taking event, and the salty tang has been taken to the place where the protagonist stays. The taking event was completed within the topic time t_c which precedes “now”. The result state of “being taken” and “being here”, held by the tang, extends over “now” (from the reader’s perspective, “now” refers to a past time) such that it makes (54b) qualified to translate the stative (54a).

Interestingly, although the stacking example (54b) translates a stative sentence (54a), the aforementioned stacking examples *zhai-diao-le* ‘take-off-LE’ (32b) and *kan-jian-le* ‘look-see-LE’ (48b) are used to translate eventive sentences. Here arises a question: what causes the different uses of the stacking examples, although they all project *initP*, *procP*, and *resP* and thus provide lexical inputs to the Perfective and Imperfective components of *le1*? It is hard to propose a general answer based on the three cases, and I tentatively attribute it to the presence/absence of overt expressions of (sentential) topic time (t_{top}). The difference causes that (54b) entails the result state holds at the evaluation time while (32b) and (48b) do not.

Without an overt expression of topic time, the topic time of the result state (t_{ana}) in (54b) receives its value from the evaluation time. Therefore, the Imperfective component of *le1* gives rise to the stative meaning that the result state holds at the evaluation time (the protagonist’s “now”). The stative meaning is rather salient such that it makes (54b) a qualified translation of the stative (54a). The effect of *le1* in (54b) is similar to the resultative Perfect.

On the other hand, (32b) and (48b) have overt expressions of sentential topic time, i.e., the temporal adverbial in (32b) that gives t_{cl} , or the locational phrase that implies a temporal frame t_w in (48b). Recall in Section 7.5, I fine-tuned Lin’s proposal by arguing that the topic time of the result state (t_{ana}) obtains its value from the sentential topic time (t_{top}) by being included in the latter, if the latter is overt (see the conditions “ $t_{ana} \subseteq t_{cl}$ ” in (38) and “ $t_{ana} \subseteq t_w$ ” in (49)). The Imperfective component of *le1* in (32b) and (48b) requires the result state just holding at t_{ana} (included in t_{cl} or t_w) and allows it to cease before the evaluation time (the protagonist’s “now”); thus, in both cases the stative meaning given by the Imperfective component of *le1* is less salient than that of (54b). Hence, they are used to translate eventive rather

than stative French sentences.

Just like the stacking example (54b), the aforementioned *imparfait* cases (51b) and (53b) also lack overt topic time expressions such that they entail that their result states hold at the evaluation time. Based on the *imparfait* and stacking cases, I propose that *leI*-marked sentences cannot be used to translate stative French sentences without satisfying the following conditions: (i) the verbs (including RVC compounds) project *resP* (so the Imperfective component of *leI* has a lexical input); (ii) the sentences lack overt expressions indicating the (sentential) topic time. Importantly, *leI*-marked sentences satisfying the conditions are not obligatorily used to translate stative sentences. For example, although the state verb *mingbai* ‘understand’ in (1e) is coerced by *leI* into a telic verb projecting *resP* (see (11b)), (1e) is used to translate the eventive French case (1a). My explanation is as follows: my intuition indicates that *mingbai* ‘understand’ cannot be marked by an RVC (probably because it is a state verb not projecting *procP*, which is a prerequisite phrase to introduce *resP*) so that the translator resorts to *leI* to render (1e) with an eventive meaning. Although the Imperfective component of *leI* gives rise to a stative meaning that the protagonist holds the state of understanding at his “now”, the meaning is trivial (as people usually do not cease to understand something if they once understood it) and less salient than the eventive meaning that an understanding event happened. Hence, (1e) is used to translate the eventive (1a).

The remaining two *imparfait* cases involve paraphrasing, which I count as noise. For instance, the copular verb *était* ‘be’ in the French stative sentence (56a) is paraphrased by (56b) without a literal translation equivalent. (56b) uses *shi-jin-le* ‘use-finished-LE’ to characterize the spitting act. I produced the Mandarin literal translation here for accuracy (the English translation equivalent in the corpus is *Every time he did it, it sounded as if his insides were being torn out.*).

(56) ID 32162

- a. [...] chacun de ses crachats était comme un arrachement.

[French: *imparfait*]

- b. [...] mei yi-kou tan dou xiang
 every one-CL spit all seem
shi-jin-LE quan-shen de liqi. [Mandarin: *leI*]
 use-finished-LE whole-body DE strength
 ‘Every spit seems to use up all the strength of the whole body.’

Having discussed all the *imparfait* cases, the remaining single case where *leI* is used to translate a stative French sentence is (57b). It translates (57a), which uses *présent*. *LeI* in (57b) marks the verb *lai* ‘come’.²⁷

(57) ID 32189

- a. Il a pris le téléphone en main et il m’a interpellé: « Les employés des pompes funèbres sont là depuis un moment.[...] »
 [French: *présent*]
- b. Ta na-qi dianhua, wen wo:
 he pick-arise telephone ask me
 “Binyiguan de ren yi lai-le yihuier le.[...]”
 the undertaker’s DE people already come-LE a while LE
 ‘He picked up the telephone and addressed me: “The undertaker’s men have just arrived.[...]”’
 [Mandarin: *leI*]

Using (57b) to translate (57a) can be explained in the same way as I have argued for the *imparfait* examples, namely it satisfies the aforementioned conditions (i) and (ii). (58) shows that *lai* ‘come’ satisfies the condition (i) that it is a telic verb encoding an inherent result. Therefore, *lai* ‘come’ projects *resP*, which provides the Imperfective component of *leI* with a lexical result state (having arrived) to operate on.

- (58) * Zhangsan lai-le Beijing, keshi ta mei daoda.
 Zhangsan come-LE Beijing, but he not arrive.
 (Intended) *‘Zhangsan came to Beijing but he did not arrive.’

²⁷ See Section 4.3.2.2 for the motivation to annotate (57b) as *leI*.

(57b) also meets the condition (ii) for it has no overt expression of sentential topic time. The topic time of the result state (t_{ana}) thus takes the evaluation time (the moment “he” uttered the speech) as its value. The Imperfective component of *leI* specifies that the result state extends over the evaluation time. The duration of the result state is specified by the phrase *yihuier* ‘for a while’. Moreover, the sentence also contains a temporal adverb *yi* ‘already’ and a sentence-final *le*. I leave their contribution to (57b) open for they are beyond my research scope. Anyway, the conditions (i) and (ii) can explain the use of (57b).

This section probes into cases where *leI* is used to translate stative French sentences, and I propose two necessary conditions for *leI*-marked sentences to be used to translate stative French sentences: first, the verb (including RVC compounds) projects *resP*; second, there is no overt constituent in the sentence to denote (sentential) topic time. The first condition enables the Imperfective component of *leI* to have a lexical input to operate on, and the second condition means that the result state has to take the evaluation time as its topic time, giving rise to the interpretation that the result state extends over the evaluation time (speech time by default). When the conditions are satisfied, the *leI*-marked sentence has a composite meaning that entails not only that an event reached its culmination but also that its result state extends over the evaluation time. The composite meaning makes *leI*-marked sentences have an interpretation similar to resultative Perfect. The fact that *leI* can be used to translate stative French sentences is accounted for by the aspectual duality of *leI*, especially providing evidence for the Imperfective component of *leI*.

Having checked all the *leI* data in the Camus corpus, I will revisit the two competing hypotheses on the marker in Section 7.8 and interpret the statistics *leI* received in Chapter 4 again.

7.8 Hypotheses on *leI* revisited

In Section 7.2.2 I generally explained how the aspectual duality analysis of *leI*, which improves Lin’s (2006) proposal with Ramchand’s (2008) framework, reconciles Hypotheses 2a and 2b. Based on the qualitative

analysis made in Sections 7.3–7.7 about the *leI* data used in eventive/stative sentences, the aspectual duality of *leI* becomes more concrete.

Specifically, when *leI* interacts with atelic verbs, the verbs do not project *resP* such that the Imperfective component of *leI* lacks a lexical input to operate on and becomes non-salient.²⁸ Therefore, *leI* interacting with atelic verbs always makes sentences have an eventive interpretation because only the Perfective component of *leI* is salient. In such a case, *leI* functions like a Perfective marker, in line with Hypothesis 2a. On the other side, when a telic verb (including an RVC compound) is marked by *leI*, the verb projects *initP*, *procP*, and *resP* such that both the Perfective and Imperfective components of *leI* have lexical inputs. As a result, a sentence using a telic verb marked by *leI* conveys a composite eventuality with its initiation and process receiving Perfective aspect but its result state receiving Imperfective aspect. Such a sentence denotes an event plus a state, and *leI* in such a sentence causes an effect as resultative Perfect does, in line with Hypothesis 2b. The phenomenon noticed by the literature in Section 2.5.1, that *leI* can translate Perfective- or Perfect-sentences, results from the varied compositional results between *leI* and different kinds of verbs.

Marrying Ramchand's framework with Lin's proposal for *leI* made another contribution, i.e., to help me compare RVCs and *leI* within one framework so as to distinguish their roles in the Mandarin aspect system. Consequently, Section 7.6 found that RVCs and *leI* divide the labor as aspectual indicators for events, which is consistent with the conclusion made in Section 6.5 that there is competition between the two. I thus attribute the low NPMI score (0.1) between *leI* and the Past Perfective tuple (indicating a weak association between them, see Section 4.5.4) mainly to the non-exclusive association between *leI* and the Past Perfective: the tuple is not only associated with *leI* but also with RVCs and other telicity-indicating methods proposed in Chapter 5. However, it should be noted that *leI* has uses that RVCs do not possess (which even allows *leI* to mark RVC

²⁸ Such cases can have non-lexicalized results. For example, the *chou* 'smoke' example (17b) has a result that the two cigarettes no longer existed, which is inferred from the monotonicity between the smoking event and the object two cigarettes.

compounds): *lel* is used in sentences denoting non-culminated events, and it can also make sentences denote a composite of event and state (similar to resultative Perfect). The fact that post-verbal *le* showed no strong association with the Present Perfect tuple (NPMI=0) is attributed to its competition against *guo* in terms of conveying Perfect meaning.

The aspectual-duality hypothesis of *lel* is in line with the claim in the literature (see Chapter 2) that the grammatical aspect of Mandarin does not show a simple Perfective/Imperfective dichotomy. Last but not least, I did not delve into the relative past meaning of *lel* but just followed Lin's proposal to assume this meaning for *lel*, as it accounts well for my data. Whether Mandarin has a TP is left open in this dissertation.

