Second Language Acquisition of the Features of *Dou* in Mandarin Chinese, by L1-English and L1-Japanese Speakers

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ABSTRACT

This thesis reports a study on the acquisition of the features of the quantifier *dou*, in particular the feature [+Dist] in Mandarin Chinese, by L1-English and L1-Japanese learners. *Dou*, which is usually on paralleled with *all*, essentially differentiates from *all* on both semantic and syntactic properties. These differences partially reflect on the meanings and interpretations of sentences at the syntax-semantics interface. In the light of Features Reassembly Hypothesis, the successful acquisition of *dou* requires the remapping or reconfiguration of the feature bundles that have already been assembled in the L1 grammar into a new formal configuration in the target language.

To explore how L1 English-L2 Mandarin and L1 Japanese-L2 Mandarin learners establish the initial mapping between L1 and L2 forms and how the features are being reassembled, two experimental tasks were conducted: a sentence-picture matching task and a picture-based acceptability judgment task. A total of 51 native English speakers and 18 native Japanese speakers, learning Mandarin as their second language, participated in this study. Their interpretations of *dou*-quantified subject/numeral-quantified object sentences with mixed predicates and *dou*-quantified subject/*wh*-object interrogatives were examined through the two tasks, respectively.

The results indicate that in the stage of mapping, most L2 Mandarin learners chose the universals and their relevant features as the starting point (i.e. [+universal] and [+universal, ∨]). Learners with lower proficiency encountered difficulties in overcoming the influence of L1 transfer, whereas those with higher proficiency, who underwent the stage of reassembly, were capable of assigning *dou* a [+Dist] feature, as the equivalents in their native languages. Additionally, the poverty of the stimulus problem at the interpretive interface can be overcome with the Universal Grammar access.

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For love and freedom.

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DECLARATION

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for a degree or other qualification at this University or elsewhere. All sources are acknowledged as references.

Chapter 1

Introduction

1.1 Aims and Objectives of the Current Study

The current study is an attempt to explore the learnability problems at the interpretive surface in non-native acquisition. The specific research topic is to examine the acquisition of the distributivity of *dou* in Mandarin as a second language by native English and native Japanese speakers. The morpheme *dou* has evoked extensive debates in the past few decades within the realm of theoretical linguistics. Its semantic properties, functions, meanings and features as well as its syntactic derivations and distributions, have been discussed controversially. Recently, the study of *dou* has extended to the empirical field, with a number of researches investigating the acquisition of *dou*'s position and syntactic strings, *dou*'s quantificational force, *dou*'s distribution and *dou*'s surface scope by native children. However, the number of second language studies on *dou* is relatively small. The current study intends to probe into the second language acquisition (SLA) of *dou*'s distributivity at the syntax-semantics interface, with the predictions of the Feature Reassembly Hypothesis (FRH). Learners whose native language is English were compared with learners whose native language is Japanese. The study focuses on two representations of the distributivity of *dou*: one is *dou* in the declarative sentence with mixed predicate (*dou*-quantified subject/numeral-quantified object), and the other is *dou* in the interrogative sentence (*dou*-quantified subject/*wh*-object). In the former case, *dou* rules out the collective reading and makes the distributive reading the only possibility for the sentence. In the latter case, with the distributive force of *dou*, the question is more likely to receive a pair-list answer rather than an individual answer. Two data collection methods, namely a sentence-picture matching task and a picture-based acceptability judgment task, were adopted to test learners' knowledge of the target subjects. At the same time, the learning problems triggered by the poverty of the stimulus (POS) have been considered. The findings will provide new evidence to support the Feature Reassembly Hypothesis and the accessibility of innate computation mechanism in the acquisition process and fill the gap of less attention on the learning task of *dou* by non-native speaker by adding a small amount of empirical data.

1.2 Introduction

Consider the sentences in (1). In Mandarin Chinese, a sentence without any overt quantifier or operator must be interpreted collectively. After the insertion of *dou*, the collective interpretation is excluded and the sentence has to be interpreted distributively.

(1) a. haizi-men mai-le yitai diannao
kid-PL buy-ASP one-CL computer
'The kids together bought a computer.'

b. haizi-men *dou* mai-le yitai diannao
kid-PL DOU buy-ASP one-CL computer
'The kids each bought a computer.'

The situation is quite different in English and Japanese. In (2a) and (2b), whether a quantifier is inserted or not does not influence the interpretation of sentences. They can be interpreted either collectively, as *the kids jointly bought a computer*, or distributively, as *the kids each bought a computer*.

(2) a. English: The kids bought a computer.
Japanese: kodomo-tachi-wa pasokon-o katta
kid-PL-TOP computer-ACC bought

b. English: The kids *all* bought a computer.
Japanese: kodomo-tachi-wa *subete/minna/zen'in* pasokon-o katta
kid-PL-TOP all computer-ACC bought
'The kids together bought a computer.'
OR 'The kids each bought a computer.'

Furthermore, this kind of interpretation mismatch can be observed in the answers of universal-quantified subject/*wh*-object questions. As shown in (3), without any intonation or stress on the interrogative, the pair-list reading in (3a) is a more accessible answer to the question. By contrast, in English and Japanese, both the pair-list answer and the individual answer are available and can be accessed consistently (4).

(3) haizi-men *dou* mai-le shenme
kid-PL DOU buy-ASP what
'What did all the kids buy?'
a. Zhangsan bought a book and a pen, Lisi bought a book and a ruler, Wangwu bought a book and a tape…
b. ?? A book.

(4) English: What did *all* the kids buy?
Japanese: kodomo-tachi-wa *subete/minna/zen'in* nani-o katta no
kid-PL-TOP all what-ACC buy Q
a. Zhangsan bought a book and a pen, Lisi bought a book and a ruler, Wangwu bought a book and a tape…
b. A book.

In the learning situation, Slabakova summarises this type of meaning mismatch as poverty of the stimulus at the syntax-semantic interface. That is, the available interpretation(s) of two closely related and minimally different sentences are distinct. For one sentence, it may contain two meanings, but for the other, only one of the two meanings is present. However, even though the learning task would be difficult, a number of studies have proved that the poverty of the stimulus problem can be overcome, and the missing properties are acquirable presumably, with the UG access.