7.9 Conclusions

Through probing into the Camus corpus data containing *lel*(post-verbal *le*), this chapter has argued that *lel* has aspectual duality, which reconciles Hypotheses 2a and 2b. To thoroughly analyze the aspectual interpretations of sentences marked by *lel* and to compare *lel* with RVCs, I married Lin's (2006) proposal (which uses the two-component approach to aspect) with Ramchand's (2008) first-phase syntax and its associated post-Davidsonian event semantics. The improved version of Lin's proposal enabled me to spell out the varied compositionally semantic interactions between different verbs and *lel*. I reached the conclusion that *lel* is a tense-aspect marker identifying Asp head and taking *initP* as its complement. Particularly, *lel* comprises dual grammatical aspects, and it denotes different grammatical aspects for different subeventualities encoded by verbs: the Perfective aspect for the union of the initiation and the process of eventuality yet the Imperfective aspect for the result state (if any) of eventuality. The two opposite aspects are bundled by *lel* without causing contradiction because they are applied to different subeventualities. The aspectual duality of *lel* indicates that Mandarin does not have a Perfective/Imperfective distinction which is common in Romance languages.

Specifically, when a sentence uses *lel* to mark an atelic verb (not projecting *resP*), the Imperfective component of *lel* has no lexical input to

operate on. As a result, only the Perfective component of *lel* is salient and makes the sentence denote an event by setting a temporal boundary to the run time of the union of the initiation and the process denoted by the verb, as reflected by Hypothesis 2a. Sentences marked by *lel* do not entail culminated events because the inclusive temporal relation denoted by Perfective aspect sets nonspecific endpoints to events. However, the sentence marked by *lel* can have a culmination meaning as a conversational implicature if the sentence contains a bounded Path (e.g., an extensional quantized object forming monotonic relation with the event).

When a sentence uses *lel* to mark a telic verb or verb compound (projecting *resP*), both the Perfective and Imperfective components of *lel* have lexical inputs and make the sentence denote a composite meaning combining a completed event plus a result state, similar to resultative Perfect. This is reflected by Hypothesis 2b. The packing of the event and the state is indicated by the fact that such a sentence can be used to translate an eventive or a stative French sentence. When the Mandarin sentence lacks an overt expression of (sentential) topic time, the Imperfective component denotes that the result state extends to the evaluation time (speech time by default), making the state more salient than the event. When the topic time is overtly indicated, the event is more salient.

This chapter also differentiates the aspectual functions of RVCs and *lel*. RVCs contribute to eventuality descriptions, but *lel* contributes to grammatical aspect. They are alternatively used in eventive sentences having a culmination meaning: RVCs are compulsorily used for specifying the result states, otherwise *lel* is used. However, *lel* is obligatorily used to convey non-culminated events. Mandarin also uses the stacking of RVC and *lel* to emphasize the duration of the result state. The emphasis may strengthen discourse cohesion or highlight the pragmatic meaning of the result state.

By exploiting the Camus corpus, this dissertation has integrated quantitative and qualitative methods to properly examine and improve, if needed, Hypotheses 1–7 formulated according to the literature about the semantics of all kinds of Mandarin tense-aspect forms. In Chapter 8, I will summarize the findings of the dissertation and discuss topics worth further exploration.

Chapter 8

Conclusions

8.1 Main findings

In this dissertation I exploited a parallel corpus to study the compositionality of Mandarin aspect. Specifically, by integrating quantitative empirical tests and qualitative theoretical analysis, I tested and then improved (when needed) a series of hypotheses concerning the meanings of Mandarin tense-aspect forms (including the aspectually unmarked form) drawn from the literature. I found that in Mandarin, aspectually unmarked sentences usually have a stative (i.e., temporally unbounded) interpretation, while eventive (i.e., temporally bounded) sentences must have overt aspectual expressions (grammatical markers or telicity-indicating methods). In particular, I spelled out the semantics of resultative verb compounds and post-verbal *le* (labeled as *le1* in my study). This section will summarize the main findings.

In Chapter 2 I outlined the general framework for the formal analysis in the dissertation, namely, neo-Davidsonian event semantics, and introduced classical tense-aspect theories, especially the one-component approach to aspect (Moens & Steedman 1988; Parsons 1990; Kamp & Reyle 1993; de Swart 1998; Verkuyl 1999; Cipria & Roberts 2000) and the two-component approach (Depraetere 1995; Smith 1997; Kratzer 1998; Filip 1999; Bertinetto & Delfitto 2000; and others). I assumed the syntactic structure in

(1) to model the compositionality of tense-aspect system.

(1) [Tense [Grammatical aspect* [Eventuality description]]]

(de Swart 1998)

To be specific, eventualities are assumed to ontologically fall into states, processes, or events (also known as aspectual classes). Verbs or verb phrases (including the arguments and complements of verbs) are eventuality descriptions: atelic verbs or verb phrases denote states or processes, whereas telic ones denote events. Aspectual operators are sandwiched between eventuality descriptions and tense operators (the star * indicates 0 or more aspectual operators). Furthermore, to model the compositionality of aspect in a bottom-up way, I introduced Krifka's (1989) analysis for the interaction between a (consumption/creation) verb and its internal argument, followed by the analyses of one- and two-component approaches to general tense-aspect categories (Perfective, Imperfective, Progressive, and Perfect). With the theoretical toolkit in place, I reviewed previous studies and formulated Hypotheses 1–7 accordingly (the controversial markers post-verbal *le* and *guo* each have two competing hypotheses):

(2)

- Hypothesis 1: A resultative verb compound (V+RVC) denotes a culminated event plus result state (along the lines of Li & Thompson 1981).
- Hypothesis 2a: Post-verbal *le* is a Perfective marker (along the lines of Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014).
- Hypothesis 2b: Post-verbal *le* is a resultative Perfect marker (along the lines of Lin 2006).
- Hypothesis 3a: *Guo* is a Perfective marker (along the lines of Smith 1997; Lin 2006).
- Hypothesis 3b: *Guo* is an experiential Perfect marker (along the lines of Xiao & McEnery 2004).

- Hypothesis 4: *Zai* is a Progressive marker requiring a process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006; Sun 2014).
- Hypothesis 5: *Zhe* is an Imperfective marker requiring a state or process as its input (along the lines of Smith 1997; Xiao & McEnery 2004; Lin 2006).
- Hypothesis 6: Verbal reduplication is a Perfective marker (along the lines of Smith 1997; Dai 1997; Xiao & McEnery 2004).
- Hypothesis 7a: Mandarin aspectually unmarked sentences are aspectually transparent (i.e., they have an eventive interpretation if the underlying eventuality description is quantized and have a stative interpretation if the eventuality description is homogeneous, along the lines of de Swart 1998).
- Hypothesis 7b: Mandarin aspectually unmarked sentences have neutral aspect (i.e., neither Perfective nor Imperfective, along the lines of Smith 1997).
- Hypothesis 7c: Mandarin aspectually unmarked sentences using non-dynamic eventuality descriptions have a stative interpretation, whereas those using dynamic eventuality descriptions are underspecified for aspect (they receive a Perfective or an Imperfective interpretation depending on the discourse context, along the lines of Xiao & McEnery 2004).
- Hypothesis 7d: Mandarin aspectually unmarked sentences have a stative interpretation (denoting lexical states or generics, along the lines of Sun 2014).

To test the hypotheses, I used the parallel corpus (the Camus corpus) built by the *Time in Translation* project (van der Klis *et al.* 2021a), which my study was embedded in. The corpus uses three chapters from Camus's French novel *L'Étranger* (*The Outsider*) as source texts and includes their translations in Mandarin and multiple European languages. I did not choose a monolingual Mandarin corpus because operationalizing the hypotheses in such a corpus would be susceptible to circular reasoning.

Chapter 3¹ preliminarily tested the hypotheses through a contrastive study between French and Mandarin, which was a joint work with *Time in Translation* project members. Operationalizing the hypotheses required converting abstract general tense-aspect categories and concepts concerning aspectual classes involved in the hypotheses into countable items. The test thus used French tense-aspect forms (European tense-aspect forms were previously annotated in the Camus corpus by the *Time in Translation* project) as representations of the abstract notions. We then used absolute frequencies to measure the tendencies regarding Mandarin tense-aspect forms occurring as translations of French tense-aspect forms, mainly exploring the Mandarin variation of the general tense-aspect categories. The translation tendencies were in line with Hypotheses 4 and 6, but we also arrived at findings not expected by the other hypotheses. To interpret these findings properly, we reflected on the reliability of using parallel corpora for cross-linguistic variation studies, particularly by discussing and comparing three traditions in the field, namely, the contrastive tradition (Johansson 1998a, 2007; Granger & Lefer 2020), the typological tradition (Wälchli 2010; Wälchli & Cysouw 2012), and the *Translation Mining* tradition (van der Klis *et al.* 2017, 2021a; Le Bruyn *et al.* 2019; Bremmers *et al.* 2021). This reflection led to the conclusion that parallel corpora were suitable for cross-linguistic variation studies and, particularly, that *Translation Mining* matched our testing goal best.

Furthermore, we reflected on the unexpected findings and found that tense-aspect forms in a single language such as French are not solid representations for general tense-aspect categories. This drove us to look for better representations by aggregating cross-linguistic tense-aspect forms in European languages. Since the aggregation cannot be implemented by following the standard *Translation Mining* methodology, we developed a variant of it, which we dubbed *Aggregated Translation Mining*, and applied this variant to a sophisticated test on Hypotheses 1–7 in Chapter 4. Chapter 4

¹ This chapter is adapted from Le Bruyn *et al.* (2022) “Parallel Corpus Research and Target Language Representativeness: the Contrastive, Typological and *Translation Mining* Traditions”. In view of the joint authorship, this chapter uses the first-person plural pronoun “we”.

initially introduced *Aggregated Translation Mining* and exploited it to obtain European tense-aspect tuples (Table 1) from tense-aspect forms that frequently emerged as translation equivalents in four European language data in the Camus corpus (data from Romance and Germanic languages: French, Spanish, English, and German). The emergence of the tuples indicated that the tense-aspect forms consisting of every tuple have semantic intersections, which I labeled as Past Perfective, Past Imperfective, Past Progressive, Present, and Present Perfect. I then argued that the tuples, which averaged semantic variations of language-specific tense-aspect forms, are good representations of general tense-aspect categories. Therefore, I used the tuples and the aspectual interpretations (stative/eventive) that the tuples render to sentences to operationalize Hypotheses 1–7.

European tense-aspect tuple (consisting of tense-aspect forms in French, English, German, and Spanish)	General tense-aspect category represented	Aspectual interpretation rendered
Past Perfective := <passé composé, simple past, Perfekt, pretérito indefinido>	Perfective	Eventive
Past Imperfective := <imparfait, simple past, Präteritum, pretérito imperfecto>	Imperfective	Stative
Present := <présent, simple present, Präsens, presente>	Present	Stative
Past Progressive := <imparfait, past continuous, Präteritum, pretérito imperfecto>	Progressive	Stative
Present Perfect := <passé composé, present perfect, Perfekt, pretérito perfecto compuesto>	Perfect	Stative

Table 1: Five European tense-aspect tuples, the general tense-aspect categories they represent and the aspectual interpretations they render to sentences

To make the testing optimally transparent, I supplied information about the annotation of Mandarin tense-aspect forms (annotation rules and solutions to

difficult cases). With the annotation in place, I tested Hypotheses 1–7 again using the bi-directional association measure Normalized Pointwise Mutual Information (NPMI) and took absolute frequency as a supplementary measure. Particularly, NPMI measured the association between Mandarin tense-aspect forms and European tense-aspect tuples, and the frequency characterized the occurrence tendencies of the former in corpus contexts instantiating the latter. The statistics were straightforwardly against H3a but were in line with H3b, H4, and H5. I thus made the following claims (the inputs of *zai* and *zhe* were checked case by case):

- (3) *Guo* is an experiential Perfect marker (H3b), showing strong association with the Present Perfect tuple (NPMI=0.6).
- (4) *Zai* is a Progressive marker requiring a process as its input (H4), showing moderate association with the Past Progressive tuple (NPMI=0.5).
- (5) *Zhe* is an Imperfective marker requiring a state or process as its input (H5), showing moderate association with the Past Progressive tuple (NPMI=0.3) and non-negative association with the Past Imperfective tuple (NPMI=0).

On the other hand, no strong statistical evidence supported any other hypotheses concerning RVCs (H1), post-verbal *le* (H2a, 2b), or verbal reduplication (H6). No strong association was found between any of the three aspectual expressions and the Past Perfective tuple (NPMI=0.1 in all cases), or between post-verbal *le* and the Present Perfect tuple (NPMI=0). As for aspectually unmarked sentences, the statistics were against H7b, but H7a, H7c and 7d received not-very-strong positive evidence. To properly interpret the statistics and evaluate the pending hypotheses, I zoomed in on data containing RVCs or post-verbal *le*, and aspectually unmarked sentences in Chapters 5–7 and analyzed them qualitatively. Verbal reduplication has been left for future research due to the limited data available. Aiming to unpack the compositionality of Mandarin aspect, Chapters 5–7 examined the tense-aspect forms in a syntactically bottom-up manner. I first analyzed the

use of aspectually unmarked sentences in Chapter 5. Then, Chapter 6 dealt with RVCs, which are related to eventuality descriptions. Post-verbal *le*, which is related to grammatical aspect, was tackled in Chapter 7.

Chapter 5 investigated the aspectual interpretations of aspectually unmarked sentences. Since Chapter 4 showed positive evidence to H7a, H7c and H7d (but not to H7b), I zoomed into them and found that H7a and H7d could be reconciled if telicity-indicating methods were considered to be overt aspectual expressions. Since this dissertation was about the compositionality of Mandarin aspect, I was interested in factors regulating the presence/absence of all kinds of aspectual expressions (including grammatical markers and telicity-indicating methods) in sentences. I hence pushed the reconciliation further by taking Sun's (2014) overall generalizations into account, formulating Hypothesis 7e, which additionally includes grammatical aspectual markers (post-verbal *le*, *guo*, *zhe*, *zai*, and verbal reduplication).

- (6) Hypothesis 7e: Mandarin sentences with predicates using aspectually unmarked verbs have a stative interpretation. Mandarin sentences with an eventive interpretation must use overt aspectual expressions (including grammatical aspectual markers or telicity-indicating methods).

The telicity-indicating methods, which I proposed in Chapter 5, are shown in Table 2.

Telicity-indicating method	Domain
Resultative verb complement (RVC)	Within verbal domain
<i>De</i> -resultative	Within clause domain
Endpoint-indicating phrase (e.g., goal argument)	Within clause domain
Consequent state in the causative construction	Within clause domain
(In)direct speech	Across clause domain
Dynamic telicity indicating	Across clause domain

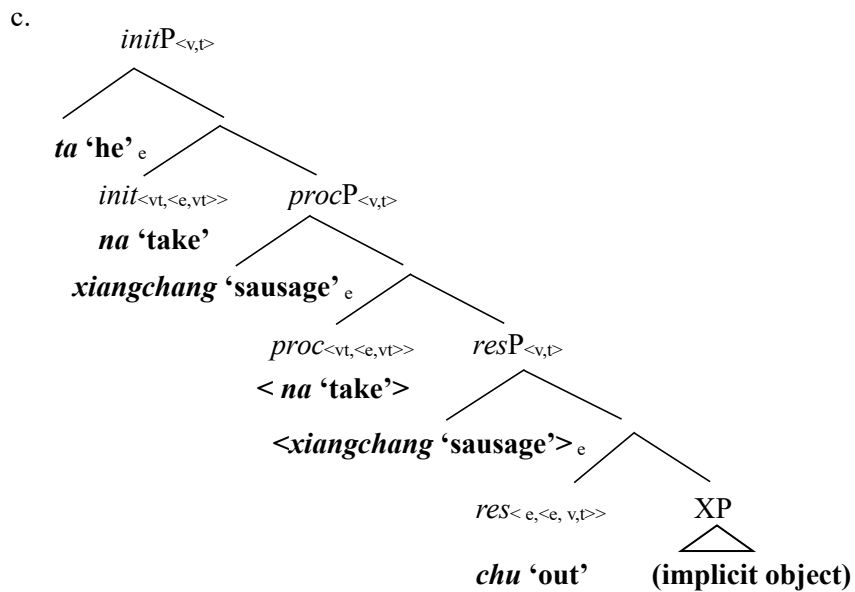
Table 2: The inventory of Mandarin telicity-indicating methods

To test H7e, I reanalyzed the Mandarin data previously annotated as aspectually unmarked and found that many of them contained telicity-indicating methods. Both NPMI and absolute frequency were then applied to measure the association between Mandarin sentences with/without overt aspectual expressions and the eventive/stative interpretation of the sentences (the Past Perfective and Past Imperfective tuples were exploited as probes to indicate the eventive/stative interpretation of Mandarin sentences). The statistics presented strong evidence for H7e. Since H7e was incompatible with H7c, H7c was no longer retained. I thus concluded that in the absence of grammatical aspectual markers, Mandarin sentences using aspectually unmarked verbs as predicates have a stative interpretation by default, but have an eventive interpretation if the verbs interact with telicity-indicating methods.

Having studied the interpretations of aspectually unmarked sentences, I investigated RVCs in Chapter 6, the aspectual expressions that compositionally have the closest interaction with verbs, as they function within the verbal domain. RVCs morphemes are verbal or adjectival, falling into four subtypes: completive RVCs, result-state RVCs, directional RVCs, and frozen RVCs. They compound with verbs differently, forming all kinds of RVC compounds (some RVC morphemes play different RVC subtype roles when compounding with different verbs). To spell out the semantics of RVC compounds, I applied Ramchand's (2008) first-phase syntax and its associated post-Davidsonian semantics to decompose the eventualities denoted by RVC compounds at the lexicon-syntax interface. The framework assumes a mapping between event structure and the syntactic first phase (comparable to the canonical *vP*). A maximal eventuality is decomposed into three subeventualities: an initial state, a process, and a result state, which correspond to *initP*, *procP*, and *resP* respectively in the hierarchical first-phase syntax. My analysis indicated that RVCs are embedded in *resP*, either identifying the *res* head, such as the directional RVC *chu* 'out' in (7b), or the complement of *res*, such as the completive RVC *hao* 'finished' in (8b) and the result-state RVC *lei* 'tired' (9a). The first-phase representations for (7b), (8b), and (9a) are shown in (7c), (8c), and (9b), respectively, and the key denotations are shown in (7d,e), (8d,e), and (9c,d,e).

(7) ID 26011

- a. Il a sorti du boudin, [...]. [French: *passé composé*]
- b. Ta na-chu xiangchang, [...]. [Mandarin: *RVC*]
 he take-out sausage
 ‘He took out sausages, [...].’

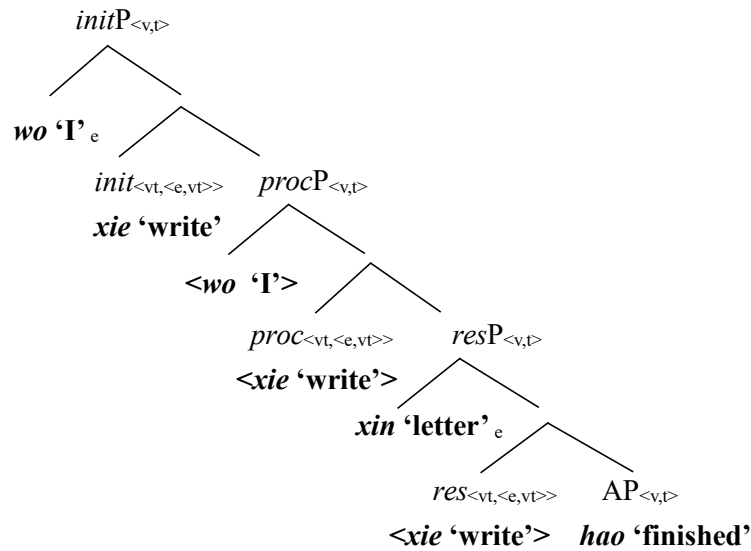


- d. $[[chu]] = \lambda y \lambda x \lambda e [being-out-of(e) \ \& \ State(e) \ \& \ Subject(x,e) \ \& \ Object(y,e)]$
- e. $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[being-out-of(e_2) \ \& \ State(e_2) \ \& \ Subject(sausages, e_2) \ \& \ Object(storage\ place, e_2)] \ \& \ take(e_1) \ \& \ Process(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ Subject(sausages, e_1)] \ \& \ take(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(he, e_3)]$

(8) ID 26151

- a. J'ai fait la lettre. [French: *passé composé*]
- b. Wo xie-hao xin. [Mandarin: *RVC*]
 I write-finished letter
 ‘I wrote the letter.’