The Feature Reassembly Hypothesis provides a new perspective for investigating this issue. According to FRH, the second language acquisition involves two tasks: mapping and reassembly. In the first stage, learners should map the features that have already assembled on their L1 lexical items onto the equivalents in the L2. In the second stage, learners should reassemble the feature bundles from the way they are presented in their L1 into the way they are presented in the L2. For the current study, it is reasonable to predict that L2 learners would build a similar contrast between *dou* and the universals in their L1s and map the [+universal] feature onto *dou*. Then, the feature reassembly process has to take place. The [+universal] feature should be deleted from the L1-based feature sets, and the [+distributive] feature should be added. What is interesting is that L2 learners have an alternative way of mapping, that is, associating *dou* with the distributives. At this time, neither the feature reassembly nor the POS problem would occur.

In regard to the crosslinguistic difference between Mandarin Chinese and English/Japanese and the L2 acquisition tasks with the predictions of the Feature Reassembly Hypothesis, the research questions of the current study are outlined below:

(5) Research Question 1: Do English-speaking and Japanese-speaking learners of Mandarin have the basic semantic knowledge of the contrast between *dou* and the universals in their first languages?

(6) Research Question 2: In the mapping stage, how do English-speaking and Japanese-speaking learners of Mandarin map the feature sets on their L1 lexical items onto the target item *dou*?

(7) Research Question 3: In the reassembly stage, how do English-speaking and Japanese-speaking learners of Mandarin reconfigure the feature sets to better match the target item *dou*?

(8) Research Question 4: Does the poverty of the stimulus problem occur in the acquisition process? If yes, do English-speaking and Japanese – speaking learners of Mandarin get rid of the overgeneralisation or overinfluence of their L1 transfer and acquire the knowledge of the target item *dou* successfully?

1.3 Organisation of This Thesis

This thesis is organised into seven chapters. Chapter 2 introduces the Parameter and Principal programme, the Minimalism programme, the Feature Reassembly Hypothesis and its representative researches and the studies of L2 acquisition at the syntax-semantic interface. Chapter 3 reviews the properties of *dou*, including its semantic functions, meanings, features and distributions. Chapter 4 reports an empirical study on the interpretation of universal quantifiers in Japanese by native speakers. Chapter 5 outlines the hypotheses in the light of the Feature Reassembly Hypothesis and demonstrates the experimental design of the two tasks with the participants' information, the procedure of the experiment and the predictions of the tasks. Chapter 6 presents the data analysis and the results of the two tasks, followed by a discussion

on the hypotheses. Chapter 7 concludes the thesis by presenting the contributions, limitations and directions for future research.

Chapter 2

The Features Reassembly Hypothesis and the Learnability Problem of Syntax-Semantics Interface in Second Language Acquisition

2.1 Universal Grammar and Language Acquisition

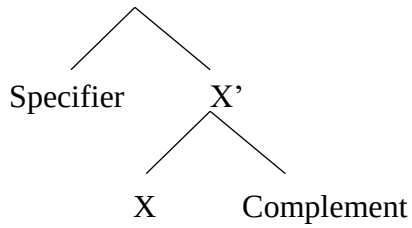
When considering the notion of language, what is knowledge of language, how is that knowledge achieved and how is that knowledge put into use are the essential questions for the contemporary linguists from the perspective of cognitive science. In Chomsky's article "Three factors in language design" (2005), he suggests that there are three critical elements which the development of language of human beings relies on, including genetic endowment, experience and principles not specific to the faculty of language. The term genetic endowment refers to a mechanism known as Universal Grammar (UG) which is biologically determined. UG enables human beings to access the knowledge represented in mind or brain, allowing them to generate an infinite number of sentences within a finite set of grammars and a limited amount of language experience. UG does not require explicit learning and prepares individuals to acquire the language they are exposed to. In the process of first language (L1) acquisition, UG composes the knowledge involved in the initial stage. Subsequently, with the input of the primary linguistic data (PLD), the grammar undergoes reconstruction over time and eventually reaches a stable and consistent state. Experience denotes to the environment of language learning, where a language learner needs exposure to sufficient coherent input. Lack of such kind of input will result in the failure of acquisition of any language. The third factor encompasses genetic principles that are not particular to the language faculty, such as principles of data analysis and principles of efficient computation.

In the 1980s and early 1990s, the debate between *descriptive adequacy* and *explanatory adequacy* gave rise to the Principles and Parameters (P&P) framework. (Chomsky, 1981, 1986, 1995). Here, *descriptive adequacy* focuses on the variability of specific grammars and rules within a language, while *explanatory adequac*y concentrates on the invariance that grants a child to master a language within a short period. In the P&P framework, principles represent the invariant properties of grammar construction common to all languages, while parameters represent the specifications of possible variation from language to language. UG provides a set of universal rules as

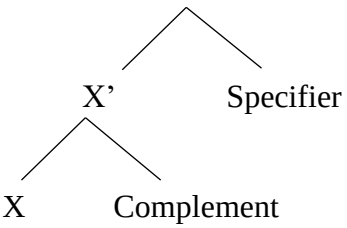
well as properties that define the grammatical structure of a language, such as the Principle of Subjacency. At the same time, UG restricts and determines the build-in options (*settings* or *values*) of the small number of parameterised principles. These parameters account for the crosslinguistic variation observed among languages (Chomsky, 1981). In accordance with the P&P framework, a child is equipped with the principles that apply to all languages from birth, and through exposure of the first language, the child acquires the options of parameters gradually.

To illustrate, let us consider the head parameter. It is a universal characteristic in all languages that phrases should consist of head categories, specifiers and complements. However, the directionality of heads differs across languages, as drawn in (1). In English, the head is always preceded by a specifier and followed by a complement, while in Japanese, the head is typically preceded by a complement and followed by a specifier. In summary, there are two parametric possibilities concerning the principle of phrase structure: 1) specifier may precede or follow X' category and 2) complement may precede or follow X category.

(1) a.



b.