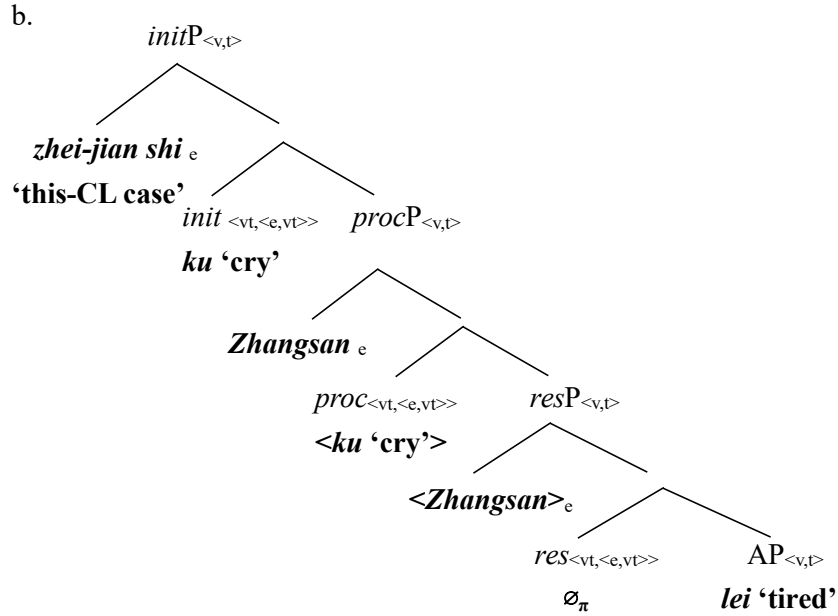
c.



d. $[[hao]] = \lambda e[finished(e)]$

e. $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[finished(e_2) \ \& \ written(e_2) \ \& \ State(e_2) \ \& \ Subject(letter, e_2)] \ \& \ write(e_1) \ \& \ Process(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ Subject(I, e_1)] \ \& \ write(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(I, e_3)]$

- (9) a. Zhei-jian shi ku-lei-le Zhangsan.
 this-CL case cry-tired-LE Zhangsan
 ‘This thing got Zhangsan tired from crying.’



- c. $[[lei]] = \lambda e[tired(e)]$
- d. $[[\emptyset_{\pi}]] = \lambda P\lambda x\lambda e[P(e) \ \& \ poss(e) \ \& \ State(e) \ \& \ Subject(x, e)]$
- e. $[[initP]] = \lambda e \exists e_3, e_4 [\exists e_1, e_2 [[tired(e_2) \ \& \ poss(e_2) \ \& \ State(e_2) \ \& \ Subject(Zhangsan, e_2)] \ \& \ cry(e_1) \ \& \ Process(e_1) \ \& \ e_4 = (e_1 \rightarrow e_2) \ \& \ Subject(Zhangsan, e_1)] \ \& \ cry(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_4) \ \& \ Subject(this \ case, e_3)]$

Particularly, the result-state *lei* ‘tired’ (9b) is the complement of a null head \emptyset_{π} , which has a general possessive meaning.

The aforementioned three RVC subtypes all specify the result states of events, contributing to eventuality descriptions. However, frozen RVCs are distinguished from the others because they are unanalyzable components in frozen RVC compounds, which are primitive verbal items identifying *init*, *proc*, and *res* heads. Despite the internal differences within the family, RVC compounds always denote culminated events.

Besides RVCs, Chapter 6 additionally applied Ramchand’s (2008) framework to analyze other telicity-indicating methods functioning within the clause domain, including *de*-resultatives, the endpoint-indicating phrase, and a consequent state in the causative construction. My analysis showed

that they are embedded in *resP* as part of the eventuality descriptions, describing culminated events. I therefore generalized that Mandarin obligatorily uses *resP* to introduce telicity so as to denote culminated events (cf. English, which resorts to *resP* or the combination of *proc* with a bounded Path; see Section 6.2).

The first-phase qualitative analysis of RVC was checked against all RVC data in the Camus corpus, and it turned out to work well. Since the analysis is a formal version of H1, I thus argued that H1 was in line with my data. The weak association between RVCs and the (eventive) Past Perfective tuple was mainly attributed to the divided labor between RVCs, other telicity-indicating methods, and post-verbal *le* in terms of rendering sentences an eventive interpretation.

Chapter 7 spelled out the semantics of post-verbal *le* (called *le1* in that chapter for annotation consistency) and then compared it to RVCs. Recall that statistics in Chapter 4 did not straightforwardly support neither H2a (post-verbal *le* is a Perfective marker) nor H2b (post-verbal *le* is a resultative Perfect marker), I proposed that the two could be reconciled through an improved version of Lin's (2006) aspectual duality proposal for post-verbal *le*. The improved version incorporates Ramchand's (2008) first-phase framework to enrich Lin's preliminary analysis of event structure. I argued that semantically, post-verbal *le* has aspectual duality, as it denotes Perfective aspect for the initiation and process of eventuality but Imperfective aspect for the result state of eventuality, if any; syntactically, post-verbal *le* identifies the Asp head and takes *initP* as its complement. See my definition for post-verbal *le* in (10), adapted from Lin (2006). The variable e_1 stands for the process of eventuality, which e_2 and e_3 represent the result state and the initiation of eventuality, respectively.

$$(10) \quad [[le]] = \lambda P_{\langle v,t \rangle} \lambda t_{Top} \lambda t_0 \exists e_1, e_2, e_3 \exists e [P(e) \ \& \ \text{Istage}(e) = (e_1 \cup e_3) \ \& \ \tau(e_1 \cup e_3) \subseteq t_{Top} \ \& \ t_{Top} < t_0 \ \& \ \text{Rstate}(e) = e_2 \ \& \ t_{ana} \subseteq \tau(e_2)]$$

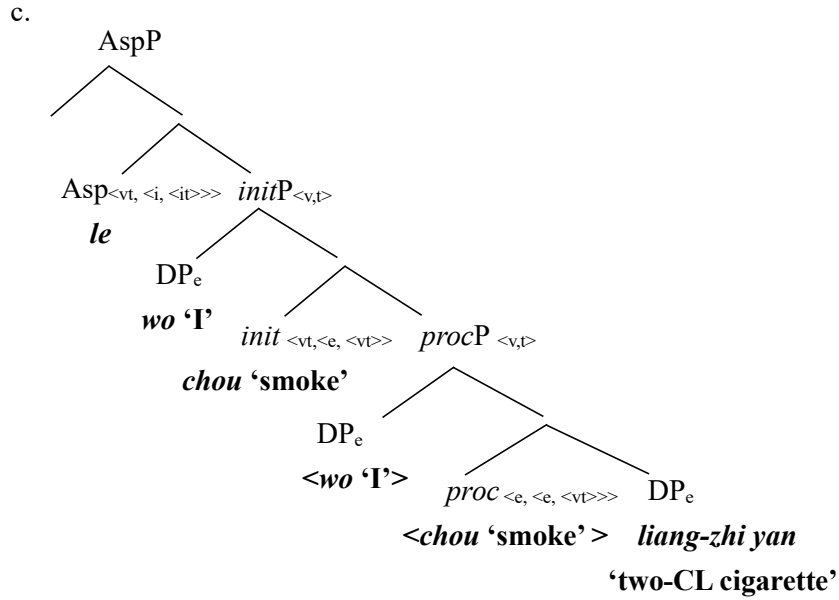
Applying this to my narrative discourse data, t_{Top} is the topic time of sentence, which moves forward as the story unfolds. T_0 is the evaluation time (the protagonist's "now" as default). Lin defines t_{ana} as the topic time of the result

state, which is anaphoric and cannot be existentially bound. It either takes t_0 as default antecedent or obtains its value from some temporal anchoring expression in the context, such as a temporal adverbial or temporal clause. Also, (10) follows Lin's proposal to assume that post-verbal *le* also denotes the relative past ($t_{top} < t_0$). (10) was checked against my data bearing post-verbal *le* in the Camus corpus, and I found that it worked well.

Specifically, my data showed that post-verbal *le* operates on the eventuality descriptions of states, processes, and events. When marking process verbs (or verb compounds), which are atelic and thus do not project *resP* (not introducing e_2), post-verbal *le* functions as a Perfective marker because its Imperfective component has no lexical input. As a result, the sentences marked by post-verbal *le* denote events (possibly non-culminated). See (11b), the translation of the eventive French sentence (11a). The verb *chou* 'smoke' denotes a process without projecting *resP* (11c). Observe the denotation of (11b) in (11d): it conveys a culminated event that the two cigarettes were completely consumed, which is obtained through Ramchand's (2008) monotonic relation (in the spirit of Krifka's (1989) homomorphic relation) between the smoking process and the quantized object *liang-zhi yan* 'two-CL cigarette'. Importantly, the culmination meaning of (11b) is a conversational implicature that can be canceled in a context if the quantized object is not understood as a bounded Path of the event.

(11) ID 25619

- | | | |
|----|--|-------------------------|
| a. | J' <u>ai fumé</u> deux cigarettes, [...] | [French: passé composé] |
| b. | Wo <u>chou-le</u> liang-zhi yan, [...] | [Mandarin: <i>leI</i>] |
| | I smoke-LE two-CL cigarette | |
| | 'I smoked two cigarettes, [...] | |



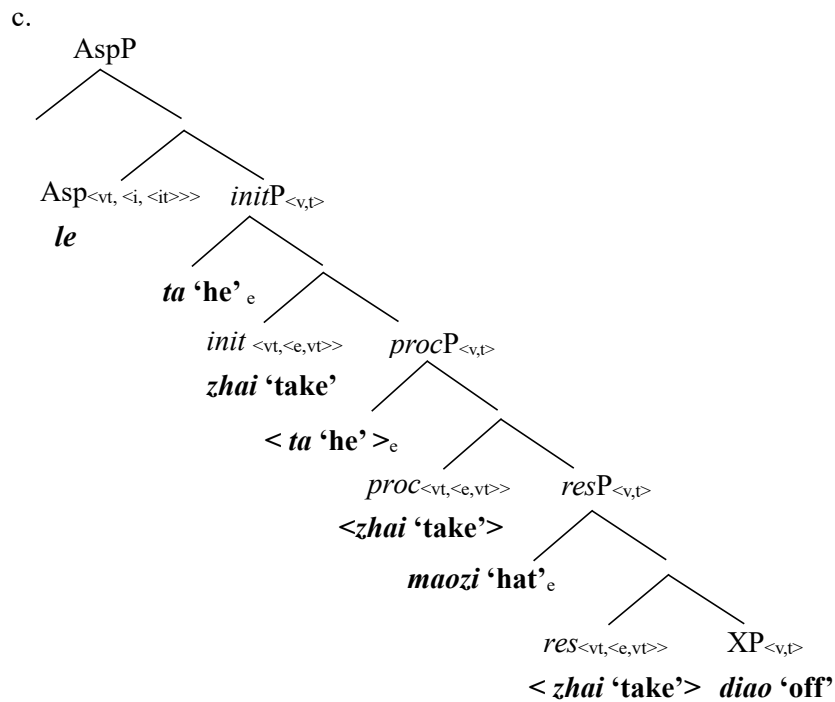
- d. $\exists t_c \exists e [\exists e_3, e_1 [[\exists R \exists D_{c_1 \oplus c_2} [\forall e_1, d, d' [R(e_1, d) \ \& \ d' \leq d \rightarrow$
 $\exists e_1' [e_1' \subseteq e_1 \ \& \ R(e_1', d')] \ \& \ \forall e_1, e_1', d [R(e_1, d) \ \& \ e_1' \subseteq e_1 \rightarrow$
 $\exists d' [d' \leq d \ \& \ R(e_1', d')] \ \& \ smoke(e_1) \ \& \ Process(e_1) \ \&$
 $Subject(I, e_1)] \ \& \ smoke(e_3) \ \& \ State(e_3) \ \& \ e = (e_3 \rightarrow e_1) \ \&$
 $Subject(I, e_3)] \ \& \ Istage(e) = e_3 \cup e_1 \ \& \ \tau(e_3 \cup e_1) \subseteq t_c \ \& \ t_c < now_M]$
 (The two cigarettes are represented by c_1 and c_2 . The topic time t_{Top} takes the context-dependent value t_c ; t_0 takes the value of the protagonist Meursault's speech time "now," represented by now_M .)

When post-verbal *le* marks event descriptions, which are telic verbs (or verb compounds) and thus project *resP*, both the Perfective and Imperfective components of post-verbal *le* have lexical inputs such that the sentences marked by post-verbal *le* convey events reaching culmination and their result states hold at evaluation time. The composite meaning is similar to what the resultative Perfect conveys. In such cases, post-verbal *le* can be used to translate French eventive sentences such as the one in the bracket of (12a) or stative sentences such as (13a). The event descriptions in (12b) and (13b) are the RVC compounds *zhai-diao* 'take-off' and *dai-lai* 'take-come',

respectively. (12c) and (12d) are the first-phase syntax representation and denotation of (12b).

(12) ID 25262

- a. Il avait un feutre mou à la calotte ronde et aux ailes larges (il l'a ôté quand la bière a passé la porte), [...] [French: *passé composé*]
- b. Ta dai-zhe yi-ding yuanding kuanyan ruan zhanmao,
 he wear-ZHE one-CL round-top wide-brim soft felt hat
 (Guancai jingguo de-shihou, ta zhai-diao-le maozi)
 coffin pass-by DE-time, he take-off-LE hat
 'He was wearing a soft felt hat with a round crown and a wide
 brim (he took it off when the coffin passed by), [...]'
 [Mandarin: *lel*]



- d. $\exists t_{cl} \exists e [\exists e_3, e_4 [\exists e_1, e_2 [[being-off(e_2) \& taken(e_2) \& State(e_2) \& Subject(hat, e_2)] \& take(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(he, e_1)] \& take(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(he, e_3)] \& Istage(e) = e_1 \cup e_3 \& \tau(e_1 \cup e_3) \subseteq t_{cl} \& t_{cl} < now_M \& Rstate(e) = e_2 \& t_{ana} \subseteq \tau(e_2) \& t_{ana} \subseteq t_{cl}]$
 (T_{Top} and t_{ana} obtain their values from t_{cl} , the time denoted by *de-shihou* ‘when’-clause; t_0 takes the value of the protagonist Meursault’s “now_M”)

Since the first-phase syntax representation of (13b) is in the same configuration of (12b), I omit it here for considerations of space. (13c) is the denotation of (13b), with the *guo*-clause ignored for simplicity.

(13) ID 32172

- a. Et le vent qui passait au-dessus d’elles apportait ici une odeur de sel.
 [French: *imparfait*]
- b. Cong shan-shang chui guo de feng dai-lai-le
 from hill-over blow GUO DE wind take-come-LE
 yi-gu yan-wei.
 one-CL salt-tang
 ‘The wind which has blown over the hills has taken here a salty tang.’
 [Mandarin: *lel*]
- c. $\exists t_c \exists e [\exists e_3, e_4 [\exists e_1, e_2 [[being-here(e_2) \& taken(e_2) \& State(e_2) \& Subject(salty tang, e_2)] \& take(e_1) \& Process(e_1) \& e_4 = (e_1 \rightarrow e_2) \& Subject(wind, e_1)] \& take(e_3) \& State(e_3) \& e = (e_3 \rightarrow e_4) \& Subject(wind, e_3)] \& Istage(e) = e_1 \cup e_3 \& \tau(e_1 \cup e_3) \subseteq t_c \& t_c < now_M \& Rstate(e) = e_2 \& now_M \subseteq \tau(e_2)]$
 (T_{Top} takes the context-dependent value t_c , t_0 and t_{ana} take the value of the protagonist Meursault’s “now_M”)

When post-verbal *le* marks state descriptions, it coerces them into event descriptions, giving rise to an inchoative interpretation. For example, the

eventive sentence (14a) is translated by (14b), where the state verb *mingbai* ‘understand’ is coerced by post-verbal *le* into an event verb that projects *initP*, *procP*, and *resP*.

(14) ID 25583

- a. En le voyant avec sa femme, j’ai compris pourquoi dans le quartier on disait de lui qu’il était distingué. [French: *passé composé*]
- b. Kan-dao ta he ta laopo zai yiqi, wo mingbai-le
 look-arrive he and his wife at together I understand-LE
 weishenme zhe-yi-dai-de-ren dou shuo ta
 why the-local-place-DE-people all say he
 yitaibufan.
 distinguished
 ‘Seeing him with his wife, I understood why local people said he was distinguished.’

[Mandarin: *leI*]

With the semantics of post-verbal *le* spelled out, Chapter 7 compared it with RVCs. RVCs indicate telicity, contributing to eventuality descriptions, but post-verbal *le* conveys grammatical aspect. They have competition in terms of assigning sentences an eventive interpretation. Sentences using RVCs entail culminated events, while sentences using post-verbal *le* convey culminated events as a conversational implicature or convey non-culminated events. Also, Mandarin sentences allow the stacking of RVC and post-verbal *le*, which could cause an effect similar to the resultative Perfect that asserts the result state extending to the evaluation time, when sentences have no overt topic time expressions such as (13b).

The fact that no strong association was found between post-verbal *le* and the (eventive) Past Perfective tuple (NPMI=0.1) was attributed to its competition with RVCs as well as other telicity-indicating methods. Moreover, the fact that post-verbal *le* showed no strong association with the Present Perfect tuple (NPMI=0) was attributed to its competition with *guo* in terms of conveying Perfect meaning.

To sum up, the main conclusion of the dissertation is that the aspectual

interpretation of a Mandarin sentence (i.e., stative/eventive) is compositionally derived from the eventuality description and its interaction with the optional grammatical aspectual marker (post-verbal *le*, *guo*, *zhe*, or *zai*). In the absence of grammatical aspectual markers, Mandarin sentences have a stative interpretation by default if using aspectually unmarked verbs as predicates, but have an eventive interpretation if the sentences contain telicity-indicating methods, including those functioning within the clausal domain (i.e., RVCs, *de*-resultatives, endpoint-indicating phrases, and a consequent state in the causative construction), and those functioning across the clausal domain (i.e., (in)direct speeches and the dynamic telicity indicating). In the presence of grammatical aspectual markers, sentences marked by *zhe* (Imperfective marker), *zai* (Progressive marker), or *guo* (experiential Perfect marker) have a stative interpretation, while sentences marked by post-verbal *le* (which has aspectual duality) have an eventive interpretation (when post-verbal *le* marks process descriptions, functioning like a Perfective marker) or a composite of event plus state (when post-verbal *le* marks event or state descriptions, functioning like a resultative Perfect marker). Mandarin establishes more complex aspectual distinctions than the Perfective/Imperfective or Progressive/non-Progressive dichotomies in European languages, and parallel corpus data can be fruitfully used to bring out the relevant differences.

8.2 Future work

The dissertation only spelled out the semantics of RVCs and post-verbal *le* in narrative discourse. Although narrative discourse allows eventive sentences to only use RVCs as overt aspectual expressions, I have the intuition that in eventive sentences in out-of-the-blue contexts, simple verbs or RVC compounds must be marked by post-verbal *le*. Chapter 7 proposed a tentative explanation for this: *init*P has a free eventuality variable that can be existentially bound by the context in narrative discourse, whereas in out-of-the-blue contexts, it has to be bound by post-verbal *le*. Since there is no real out-of-the-blue data in the Camus corpus, I must leave the issue for future research. Chapter 7 also presented a preliminary discussion of factors

regulating when an event description marked by post-verbal *le* is used to translate an eventive or stative French sentence, but this needs further investigation because the corpus cases where post-verbal *le* is used to translate stative French sentences are very limited in number.

Beyond RVCs and post-verbal *le*, the semantics of *zhe*, *zai*, *guo*, and verbal reduplication requires future work. It is also important to explore what factors govern the alternation between *zhe* and *zai* when they are used to convey Progressive aspect. All these issues need to be settled in order to elaborate a fully-developed formal semantics of Mandarin aspect.

Furthermore, Mandarin is acknowledged as morphologically tenseless, and the temporal anchoring of Mandarin sentences remains controversial. Sun (2014) argues that Mandarin has a covert NONFUT tense, while Lin (2006) claims that having no TP but only AspP, Mandarin uses various devices such as temporal adverbs, modal verbs, tense-aspect particles (e.g., post-verbal *le* and *guo*), and pragmatic reasoning to determine the temporal interpretation of sentences. Although my data supports Lin's (2006) argument that post-verbal *le* fuses tense and aspect meanings, the question as to whether Mandarin has TP is beyond the scope of my research so I leave the issue open. The answer to this question will contribute to a complete theory for the Mandarin temporal system.

Last but not least, this dissertation only investigates the Camus corpus, which takes French as the source language. However, the replication-based paradigm of *Translation Mining* methodology I have adopted requires studying the same phenomenon from the perspective of different parallel corpora with different source languages so as to test generalizations drawn by research following this tradition. Therefore, it is necessary to test my conclusions about Mandarin aspect system by replicating the association study with another European–Mandarin parallel corpus that takes, for example, English, German, or Spanish as the source language. Moreover, it is also important to replicate the association study using a Mandarin–European parallel corpus and compare the results with the findings in this dissertation. Also, different parallel corpora using different text types (speech, non-fiction, etc.) or using texts produced by different authors deserve investigation. All the replication studies will contribute to a

better understanding of the validity of using parallel corpora in cross-linguistic studies.