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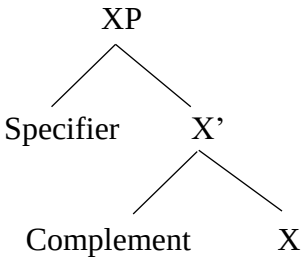

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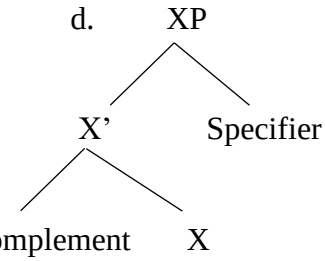


(Hawkins, 2001, p. 15-16)

In general, most parameters contain two settings or values which are analogous to light switches: On and Off. The availability of a value corresponds to On, while the unavailability of a value corresponds to Off. The setting of parameters plays a crucial role in L1 acquisition, known as the *cluster effect*. This effect implies that a single parameter setting will lead to a cluster of syntactic properties automatically

incorporated into the grammar of L1 learners. For instance, according to Rizzi (1982), the Null Subject Parameter may result in a cluster effect on construction, including null expletives, postverbal subjects, "*that*-trace effect" and rich subject-verb agreement.

More recently, the emergency of the Minimalism programme has transformed the concept of parameters and shifted the focus of language acquisition from setting a number of parameters to assembling a bundle of appropriate features into lexicons. Features refer to properties of lexical items, morphemes and syntactic atoms (den Dikken, 2000, Adger, 2011), including three types: phonological features (e.g., [±voice]), semantic features (e.g., [±definite], [±human]) and morphosyntactic features (e.g., [Case: {Nom, Dat, Acc, Gen…}], [Number: {Singular, Plural}]). The new Minimalism programme intends to optimize the functionality of the language faculty while minimizing the number of purely language internal entities. As exemplified in Figure 2.1, the architecture of Minimalism is simplified that only contains the Lexicon, the Computational System and two interface system: Articulatory-Perceptual and Conceptual-Intentional.

Under Minimalism approach, the computational system is universal and identical across languages, while the controversial aspect lies in what the "old" parameters are associated with. In the light with the Borer-Chomsky Conjecture, all parameters are encoded in the features of functional categories and are represent on the level of lexicons. In other words, what distinguishes one language from another is functional categories, in which features may be varied either on the presence/absence or on the strength. Other proposals suggest that the variation of languages can be found in the Phonetic Form (PF) (Bošković, 2001; Bobaljik, 2002), Logical Form (LF) (Ramchand & Svenonius, 2008) or the features that lexical items assembled (Giorgi & Pianesi, 1996). For the last proposal, the UG provides a common inventory of features applicable to all languages, and each language selects and assembles these features into its lexical items (L1s). In this case, the lexical item can be regarded as a bundle of features, and the difference between languages depends on the choice and assembling of features on seemingly equivalent lexical items.

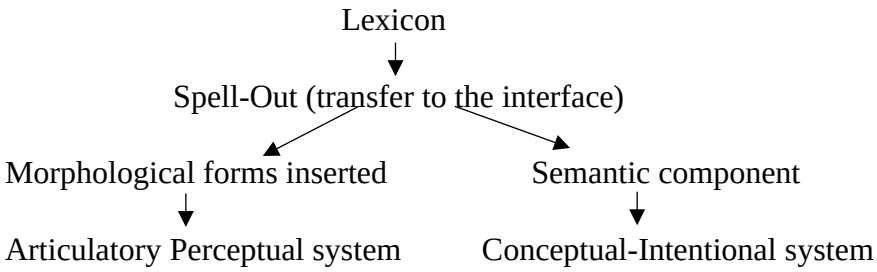


Figure 2.1. Minimalist Language Architecture

Now, what do second language (L2) learners bring to the process of second language acquisition and what is the task of L2 acquisition? The innateness of the mechanisms triggering grammar-building in child L1 acquisition offers a possible assumption that the same genetic endowed mechanisms are the keystones of second language grammar-building. Consequently, difference accounts on adult L2 acquisition arise from variations in *full access, partial access* and *no access* to UG. The Representational Deficit view posits that due to the inability to acquire uninterpretable features that are not present in the learner's first language, the mental representation of L2 learners cannot reach a native-like level in principle. Several hypotheses fall under this category, including the Valueless Feature Hypothesis (Eubank, 1996), the Local Impairment Hypothesis (Beck, 1998), the Failed Functional Feature Hypothesis (Hawkins & Chan, 1997) and the Interpretability Hypothesis (Hawkins & Hattori, 2006; Tsimpli & Dimitrakopoulou, 2007). For example, the Failed Functional Feature Hypothesis suggests that while lexical categories can be learnable, the abstract functional features are inaccessible to L2 learners if they are not instantiated in their native language. The Valueless Feature Hypothesis assumes that all the categories present in L1 can be transferred into L2, but the features of functional categories become neutralised. In other words, even though functional categories introduced in L1 are introduced in L2 as well, the features possessed by these functional categories hold no value. The Interpretability Hypothesis proposes that the uninterpretable features are not acquirable for post-critical-period learners unless these features are available in the learners' L1 and integrated into their interlanguage grammar. Overall, the Representational Deficit view emphasises that the representations on functional categories of adult L2 learners are impaired.

By contrast, the Full Functional Representation view argues that it is possible for adult L2 learners to achieve native-like representations in principle, although it may be extremely challenging in practice (Schwartz & Sprouse, 1994, 1996; Prévost & White, 2000; Lardiere, 2008, 2009). Schwartz and Sprouse put forward the Full Transfer/Full Access Hypothesis which contends that instead of starting with an entirely blank initial state that requires the activation of universal principles and setting parameters based on L2 input, the entire native grammar, including all the principles and parameters, is unconsciously transferred to the L2 and forms the initial state of L2 acquisition. This accessibility of the integrated L1 grammar is referred to as "L1 transfer". Subsequent restructuring is then triggered if the target language input cannot be produced by this grammar. Parametric settings and values that are transferred from L1 to L2 will be developed and reset based on the L2 input. If the L1 and L2 share similar values or options, no revision or adjustment is necessary. However, if the L1 and L2 parameter values or options differ, resetting becomes inevitable. The critical period does not impose restrictions on adult L2 acquisition. The Features Reassembly Hypothesis, which aligns with the Full Transfer/Full Access Hypothesis, suggests that L2 learners bring a list of features that has been selected and assembled into lexical items in their native language to the task of L2 acquisition. Instead of resetting parametric values, the reconfiguration of the feature bundles of L1 lexical items into the corresponding items of L2 becomes the central issue in successful L2 acquisition. It is worth noting that neither the Full Transfer/Full Access Hypothesis nor the Feature Reassembly Hypothesis can guarantee that L2 learners will ultimately achieve a target-like grammar. Lack of data that motivates restructuring or reassembling, such as ineffective negative evidence, or the scarcity, difficulty, or complexity of positive data, can hinder the attainment or delay the development of native-like representations.

In the past decades, a considerable amount of research in L2 acquisition has engaged in the learnability problem of functional lexicons or morphemes and the features associated with them. The Bottleneck Hypothesis (Slabakova, 2008) proposes a hierarchy on the degree of difficulty in L2 acquisition. It argues that L2 learners can acquire knowledge of phrasal semantics and some universal pragmatics, as well as the syntactic computations successfully. The properties of the former are universal, while the syntactic mechanism of the latter can be transferred from native languages. However, "acquiring the functional morphology of a second language, together with the related syntactic and semantic effects, should prove to be more difficulty".

Moreover, the Interface Hypothesis (Sorace, 2006; Sorace & Filiaci, 2006) highlights the challenges faced by L2 learners when their acquisition task asks for the integration of linguistic information across various interfaces, such as phonology and syntax, and syntax and semantics. The acquisition of syntax-semantics interface also encounters challenges: mismatch and poverty stimulus. In the reminder of this chapter, I will introduce the Feature Reassembly Hypothesis along with previous findings, and then move on to observations from research on the L2 syntax-semantics interface. The chapter will conclude with a brief summary of the learnability problems addressed in the current study.

2.2 The Feature Reassembly Hypothesis and its Relevant Studies

2.2.1 The Feature Reassembly Hypothesis

Lardiere's proposal challenges the role of parameter-resetting in second language acquisition by emphasising the difficulty of dealing with variability in restricted options and constrained parametric values. Using the feature [+past] as an example, it is shown that different languages manifest this feature in diverse ways. For instance, in English, the feature is encoded and morphologically represented on the verb, while in Irish, it is realised through the agreement between the complementiser in the CP and the past tense in the embedded clause. In Somali, [+past] is expressed on determiners and adjectives within the DP. Simply selecting the feature of [+past] is insufficient to capture the variations among languages. Therefore, it is necessary to carefully consider how features from L1 and L2 are integrated and assembled into lexical items.

Lardiere states that "assembling the particular lexical items of a second language require the learners reconfigure from the way these are represented in the first language in new formal configuration on possible quite different types of lexical items in the L2." (Lardiere, 2009, p.173). The failure to achieve native-like performance is no longer attributed to post-critical-period effects or the absence of uninterpretable features in the native language. Instead, it is attributed to the challenge of distinguishing the features from L1 to L2 and reconfiguring the original features into a new target combination.

In Lardiere's longitudinal study on an L1 Mandarin Chinese-L2 English speaker Patty, the acquisition of definiteness serves as a typical example revealing the process of reconfiguration. Compared with English, Chinese is a language in which both

definite and indefinite articles are absence. However, it does not mean that Chinese lacks the feature [±definite]. The unstressed quantifier *yi*- "one" can partially take the functions of the indefinite articles and the demonstrative determiners *nei*- or *na*- "that" can work as the definite article in English to some extent. In spoken and written context, Patty indicates a higher accuracy in the use of definite (84%) and indefinite articles (75.5%). At the same time, she performs properly on the application of demonstratives and numeral *one* in English. In addition, she can recognise that possessive determiners and demonstratives are definite, as well as identify the violation of definiteness between *there* and definite DPs. These findings suggest that Patty has acquired knowledge of the feature [±definite] in English and undergone the process of reassembling relevant features from the way they are combined and presented in Mandarin Chinese to the way of English.

Lardiere (2009) identifies three potential challenges in feature reassembly that L2 learners may encounter:

> (2) a. With which functional categories are the selected features associated in the syntax, and how might this distribution differ from the feature-matrices of functional categories in the L1?
>
> b. In which lexical items of the L2 are the selected features expressed, clustered in combination with what other features?
>
> c. Are certain forms optional or obligatory, and what constitutes an obligatory context? More specifically, what are the particular factors that condition the realisation of a certain form (such as an inflection) and are these phonological, morphosyntactic, semantic or discourse-linked?
>
> (Lardier, 2009, p. 175)

Since L2 acquisition adopts grammatical categories which has already been fully assembled as the initial state, whether a specific feature belongs to the same functional category as in L1, how these features are configured and assembled into lexical items in L2, and whether the realisation of a certain morphological element is obligatory or optional become the difficulties that a L2 learner has to identify and overcome.

In terms of the FRH, a L2 learner engages in a dual task that corresponds to two stages: mapping and reassembly. In the stage of feature mapping, the L2 learner works on associating perceived lexical items in the target language input with the

morpholexical equivalents in L1 based on semantic meaning or grammatical function. The learner then maps the feature bundles encoded by the equivalents in L1 onto the L2 items. Once the initial mapping is established, the feature reassembly may take place. In the situation where the direct mapping is inappropriate and failed, the L2 learner needs to remap or reconfigure features from the way they are manifested in L1 into new configurations in L2. This may involve acquiring and adding new features or deleting features that are not present in L2. Lardiere further suggests that when there are differences in how features are assembled on lexical items between L1 and L2, L2 acquisition becomes more challenging, as learners have to reassemble features based on L1 configuration into a new target representation on probably distinct types of lexical items in L2. However, unlike the Representational Deficit view, Lardiere claims that all the feature should be accessible and acquirable for L2 learners, even though reassembly may develop slowly or not occur at all due to the rareness of the effective evidence in the input or the obscure of positive data.

To demonstrate how the FRH operate in L2 acquisition task, Lardiere introduces a hypothetical case in which a native English speaker acquire knowledge of plural-marking in Mandarin Chinese. Adopting the view of Li (1999), Lardiere treats the suffix *-men* in Mandarin Chinese as a plural marker which represents not only plurality but also definiteness and animacy. It selects the features [+plural], [+human] and [+definite]. In comparison, the English plural marker *-s* only possesses the feature [+plural] and is underspecified for the features [±human] and [±definite]. Moreover, the plural marker *-men* in Mandarin is optional in some contexts or prohibited under certain conditions (e.g., *-men* cannot be used with a numeral classifier). On the other hand, the suffix *-s* in English consistently expresses plurality. An English-speaking learner of Mandarin may initially perceive the L2 plural marker *-men* as a correspondence of the L1 plural marker *-s* on the basis of grammatical function similarities. Then, the learner undergoes the feature reassembly, specifying the features [+human, +definite] instead of [±human, ±definite], and recognising the factors that condition the realisation of features in specific environments. It is important to note that in order to restrict the feature distribution from [±human, ±definite] to [+human, +definite], negative evidence (e.g., the suffix *-men* cannot get along with [−human] or [−definite]) is required. However, due to the unavailability of such evidence in natural exposure, the reassembly task becomes difficult.