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Appendix

The Camus corpus: bibliographical details of the source text and its translations

Camus, A. (1942). *L'Étranger*. Paris: Gallimard. [French]

Camus, A. (1982). *The Outsider* (J. Laredo, trans.). London: Hamish Hamilton. [English]

Camus, A. (1998). *Juwairén* (H. Guo, trans.). Nanjing: Yilin Press. [Mandarin]

Camus, A. (2004). *Der Fremde* (U. Aumüller, trans.). Reinbek: Rowohlt. [German]

Camus, A. (2012). *El extranjero* (J. Á. Valente, trans.). Madrid: Alianza Editorial. [Spanish]

Summary

Mandarin Chinese is a language that does not grammaticalize tense, but makes abundant use of aspectual forms in the lexicon and grammar. The aspectual forms interact with verbs in sentences, shaping reference to time in a different way from that in European languages. To expand our knowledge of temporal reference from its attestation in European languages to a more global picture, this dissertation studies the compositional interpretation of Mandarin aspect. Given that there are many formal semantic studies on Mandarin aspectual forms but an overall empirical picture of the Mandarin aspect is lacking in the literature, this study addresses the gap by empirically testing established hypotheses in the literature via a corpus, and then revises those hypotheses challenged by the corpus data based on qualitative analysis of the data.

To clarify the starting point of the empirical testing, Chapter 2 outlines the theoretical background on general tense-aspect studies and presents previous studies on Mandarin aspect. According to the literature, the author formulates Hypotheses 1–7:

- Hypothesis 1: A resultative verb compound (a verb plus a resultative verb complement) denotes a culminated event plus result state (along the lines of Li & Thompson 1981).
- Hypothesis 2a: Post-verbal *le* is a perfective marker (along the lines of Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014).
- Hypothesis 2b: Post-verbal *le* is a resultative perfect marker (along the lines of Lin 2006).
- Hypothesis 3a: *Guo* is a perfective marker (along the lines of Smith 1997; Lin 2006).
- Hypothesis 3b: *Guo* is an experiential perfect marker (along the lines of Xiao & McEnery 2004).

- Hypothesis 4: *Zai* is a progressive marker requiring a process as its input (along the lines of Smith 1997; Xiao & McEnergy 2004; Lin 2006; Sun 2014).
- Hypothesis 5: *Zhe* is an imperfective marker requiring a state or process as its input (along the lines of Smith 1997; Xiao & McEnergy 2004; Lin 2006).
- Hypothesis 6: Verbal reduplication is a perfective marker (along the lines of Smith 1997; Dai 1997; Xiao & McEnergy 2004).
- Hypothesis 7a: Mandarin aspectually unmarked sentences are aspectually transparent (i.e., they have an eventive interpretation if the underlying eventuality description is quantized and have a stative interpretation if the eventuality description is homogeneous, along the lines of de Swart 1998).
- Hypothesis 7b: Mandarin aspectually unmarked sentences have neutral aspect (i.e., neither perfective nor imperfective, along the lines of Smith 1997).
- Hypothesis 7c: Mandarin aspectually unmarked sentences using non-dynamic eventuality descriptions have a stative interpretation, whereas those using dynamic eventuality descriptions are underspecified for aspect (they receive a perfective or an imperfective interpretation depending on the discourse context, along the lines of Xiao & McEnergy 2004).
- Hypothesis 7d: Mandarin aspectually unmarked sentences have a stative interpretation (they denote lexical states or generics, along the lines of Sun 2014).

To empirically test the hypotheses in a corpus, the author needs to operationalize them by converting into countable items the general tense-aspect categories (perfective, perfect, etc.) and aspectual notions (stative/eventive) involved in the hypotheses. In a monolingual Mandarin corpus, the countable items could be intuition-driven annotations of the Mandarin data with the categories/notions. The annotations, however, are susceptible to circular reasoning, given that the author already has the

hypotheses in mind. The study thus opts for a parallel corpus consists of French source texts and translations to a number of European languages and to Mandarin. This design allows the author to use European tense-aspect forms (annotated in the corpus by the *Time in Translation* project members) as a probe into the Mandarin aspectual system.

Using the parallel corpus, Chapter 3 conducts a preliminary test of Hypotheses 1–7 through a contrastive study between Mandarin and French (this chapter is a joint work with the *Time in Translation* project members). To operationalize the hypotheses, French tense-aspect forms are used as countable representations of the abstract (tense-)aspectual notions involved in the hypotheses. After the initial examination, the results indicate that H4 and H6 are in line with the data, but findings not in line with the other hypotheses are also obtained. To interpret these findings properly, the authors reflect on the reliability of using parallel corpora for cross-linguistic variation studies, by comparatively examining three traditions in the field. The authors finally confirm that parallel corpora are suitable for cross-linguistic variation studies and, particularly, that *Translation Mining* tradition (van der Klis *et al.* 2017, 2021a) is an optimal match for the dissertation’s research goal. A further reflection on the unexpected findings indicates that tense-aspect forms in a single language such as French are not good representations for the general tense-aspect categories. To tackle the representativeness issue, the authors develop a variant of standard *Translation Mining* methodology, dubbed *Aggregated Translation Mining*, which is applied in Chapter 4.

Chapter 4 conducts a sophisticated test on Hypotheses 1–7 using the *Aggregated Translation Mining* methodology. The methodology exploits data from French, Spanish, English, and German in the parallel corpus and obtains tense-aspect tuples (Table 1) which consist of tense-aspect forms that frequently emerge as translation equivalents in the European language data. The emergence of the tuples indicates that the tense-aspect forms which consist of every tuple have semantic intersections. The intersections are labeled as Past Perfective, Past Imperfective, Past Progressive, Present, and Present Perfect, respectively. The author argues that the tuples, which average semantic variations of language-specific tense-aspect forms, are

good representations of general tense-aspect categories. Therefore, the tuples and the aspectual interpretations (stative/eventive) that the tuples render to sentences are used to operationalize Hypotheses 1–7.

European tense-aspect tuple (consisting of tense-aspect forms in French, English, German, and Spanish)	General tense-aspect category represented	Aspectual interpretation rendered
Past Perfective := < <i>passé composé, simple past, Perfekt, pretérito indefinido</i> >	Perfective	Eventive
Past Imperfective := < <i>imparfait, simple past, Präteritum, pretérito imperfecto</i> >	Imperfective	Stative
Present := < <i>présent, simple present, Präsens, presente</i> >	Present	Stative
Past Progressive := < <i>imparfait, past continuous, Präteritum, pretérito imperfecto</i> >	Progressive	Stative
Present Perfect := < <i>passé composé, present perfect, Perfekt, pretérito perfecto compuesto</i> >	Perfect	Stative

Table 1: Five European tense-aspect tuples, the general tense-aspect categories they represent and the aspectual interpretations they render to sentences

The author then tests the operationalized Hypotheses 1–7 in the corpus by measuring the association between Mandarin aspectual forms and the tuples with the association measure Normalized Pointwise Mutual Information (NPMI). The results do not support H3a and H7b but they are in line with H3b (*guo* is an experiential perfect marker), H4 (*zai* is a progressive marker), and H5 (*zhe* is an imperfective marker). The other hypotheses only receive weak support, requiring further examination. The remaining chapters thus zoom into data concerning the pending hypotheses. By taking a compositionally bottom-up perspective, the author first investigates aspectually unmarked sentences (Chapter 5), then studies resultative verb compounds (Chapter 6) and the grammatical marker post-verbal *le* (Chapter

7). Verbal reduplication has been left open due to the limited data available.

Chapter 5 investigates the interpretations of aspectually unmarked sentences. The author scrutinizes H7a, H7c and H7d, the hypotheses on unmarked sentences for which no incompatible results are produced from the statistics in Chapter 4. It is found that H7a and H7d can be reconciled if telicity-indicating methods are considered to be overt aspectual expressions. Since the study conducted as a part of this dissertation which focuses on the compositionality of Mandarin aspect, the author is interested in factors regulating the presence/absence of various types of aspectual expressions in sentences so she pushes the reconciliation further into Hypothesis 7e. This particular hypothesis additionally includes grammatical aspectual markers (post-verbal *le*, *guo*, *zhe*, *zai*, and verbal reduplication).

Hypothesis 7e: Mandarin sentences with predicates using aspectually unmarked verbs have a stative interpretation. Mandarin sentences with an eventive interpretation must use overt aspectual expressions (including grammatical aspectual markers or telicity-indicating methods).

Table 2 summarizes the telicity-indicating methods, which the author proposes in Chapter 5.

Telicity-indicating method	Domain
Resultative verb complement (RVC)	Within verbal domain
<i>De</i> -resultative	Within clause domain
Endpoint-indicating phrase (e.g., goal argument)	Within clause domain
Consequent state in the causative construction	Within clause domain
(In)direct speech	Across clause domain
Dynamic telicity indicating	Across clause domain

Table 2: The inventory of Mandarin telicity-indicating methods

H7e is then tested by NPMI again and the results indicate strong support for the hypothesis. Since H7e is incompatible with H7c, H7c is no longer

retained. The chapter concludes: in the absence of grammatical aspectual markers, Mandarin sentences using aspectually unmarked verbs as predicates have a stative interpretation by default, but an eventive interpretation if the verbs interact with telicity-indicating methods.

Chapter 6 analyzes resultative verb compounds, which consist of verbs and resultative verb complements (RVCs), aspectual expressions compositionally having the closest interaction with verbs, as they function within the verbal domain. RVCs morphemes are either verbal or adjectival, classified under four subtypes: completive RVCs, result-state RVCs, directional RVCs, and frozen RVCs. To spell out the semantics of all kinds of resultative verb compounds, the author applies Ramchand's (2008) first-phase syntax and its associated post-Davidsonian semantics, which decomposes verb meanings. The framework proposes that a maximal eventuality consists of three subeventualities: an initial state, a process, and a result state, which correspond to *initP*, *procP*, and *resP*, respectively. The decomposition of resultative verb compounds indicates that RVCs specify the result states of events and thus are embedded in *resP*, either constituting the *res* head, such as the directional RVC *chu* 'out' in (1b), or the complement of *res*, such as the completive RVC *hao* 'finished' in (2b).

- (1) a. Il a sorti du boudin, [...]. [French: *passé composé*]
 b. Ta na-chu xiangchang [...]. [Mandarin: *RVC*]
 he take-out sausage
 'He took out sausages [...]'
- (2) a. J'ai fait la lettre. [French: *passé composé*]
 b. Wo xie-hao xin. [Mandarin: *RVC*]
 I write-finished letter
 'I wrote the letter.'