In the next subsection, I will move on to previous studies that have tested the FRH in terms of difficulties encountered at the two distinct stages: mapping and reassembly.

2.2.2 Previous Researches on the Feature Reassembly Hypothesis

Over the past few years, the applicability and potential of the FRH have been demonstrated in various interlanguage studies. These studies include the acquisition of *wh*-words in L2 Korean (Choi & Lardiere, 2006), the acquisition of existential quantifiers in L2 Chinese, Korean and English (Choi, 2009; Gil & Marsden, 2010; Yuan, 2010; Gil et al., 2011; Gil & Marsden, 2013), the acquisition of quantifier scope in L2 English (Kimura, 2022), the acquisition of grammatical aspects in L2 Spanish (Domínguez et al., 2017), the acquisition of clitic pronouns and grammatical gender in L2 French (Shimanskaya & Slabakova, 2015) and the acquisition of definiteness in L2 Russian (Cho & Slabakova, 2014). These studies provide empirical evidence confirming the effect of L1 transfer in the initial stages of acquisition, as well as the difficulties that exists in the mapping stage. Other studies focus on the issues that occur in the reassembly stage, such as the relationship between the complexity or necessity of feature reassembly and the difficulty of L2 acquisition task and the comparison between more reassembly and less reassembly. In the remainder of this subsection, I will review the studies of Gil and Marsden (2013), Shimanskaya & Slabakova (2015) and Kimura (2022) to illustrate the applicability and promise of the FRH in the field of SLA research from a long-term perspective.

2.2.2.1 Gil and Marsden (2013)

Gil and Marsden present an inductive study on the L2 acquisition of existential quantifiers to verify the predictions of the FRH. On the one hand, they expound how L2 learners map target existential quantifiers onto the already-fully-assembled feature bundles from their L1s. On the other hand, they examine how L2 learners reassemble these feature bundles to achieve new formal configurations in target languages.

In English, the determiner *any* and its compounds, such as *anyone* and *anything*, are polarity items that are only compatible with the nonveridical context (e.g., conditionals and interrogatives). It hosts an uninterpretable nonveridical feature [*u*NV] which needs to be checked and deleted by a nonveridical operator in CP. However, *any* is not

felicitous with all nonveridical contexts. In environments with uncertainty adverbs and non-factive verbs, the application of *any* will be ungrammatical. Therefore, Gil and Marsden redefine the nonveridical feature of *any* as [*u*NV + α]. In Mandarin Chinese, there are two ways to express the existential sense: *wh*-elements and *renhe*. The distribution of *wh*-existential is not as restricted as *any* in English. It can appear in the environments, including negation, *yes-no*-questions and conditionals, and its [*u*NV] feature can be checked and deleted by the lexical items licensing in these environments. However, *renhe* represents similar restrictions on the distribution as *any* and hosts the feature [*u*NV + α]. In Korean, *wh*-words can be used to express existential, similar to Mandarin Chinese. They work as variables and occur in both veridical and nonveridical contexts. In Japanese, the combination of *wh*-elements and the particle *-ka* can be treated as an existential quantifier, appearing in both veridical and nonveridical contexts. When *wh*-elements are used alone without particles, they only function as interrogative words. In the manner of the FRH, Gil and Marsden provide a list of mapping possibilities and the potential ways in which feature reassembly may occur, as given in (3) and (4).

(3) a. L2 Chinese *shei* / L2 Korean *nwukwu* → L1 English *anyone*
b. L2 Chinese *shei* → L1 Japanese *dare-ka*
c. L2 English *anyone* → L1 Korean *nwukwu*
→ L1 Chinese $shei_{\text{EXIST}}$ / *renhe*

(Gil & Marsden, 2013, p. 128)

(4)

	L1	TARGET
L1 Japanese-L2 Chinese	φ, ∨	φ, *u*NV
L1 Korean-L2 English	φ	φ, *u*NV + α
L1 English-L2 Chinese	φ, *u*NV + α	φ, *u*NV
L1 Chinese-L2 English	[φ, *u*NV], or [φ, *u*NV + α]	φ, *u*NV + α
L1 English- L2 Korean	φ, *u*NV + α	φ

(Gil & Marsden, 2013, p. 128)

According to the assumptions made by Gil and Marsden, English/Japanese-speaking learners of L2 Mandarin and Korean may experience a tough mapping task. The

learners need to perceive that *wh*-elements in Mandarin and Korean can serve as both interrogative words and *wh*-existentials. However, the presence of morphological evidence in Japanese may assist Japanese-speaking learners in easing the pain in the mapping stage. As a consequence, English-speaking learners may have more difficulties than Japanese-speaking learners. In regard to the task of feature reassembly, due to POS, Japanese-speaking learners of Chinese as well as Korean-speaking learners of English may encounter problems on the constraint of feature specifications.