However, frozen RVCs are distinguished from other RVC subtypes because they are unanalyzable components in frozen resultative verb compounds, which are primitive verbal items identifying *init*, *proc*, and *res* heads. Despite the internal differences within the family, resultative verb compounds always denote culminated events. The first-phase qualitative

analysis of RVCs is checked against all RVC data in the parallel corpus and the analysis can function effectively. Since the analysis is a formal version of H1, the author argues that H1 is in line with the corpus data. The weak statistical evidence produced from testing H1 in Chapter 4 is attributed to the divided labor between RVCs, other telicity-indicating methods, and post-verbal *le* in terms of rendering sentences an eventive interpretation. Besides RVCs, Chapter 6 also applies Ramchand's (2008) framework to analyze other telicity-indicating methods functioning within the clause domain. The analysis uncovers that these methods are embedded in *resP*, describing culminated events. The author therefore generalizes that Mandarin obligatorily uses *resP* to introduce telicity.

Chapter 7 spells out the semantics of the aspectual marker post-verbal *le* and then compares it to RVCs. The author proposes an improved version of Lin's (2006) proposal for post-verbal *le*, which reconciles the two competing hypotheses on post-verbal *le* (H2a and H2b), both receiving weak statistical evidence in Chapter 4. The improved version incorporates Ramchand's (2008) first-phase framework into Lin's preliminary analysis of event structure. The author argues that semantically, post-verbal *le* has aspectual duality, as it denotes perfective aspect for the initiation and process of eventuality but imperfective aspect for the result state of eventuality (if any); syntactically, post-verbal *le* identifies the Asp head and takes *initP* as its complement. The analysis is checked against the data bearing post-verbal *le* in the parallel corpus, and it turns out to function well.

The aspectual duality of post-verbal *le* makes the marker a perfective marker (H2a) when marking process descriptions but a resultative perfect marker (H2b) when marking event or state descriptions. The weak statistical evidence received from the test results of H2a and H2b in Chapter 4 is attributed to the competitions between post-verbal *le*, RVCs and other telicity-indicating methods (H2a) and that between post-verbal *le* and *guo* (H2b). Additionally, Chapter 7 compares post-verbal *le* with RVCs, finding that sentences using RVCs entail culminated events, while sentences using post-verbal *le* convey non-culminated events or culminated events as a conversational implicature.

The dissertation discovers that Mandarin establishes more complex

aspectual distinctions than the perfective/imperfective or progressive/non-progressive dichotomies in European languages, and that parallel corpus data can be effectively used to reveal the relevant differences. Further follow-up research could show to what extent the analysis proposed in this dissertation can be reduplicated in other parallel corpora using other source languages.

Samenvatting in het Nederlands

Het Mandarijn is een taal die tempus niet grammaticaliseert, maar veelvuldig gebruikmaakt van aspectuele vormen in zijn lexicon en grammatica. Deze aspectuele vormen interageren met werkwoorden in zinnen, waardoor de verwijzing naar tijd op een andere manier wordt vormgegeven dan in de Europese talen. Om onze kennis over temporele verwijzing uit te breiden van enkel haar voorkomens in Europese talen in de richting van een globaler beeld, bestudeert dit proefschrift de compositionele interpretatie van aspect in het Mandarijn. Gegeven het feit dat er veel formeel-semantisch onderzoek bestaat naar aspectuele vormen in het Mandarijn, maar een omvattend empirisch beeld van aspect in het Mandarijn in de literatuur ontbreekt, richt dit proefschrift zich op deze leemte door gevestigde hypothesen uit de literatuur op basis van een corpus te testen, en de hypothesen te herzien die door een kwantitatieve analyse van de corpusdata in twijfel worden getrokken.

Ter verduidelijking van het startpunt voor de empirische toetsing, schetst Hoofdstuk 2 de theoretische achtergrond van algemene studies naar tempus en aspect, en presenteert eerder onderzoek naar aspect in het Mandarijn. Op grond van de literatuur worden Hypothesen 1-7 geformuleerd:

- Hypothese 1: Een resultatieve werkwoordssamenstelling (werkwoord plus resultatief werkwoordscomplement) duidt een geculmineerde gebeurtenis plus resultaattoestand aan (in de trant van Li & Thompson 1981).
- Hypothese 2a: Postverbaal *le* is een perfectiefmarkeerder (in de trant van Li & Thompson 1981; Smith 1997; Xiao & McEnery 2004; Sun 2014).
- Hypothese 2b: Postverbaal *le* is een resultatieve perfectiefmarkeerder (in de lijn van Lin 2006).

- Hypothese 3a: *Guo* is een perfectiefmarkeerder (in de trant van Smith 1997; Lin 2006).
- Hypothese 3b: *Guo* is een experiëntiële perfectum-markeerder (in de trant van Xiao & McEnery 2004).
- Hypothese 4: *Zai* is een progressiefmarkeerder die een proces als input vereist (in de trant van Smith 1997; Xiao & McEnery 2004; Lin 2006; Sun 2014).
- Hypothese 5: *Zhe* is een imperfectiefmarkeerder die een toestand of proces als input vereist (in de trant van Smith 1997; Xiao & McEnery 2004; Lin 2006).
- Hypothese 6: Werkwoordelijke reduplicatie is een perfectiefmarkeerder (in de trant van Smith 1997; Dai 1997; Xiao & McEnery 2004).
- Hypothese 7a: Aspectueel ongemarkeerde zinnen in het Mandarijn zijn aspectueel transparant (i.e. ze hebben een eventieve interpretatie als de onderliggende eventualiteitsbeschrijving gekwantiseerd is, en een toestandsinterpretatie als de eventualiteitsbeschrijving homogeen is, in de trant van de Swart 1998).
- Hypothese 7b: Aspectueel ongemarkeerde zinnen in het Mandarijn hebben neutraal aspect (i.e. noch perfectief noch imperfectief, in de lijn van Smith 1997).
- Hypothese 7c: Aspectueel ongemarkeerde zinnen in het Mandarijn die niet-dynamische eventualiteitsbeschrijvingen gebruiken, krijgen een toestandsinterpretatie, terwijl zinnen die dynamische eventualiteitsbeschrijvingen gebruiken, ondergespecificeerd zijn voor aspect (ze krijgen een perfectieve of een imperfectieve interpretatie afhankelijk van de discourse-context, in de trant van Xiao & McEnery 2004).
- Hypothese 7d: Aspectueel ongemarkeerde zinnen in het Mandarijn krijgen een statische interpretatie (ze duiden lexicale toestanden of generieke standen van zaken aan, in de trant van Sun 2014).

Om de hypothesen op basis van een corpus empirisch te testen, moeten ze worden geoperationaliseerd door de algemene categorieën van tempus en aspect (perfectief, perfectum, enz.) en aspectuele begrippen (statisch/eventief) die in de hypothesen een rol spelen, in telbare items om te zetten. In een eentalig corpus van het Mandarijn kunnen de telbare items op intuïties gebaseerde annotaties van de categorieën/begrippen zijn. Echter, zulke annotaties zijn vatbaar voor cirkelredeneringen, aangezien de annotator al kennis heeft van de hypothesen. De dissertatie kiest daarom voor een parallel corpus bestaande uit een Franse brontekst en vertalingen naar een aantal Europese talen en het Mandarijn. Met deze opzet kunnen de Europese vormen voor tempus en aspect (geannoteerd in het corpus door de leden van het *Time in Translation*-project) worden gebruikt om het aspectuele systeem van het Mandarijn in kaart te brengen.

Aan de hand van het parallelle corpus test Hoofdstuk 3 hypothesen 1-7 in eerste instantie door middel van een contrastieve studie van het Mandarijn en het Frans. Dit betreft gezamenlijk werk met de leden van het *Time in Translation*-project. Om de hypothesen te operationaliseren, worden Franse vormen voor tempus en aspect gebruikt als telbare representaties van de abstracte tempus-aspectbegrippen uit de hypothesen. Uit dit eerste onderzoek volgt dat H4 en H6 in overeenstemming zijn met de data, maar er zijn ook bevindingen die niet volgen uit de overige hypothesen. Om deze bevindingen te interpreteren, wordt gereflecteerd op de betrouwbaarheid van het gebruik van parallelle corpora voor onderzoek naar crosslinguïstische variatie, specifiek door drie onderzoekstradities in het veld met elkaar te vergelijken. De uiteindelijke conclusie is dat parallelle corpora geschikt zijn voor onderzoek naar crosslinguïstische variatie, en dat met name de *Translation Mining*-traditie (van der Klis *et al.* 2017, 2021a) een optimale match is voor het onderzoeksdoel van het proefschrift. Verdere reflectie op de onverwachte bevindingen wijst uit dat vormen voor tempus en aspect in een enkele taal zoals het Frans geen goede representatie zijn voor tempus-aspectvormen in het algemeen. Om het representativiteitsprobleem aan te pakken, wordt een variant van de standaard-*Translation Mining*-methodologie ontwikkeld, genaamd *Aggregated Translation Mining*, die in Hoofdstuk 4 wordt toegepast.

Hoofdstuk 4 voert een verfijnde test uit op hypothesen 1-7 met behulp van de *Aggregated Translation Mining*-methodologie. De methodologie maakt gebruik van gegevens uit het Frans, Spaans, Engels en Duits in het parallelle corpus en verkrijgt tempus-aspect-tuples (Tabel 1) die bestaan uit vormen voor tempus en aspect die vaak voorkomen als vertaalequivalenten in de Europese taaldata. De emergentie van deze tuples duidt erop dat de tempus-aspectvormen waaruit elke tuple bestaat, semantische snijvlakken hebben. Deze snijvlakken worden aangeduid als *Past Perfective*, *Past Imperfective*, *Past Progressive*, *Present* en *Present Perfect*, respectievelijk. Betoogd wordt dat deze tuples, die het gemiddelde nemen van de semantische variatie van taalspecifieke tempus-aspectvormen, goede representaties zijn van algemene tempus-aspectcategorieën. Derhalve worden de tuples en de aspectuele interpretaties (statisch/eventief) die ze aan zinnen verschaffen, ingezet om hypothesen 1-7 te operationaliseren.