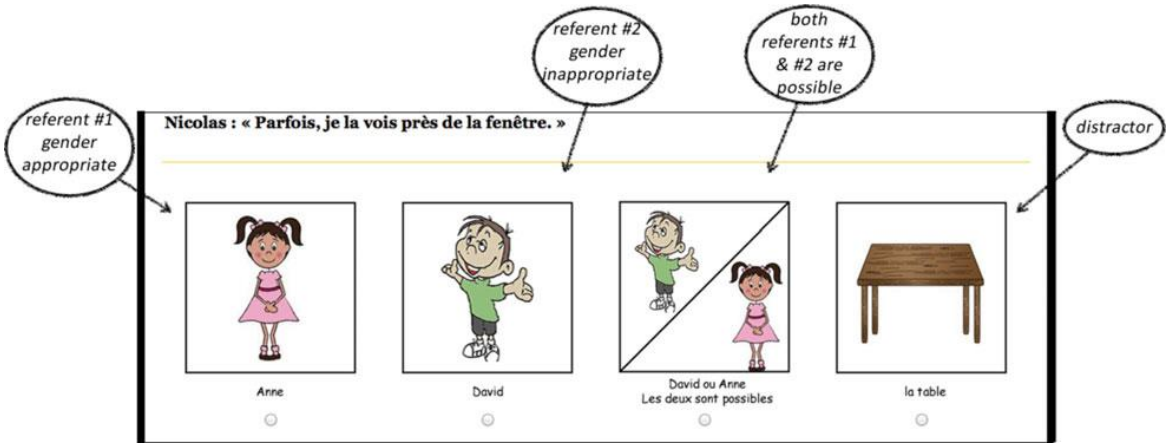
Reviewing a number of prior studies (Choi, 2009; Gil & Marsden, 2010; Yuan, 2010), Gil and Marsden indicate that "the predictions about mapping – the first step of the Feature Reassembly process – were largely confirmed" (Gil & Marsden, 2013, p. 141). The lower proficiency learners of Mandarin and Korean (L1s English and Japanese) did not reveal a preference on interpreting L2 *wh*-elements as *wh*-existentials. Instead, they only regard *wh*-elements as interrogatives. Additionally, the facilitative effect on morphological similarities between Japanese and Mandarin cannot be observed, according to Yuan's results. The Japanese-speaking learners of Mandarin did not outperform the English-speaking learners in their ability to realise the *wh*-existentials in Mandarin at early stage. In terms of the feature reassembly process, the delayed reassembly is observed in the L1 Korean-L2 English group, indicating that POS may impede L2 learners from achieving the target-like performance, especially when compared with the L1 English-L2 Korean group. However, Japanese learners of Mandarin presented target-like knowledge in using *wh*-words existentially in Chinese. suggesting that certain problems related to POS can be overcome. Overall, the researchers conclude that the acquisition of the full feature bundles of existential quantifiers in any given L2 is a challenging task for both lower and higher proficiency learners. However, it is still possible for the higher proficiency learners to overcome the issues of POS and acquire the properties of existentials in target languages.

2.2.2.2 Shimanskaya and Slabakova (2015)

Shimanskaya and Slabakova conduct a study on the learnability problem of personal pronouns in English-French interlanguage. English is a language that only has biological gender. The realisation of gender relies on the [+human] referents. By contrast, French has grammatical gender encoded in determiners, accusative clitics and strong pronouns. In English, the distinction between [+human] and [-human] can be

captured by different personal pronouns (*him/her* versus *it*) lexically. However, in French, the accusative clitics (*le, la*) can be associated with either a [+human] or a [-human] antecedent. For example, in the sentence *Je la vois* 'I see her/it', the feminine clitic *la* can refer to both the inanimate noun *la table* 'the table' and the animate noun *la fille* 'the girl'. In English, pronominals can be applied directly to express the (in)animacy (*I saw her* versus *I saw it*). That is to say, the feature [±human] is not represented in the French pronominal system. The researchers assume that the English-speaking learners of French, since the [±human] feature is encoded in their L1 lexically, will initially attempt to find an equivalent in the L2 and establish a similar contrast. They will then transfer the feature from their L1. Three groups of participants from different proficiency levels were recruited to take a force-choice picture selection task. As exemplified in (5), the participants were asked to read a context followed by a test sentence and choose which picture is compatible with the test sentence. The test sentence contains the feminine clitic *la*, which can only refer to *Anne* in the first picture (or the distractor *the table* in the last picture). A gender error occurs when participants choose an opposite gender option, such as David in this case.

(5) Context: On Tuesday evening, Nicolas goes to the library to meet Anne and David.
Nicolas: Parfois, je la vois près de la fenêtre. (Sometimes I see her near the window.)



The tokens of animate and inanimate were designed in balance. The results reveal that beginning and intermediate learners made significantly more mistakes on inanimate tokens than animate tokens. The lower proficiency learners encountered greater

difficulty in associating grammatical gender with inanimate nouns. L1 transfer may help the learners to judge the grammatical gender, but only on animate nouns at first. The performance of advanced learners reveals that the higher proficiency learners had undergone the feature reassembly process and successfully added the new feature of grammatical gender into the target grammar. The advanced group achieved an accuracy rate of 99%. Shimanskaya and Slabakova conclude that the reassembly task is influenced by the transfer of L1 features and cannot be accomplished in an instant.

2.2.2.3 Kimura (2022)

Kimura's study focuses on the acquisition of quantifier scope in English by Japanese speakers. In English, a sentence in (6) could receive two interpretations: if the subject quantifier phrase (QP) takes a wider scope (i.e., surface scope), the sentence is interpreted as *there is a specific boy who falls in love with every girl*. But if the object QP takes a wider scope (i.e., inverse scope), the sentence is interpreted as *for each girl x, there is a boy who love x*. QP-QP sentences in English are ambiguous, allowing for both S > O and O > S interpretations.

(6) A boy loves every girl.
a. There is a boy who loves every girl. (∃ > ∀)
b. For each girl *x*, there is a boy who loves *x*. (∀ > ∃)

(Kimura, 2022, p. 2)

Unlike English, Japanese is a scope-rigid language which does not allow the inverse scope interpretation with canonical subject-object-verb (SOV) order. In (7), the S > O interpretation is the only possible reading for the sentence.

(7) aru syonen-ga dono-syozyo-mo aishiteiru
a boy-NOM which-girl-MO love
'A boy loves every girl.' (∃ > ∀, *∀ > ∃)

(Kimura, 2022, p. 2)

In English, a same situation can be overserved if *every* is replaced by *all*, as shown in (8).

(8) A boy loves all girls. (∃ > ∀, *∀ > ∃)

(Kimura, 2022, p. 3)

Following Beghelli and Stowell (1997), Kimura proposes that distributivity/collectivity is closely related to the availability of inverse scope. Besides movement and Quantifier Rising (QR), the agreement on features and feature values has a significant effect on the syntax of scope. In English, *all NP* has an inherently specified [collective] value, whereas *every NP* lacks such a specified value. The absence of a feature value triggers the movement of *every NP* from its base-generated position to the specifier position of Distributive Phrase (DP) to get a [distributive] value through feature-checking. Similarly, an NP with the particle *-mo* in Japanese inherently specifies a [distributive] value. Therefore, when the NP-*mo* is in the object position, the interpretation of inverse scope becomes unavailable.

19 Japanese-speaking learners of English and 22 native English speakers participated in this study. As there is no correlation between proficiency score and task performance, the L2 participants were not divided into proficiency groups. Two acceptability judgement tasks were involved in this study: a scope test and a distributivity/collectivity test. The former included three types of test items: existential QP subject in active, counting QP subject in active and passive. The latter included two conditions: distributive and collective. Each test item was accompanied by a picture providing a concrete context. The participants were asked to judge the acceptability of the test items in the given contexts by selecting *Yes*, *No* or *I don't know* options.

The results of the scope test reveals that L1 Japanese-L2 English learners exhibited a significant lower acceptance of inverse scope readings in active sentences, compared with the native control group. However, the L2 group presented a strong preference for accepting inverse scope readings in passive sentences. In the distributivity/collectivity test, the L2 learners tended to prefer the distributive reading of *every* over the collective reading. By contrast, the native control group clearly favoured the distributive reading over the collective reading. To summarise, the majority of L2 learners treated *every* as something collective and universal and had difficulty on the acceptance of inverse scope reading. Based on these findings, Kimura suggests that the non-target-like performance of the Japanese-speaking learners of English provides evidence on L1 transfer and the failure of the feature reassembly. It appears challenging for L2 learners

to dissociate the collective value from *every* and add the distributive value into the target grammar.

2.3 L2 Acquisition at the Syntax-Semantics Interface

Slabakova (2016) identifies two main types of learning difficulties at the syntax-semantics interface in the L2 acquisition: one is syntax-semantics mismatches; the other is poverty of the stimulus. The former refers to the cases in which a universal grammatical meaning is represented by different morphemes in the L1 and the L2. The latter refers to the situations where the linguistic input is insufficient to support a successful language acquisition. In this section, I will review three representative studies: one for the first issue, namely Ionin et al. (2012) and two for the second, namely Marsden (2008) and Marsden (2009). It is worth noting that the current study is greatly inspired by Marsden (2008, 2009) on the research subject and experimental design, which is why I have chosen to report these two studies in this section.

2.3.1 L2 Acquisition of Syntax-Semantics Mismatches

"In a syntax-semantics mismatch, similar forms are meanings exist in both the L1 and the L2; however, they are misaligned" (Slabakova, 2016, p. 311). Sentences in (9)-(12) give an example on the interpretations of bare noun phrase and definite noun phrase in English and Spanish. As shown in (9) and (10), in English, a bare plural NP can express both generic and specific readings, whereas a definite plural NP is restricted to a specific reading. Here, the generic meaning implies the entire class of individuals within the denotation of the noun, while specific meaning implies a specific person or thing in the domain of the denotation. In (11) and (12), a bare plural is ungrammatical in pre-verbal position in Spanish, while a definite plural can be interpreted as either generic or specific.

(9) Tigers eat meat.	✓generic, ✓specific reading
(10) The tigers eat meat.	* generic reading, ✓specific reading
(11) * Tigres comen carne.	

(12) Los tigres comen carne
the-PL tigers eat meat
'The tigers eat meat.' ✓generic, ✓specific reading

(Ionin et al., 2012, p. 485)

Table 2.1 illustrates the mismatch between forms and meanings in English and Spanish. In Spanish, a definite plural can express both a generic meaning denoting all instances of the noun and a specific meaning denoting a particular instance of the noun. By contrast, English lacks this generic meaning with definite plurals, which are limited to the specific one.

Table 2.1. Mapping between forms and meanings in English and Spanish plural NPs in subject position

	Generic meaning	**Specific meaning**
English	bare plurals	definite plurals
Spanish	definite plural	definite plurals

(Slabakova, 2016, p. 297)

Based on this contrast, Ionin et al. (2012) conduct a bidirectional study between English and Spanish (L1 English to L2 Spanish and L1 Spanish to L2 English), employing a Truth Value Judgment Task (TVJT) and an Acceptability Judgment Task (AJT). In the TVJT, participants were asked to judge test item as *True* or *False* after reading a short story accompanied by a picture. In the AJT, participants were asked to judge to what extent they could accept the test item as a continuance of the above-mentioned story using a 4-point scale. The results of TVJT indicate that L1 English-L2 Spanish learners had a stronger preference for the specific reading of definite plurals compared with native Spanish speakers, even in contexts where the generic reading was more compatible. On the other hand, L1 Spanish-L2 English learners adopted the generic reading of definite plurals, which is ungrammatical in English. In regard to the results of the AJT, L1 English-L2 Spanish learners presented a lower rating on definite plurals and a higher rating on bare plurals. In summary, both L2 groups indicated successful acquisition, even though lower proficiency learners encountered some difficulties due

to L1 transfer. As proficiency increased, higher proficiency learners were able to retreat from the native language transfer and achieve target-like interpretations.

2.3.2 Poverty of the Stimulus (POS) at the Syntax-Semantics Interface

Generally, poverty of the stimulus at the syntax-semantics interface can be observed in the cases where "two related and minimally different sentences differ in available interpretation" (Slabakova, 2016, p. 299). As shown in Table 2.2, there are two meanings of Sentence 1, whereas one of the meanings is absence in Sentence 2. Language learners, without negative evidence (e.g., pedagogical instruction) may not easily acquire the knowledge that one of the meanings is unavailable. Since this kind of evidence is rarely presented in natural language input, the acquisition of the absent meaning can be problematic. However, with the help of the innate language faculty, namely UG, the problem can be overcome.

Table 2.2. Mapping of sentence strings and meanings in a POS learning situation

	Meaning 1	**Meaning 2**
Test sentence 1	✓	✓
Test sentence 2	✓	×!

(Slabakova, 2016, p. 299)

Marsden (2008) pays a special attention to the acquisition of the interpretation of *wh*-object/QP-subject questions. In English, a question in (13) allows both an individual interpretation and a pair-list interpretation and yields the corresponding answers respectively. In Japanese, a *wh*-object/QP-subject question and its scrambled counterpart can only be responded by an individual answer, as exemplified in (14).

(13) What did everyone buy?

a. What did each person buy in common?

(Each person bought) a book. (Individual answer)

b. For each person, what did that person buy?

Kate bought a book and a pen, Tom bought a book and a newspaper, Ann bought a book and some postcards… (Pair-list answer)

(14) a. ?? dare-mo-ga nani-o katta no
who-MO-NOM what-ACC bought Q
b. nani-o dare-mo-ga katta no
what-ACC who-MO-NOM bought Q
'What did everyone buy?'
hon desu
book COP
'A book.' (Individual answer)

(Marsden, 2008, p. 190)

Besides, a *wh*-object/QP-subject question in Mandarin Chinese is acknowledged to elicit both individual and pair-list answers, similar to English. However, in Korean, like Japanese, a pair-list answer is unattainable for a *wh*-object/QP-subject question. An individual interpretation is the only possibility for the question. The examples of Mandarin and Korean *wh*-object/QP-subject questions are given below.