Tempus-aspect-tuple (bestaande uit vormen met een gespannen aspect in het Frans, Engels, Duits en Spaans)	Algemene tempus-aspect categorie die wordt vertegenwoor digd	Verkregen aspectuele interpretatie
Past Perfective := < <i>passé composé, simple past, Perfekt, pretérito indefinido</i> >	Perfectief	Eventief
Past Imperfective := < <i>imparfait, simple past, Präteritum, pretérito imperfecto</i> >	Imperfectief	Statisch
Present := < <i>présent, simple present, Präsens, presente</i> >	Presens	Statisch
Past Progressive := < <i>imparfait, past continuous, Präteritum, pretérito imperfecto</i> >	Progressief	Statisch
Present Perfect := < <i>passé composé, present perfect, Perfekt, pretérito perfecto compuesto</i> >	Perfectum	Statisch

Tabel 1: Vijf Europese tempus-aspect-tuples, de algemene tijdaspectcategorieën die ze vertegenwoordigen en de aspectuele interpretaties die ze aan zinnen geven

Vervolgens worden de geoperationaliseerde hypotheses 1-7 op basis van het corpus getest door de associatie tussen aspectuele vormen in het Mandarijn en de tuples te meten aan de hand van de associatiemaat *Normalized Pointwise Mutual Information* (NPMI). Enerzijds ondersteunen de resultaten H3a en H7b niet; anderzijds zijn ze wel in lijn met H3b (*guo* is een experiëntiële perfectum-markeerder), H4 (*zai* is een progressiefmarkeerder) en H5 (*zhe* is een imperfectiefmarkeerder), en niet in strijd met de overige hypotheses. De resterende hoofdstukken verrichten een kwalitatieve analyse van data die betrekking hebben op de onbesliste hypotheses. Door een compositioneel bottom-up-perspectief in te nemen, worden eerst aspectueel ongemarkeerde zinnen (hoofdstuk 5) onderzocht, en daarna resultatieve werkwoordssamenstellingen (hoofdstuk 6) en de grammaticale markeerder postverbaal *le* (hoofdstuk 7). Werkwoordelijke reduplicatie wordt buiten beschouwing gelaten vanwege de beperkte beschikbaarheid van data daarvan.

Hoofdstuk 5 onderzoekt de interpretaties van aspectueel ongemarkeerde zinnen. De auteur bekijkt H7a, H7c en H7d in detail – de hypotheses over ongemarkeerde zinnen waarmee de resultaten volgend uit de statistieken in Hoofdstuk 4 niet in strijd zijn. Het blijkt dat H7a en H7d verzoend kunnen worden indien methoden om teliciteit aan te duiden, gezien worden als expliciete aspectuele uitdrukkingen. Aangezien het onderzoek verricht wordt als onderdeel van een dissertatie met een focus op de compositionaliteit van aspect in het Mandarijn, is de auteur geïnteresseerd in factoren die bepalend zijn voor de aan-/afwezigheid van diverse typen aspectuele uitdrukkingen. Vandaar dat de auteur een stap verder gaat met de verzoening, met Hypothese 7e als resultaat. Bij deze specifieke hypothese worden ook markeerders van grammaticaal aspect betrokken (postverbaal *le*, *guo*, *zhe*, *zai*, en werkwoordelijke reduplicatie).

Hypothese 7e: Zinnen in het Mandarijn met predicaten op basis van aspectueel ongemarkeerde werkwoorden krijgen een toestandinterpretatie. Zinnen in het Mandarijn met een eventieve interpretatie moeten expliciete aspectuele uitdrukkingen gebruiken (inclusief markeerders van grammaticaal aspect of methoden om teliciteit aan te duiden).

Tabel 2 biedt een overzicht van de teliciteitindicatiemethoden die in hoofdstuk 5 worden voorgesteld.

Teliciteitindicatiemethode	Domein
Resultatief werkwoordscomplement (RVC)	Binnen het werkwoordelijke domein
<i>De</i> -resultatief	Binnen het zinsdomein
Eindpunt-aanduidend zinsdeel (bijv. doelargument)	Binnen het zinsdomein
Gevolgtoestand in oorzakelijke constructie	Binnen het zinsdomein
(In)directe rede	Over het zinsdomein heen
Dynamische teliciteit-indicatie	Over het zinsdomein heen

Tabel 2 : De inventaris van methoden om teliciteit aan te duiden in het Mandarijn

H7e wordt vervolgens opnieuw getest aan de hand van NPMI en de resultaten bieden sterke ondersteuning voor de hypothese. Omdat H7e niet compatibel is met H7c, wordt H7c niet langer behouden. De conclusie van het hoofdstuk luidt als volgt: bij afwezigheid van markeerders van grammaticaal aspect hebben zinnen in het Mandarijn die aspectueel ongemarkeerde werkwoorden als predicaten gebruiken, standaard een toestandsinterpretatie, maar ze krijgen een eventieve interpretatie als die werkwoorden interageren met methoden om teliciteit aan te duiden.

Hoofdstuk 6 analyseert resultatieve werkwoordssamenstellingen, die bestaan uit een werkwoord en een resultatief werkwoordscomplement (RVC) – aspectuele uitdrukkingen die compositioneel gezien de nauwste interactie hebben met werkwoorden, aangezien ze functioneren binnen het werkwoordelijke domein. RVC-morfemen zijn ofwel werkwoordelijk of bijvoeglijk, ingedeeld onder vier subtypes: completieve RVCs, RVCs met

resultaattoestand, directionele RVCs en bevroren RVCs. Om de semantiek van al deze resultatieve werkwoordssamenstellingen te beschrijven, wordt Ramchands (2008) *first-phase syntax* en de bijbehorende post-Davidsoniaanse semantiek toegepast, die decompositie uitvoert op de betekenis van werkwoorden. Dit theoretisch kader stelt voor dat een maximale eventualiteit uit drie sub-eventualiteiten bestaat: een initiële toestand, een proces en een resultaattoestand, die respectievelijk overeenkomen met *initP*, *procP* en *resP*. De decompositie van resultatieve werkwoordssamenstellingen laat zien dat RVCs de resultaattoestanden van gebeurtenissen specificeren en dus zijn ingebed in *resP*, ofwel als *res*-hoofd, zoals de directionele RVC *chu* ‘uit’ in (1b), ofwel als complement van *res*, zoals als de completieve RVC *hao* ‘af’ in (2b).

- (1) a. Il a sorti du boudin, [...]. [French: *passé composé*]
 b. Ta na-chu xiangchang [...] [Mandarin: *RVC*]
 hij neem-uit worst
 ‘Hij haalde worsten eruit [...].’
- (2) a. J’ai fait la lettre. [French: *passé composé*]
 b. Wo xie-hao xin. [Mandarin: *RVC*]
 ik schrijf-af brief
 ‘I heb de brief afgeschreven.’

Bevroren RVCs onderscheiden zich daarentegen van de andere RVC-subtypen omdat het gaat om niet-analyseerbare componenten in bevroren resultatieve werkwoordssamenstellingen, die primitieve verbale items betreffen die *init*-, *proc*- en *res*-hoofden identificeren. Ondanks de interne verschillen binnen de familie verwijzen resultatieve werkwoordssamenstellingen altijd naar culminerende gebeurtenissen. De kwalitatieve analyse van RVCs in termen van de *first-phase* wordt getoetst aan alle RVC-gegevens in het parallelle corpus, en de analyse blijkt goed stand te houden. Aangezien de analyse een formele versie is van H1, wordt gesteld dat H1 in overeenstemming is met de corpusgegevens. Het zwakke statistische bewijs dat werd verkregen door H1 te testen in Hoofdstuk 4 wordt toegeschreven aan de arbeidsverdeling van RVCs, andere

teliciteitsindicatiemethoden en postverbaal *le* in termen van de eventieve interpretatie van zinnen. Naast RVCs past Hoofdstuk 6 Ramchands (2008) theorie ook toe op de analyse van andere teliciteitsindicatiemethoden binnen het werkwoordelijke domein. De analyse wijst uit dat deze methoden zijn ingebed in *resP*, die culminerende gebeurtenissen aanduidt. De generalisatie is daarom dat het Mandarijn verplicht *resP* gebruikt om teliciteit te introduceren.

Hoofdstuk 7 beschrijft de semantiek van de aspectmarkeerder postverbaal *le* en vergelijkt deze vervolgens met RVCs. De auteur stelt een verbeterde versie voor van Lins (2006) voorstel voor postverbaal *le*, die de twee concurrerende hypothesen over postverbaal *le* (H2a en H2b) verzoent waarvoor in beide gevallen in Hoofdstuk 4 zwak statistisch bewijs was. De verbeterde versie integreert Ramchands (2008) *first-phase*-raamwerk in Lins voorlopige analyse van *event structure*. De auteur stelt dat postverbaal *le* semantisch gezien een aspectuele dualiteit kent, aangezien het perfectief aspect aanduidt voor het begin en het proces van een eventualiteit, tegenover imperfectief aspect voor de resulterende toestand daarvan (indien aanwezig); wat de syntaxis betreft identificeert postverbaal *le* het *Asp*-hoofd en neemt *initP* als zijn complement. De analyse wordt getoetst aan data met postverbaal *le* in het parallelle corpus en blijkt goed stand te houden.

De aspectuele dualiteit van postverbaal *le* maakt de markeerder een perfectiefmarkeerder (H2a) bij het markeren van procesbeschrijvingen, maar een resultatieve perfectummarkeerder (H2b) bij het markeren van gebeurtenis- of toestandsbeschrijvingen. Het zwakke statistische bewijs dat werd verkregen uit de testresultaten van H2a en H2b wordt toegeschreven aan de competitie tussen postverbaal *le*, RVCs en andere teliciteitsindicatiemethoden (H2a) en die tussen postverbaal *le* en *guo* (H2b). Daarnaast vergelijkt Hoofdstuk 7 postverbaal *le* met RVCs, met als resultaat dat zinnen met RVCs geculmineerde gebeurtenissen inhouden, terwijl zinnen met postverbaal *le* ofwel niet-geculmineerde gebeurtenissen inhouden ofwel culminerende gebeurtenissen overbrengen als conversationele implicatuur.

Het proefschrift brengt aan het licht dat het Mandarijn complexere

aspectuele distincties uitdrukt dan de dichotomieën perfectief/imperfectief en progressief/niet-progressief in de Europese talen, en dat parallelle corpusdata effectief kunnen worden gebruikt om de relevante verschillen op het spoor te komen. Vervolgonderzoek zou zich kunnen richten op de vraag in hoeverre de in het proefschrift voorgestelde analyse kan worden gerepliceerd in andere parallelle corpora met andere brontalen.

Curriculum Vitae

Chou Mo (莫愁) was born in Changsha, Hunan province, in the People's Republic of China in 1991. She received her Bachelor's degree in English from Beijing Language and Culture University in 2013. She continued her Master program in Linguistics and Applied Linguistics in Foreign Languages at the same university, specializing in formal semantics. After obtaining her Master degree in 2016, she won the scholarship from China Scholarship Council (CSC) in the same year and started her PhD research on the semantics of Mandarin aspect at Utrecht University, affiliated to the NWO-project *Time in Translation*. This dissertation is the result of the research.