(15) meige-ren *dou* mai-le shenme
Every-person DOU buy-ASP what
'What did everyone buy?'

(16) mwues-ul nwukwuna-ka sass ni
what-ACC everyone-NOM bought Q
'What did everyone buy?'

(Marsden, 2008, p. 193)

In the light of this crosslinguistic difference, Marsden predicts that Korean-speaking learners, due to L1 transfer, will consistently reject the non-target-like pair-list answer, regardless of their proficiency level. Conversely, lower proficiency Mandarin and English-speaking learners will accept the non-target-like pair-list answer. The ungrammaticality of the pair-list reading in Japanese will pose a challenge due to POS, resulting in difficulty in retreating from the superset L1-based input and potential overgeneralisation. However, with the accessibility of UG, higher proficiency Mandarin and English-speaking learners will reject the non-target-like interpretation.

To investigate the participants' knowledge on the interpretations of *wh*-object/QP-subject questions, an acceptability judgement task was employed. In this task, 10 test items were created based around five pictures. Each picture illustrated a context for either an individual or a pair-list answer. The whole test was manipulated as a paced judgment task, wherein the participants viewed the picture for 10 seconds, followed by reading the question and answer below the picture. Once the question and answer were revealed, an audio recording of the question and answer was played. The picture and the question and answer were displayed for 15 seconds together. During this time, the participants were asked to make a judgement on how possible they found each answer in the context of the question and the picture, using a 4-point scale. The results partially supported the predictions. The intermediate Mandarin-Japanese and English-Japanese groups tended to accept both individual and pair-list answers, by virtue of the transfer from their L1 grammars. Contrary to the predictions, the performance of the intermediate Korean-Japanese group was similar to that of the other two intermediate groups, accepting the pair-list answer as well as the individual answer. The three advanced groups exhibited a relatively lower acceptance rate for the pair-list answer compared with the individual one. Furthermore, a certain number of advanced learners could make consistent judgments on rejecting the non-target-like answer in a native-like pattern. These findings confirmed the accessibility of UG in L2 acquisition.

Marsden (2009) investigates on the L2 acquisition of distributive quantifiers in Japanese by L1 English and L1 Korean speakers. The study focuses on the interpretation contrast between canonical SOV order and scrambled OSV order in sentences with an existentially quantified subject and a universally quantified object (henceforth QP-QP). In Japanese and Korean, as demonstrated in examples (17), the interpretation of sentences varies depending on the word order. In (17a), sentences with SOV order are only interpreted with the subjects taking a wider scope. On the other hand, in (17b), the scrambled OSV sentences can be interpreted with both a scope-wide and an object-wide reading. Similarly, English sentences, as shown in (18), without the scrambling on the surface, are ambiguous between S > O and O > S interpretations.

(17) a. Japanese: dare-ka-ga dono-hon-mo yonda
Korean: nwukwuka-ka enu chayk-ina ilkessta
someone-NOM every book read
'There is some person *x*, such that *x* read every book.' (S > O)

b. Japanese: dono-hon-mo dare-ka-ga yonda
Korean: Enu chayk-ina nwukwuka-ka ilkessta
'There is some person *x*, such that *x* read every book.' (S > O)
Or 'For each book *y*, some person read *y*.' (O > S)

(18) Someone read every book.
'There is some person *x*, such that *x* read every book.' (S > O)
Or 'For each book *y*, some person read *y*.' (O > S)

(Marsden. 2009, p. 137)

In the context, a POS learning situation can be observed: with the canonical SOV order, an English QP-QP sentence has two interpretations, whereas the equivalent Japanese sentence has only one of the two English interpretations. However, with scrambled OSV order, both interpretations become available in Japanese. Based on this, Marsden predicts that due to L1 transfer, Korean-Japanese learners will reject the object-wide scope in SOV QP-QP sentences, regardless of their proficiency level. Lower proficiency English-Japanese learners, on the other hand, will mistakenly accept the object-wide scope. With the accessibility of UG, higher proficiency English-Japanese learners will be able to reject the object-wide scope.

During the test, the participants were presented with two pictures for 10 seconds first. One picture depicted a context of S > O scope, the other depicted a context of O > S scope. Then, a test sentence was displayed along with an audio recording. The pictures and the sentence were shown together for 15 seconds, and the participants were asked to judge to what extent the pictures match with the sentence, using a 4-point scale. The results from the Korean-Japanese learners provide evidence on the prediction of L1 transfer. Moreover, some advanced English-Japanese learners were able to get rid of the influence of lack of overt evidence and performed target-likely in rejecting the object-wide scope. That means POS can be overcome with the constraints of internal mechanisms, namely UG.

2.4 Conclusion

In this chapter, I provided an overview of the Feature Reassembly Hypothesis and its relevant researches as well as the learnability problems of L2 acquisition at the syntax-

semantics interface, namely syntax-semantics mismatch and poverty of the stimulus. At the end of this chapter, I intend to take a further step and make forward-looking predictions for the current study, which will be discussed in detail in Chapter 5.

Consider the pair of sentences in (19). In Mandarin Chinese, the realisation of the distributivity relies on the insertion of specific morphemes, such as *dou* and *ge*, overtly. Without such kind of morphemes, the sentence can only be interpreted as collective.

(19) a. haizi-men mai-le yiben shu
kid-PL buy-ASP one-CL book
'The kids together bought a book.'
b. haizi-men *dou* mai-le yiben shu
kid-PL DOU buy-ASP one-CL book
'The kids each bought a book.'

However, the counterparts of (19b) in English and Japanese are ambiguous. The sentences in (20) can be interpreted either collectively or distributively.

(20) English: The kids *all* bought a book.
Japanese: kodomo-tachi-wa *subete/minna/zen'in* hon-o katta
kid-PL-TOP all book-ACC bought
'The kids together bought a book.'
OR 'Each of the kids bought a book.'

This observation aligns with the mapping of sentence strings and meanings presented in Table 2.2, suggesting a case of POS where the sentences share similar strings crosslinguistically but do not have the same interpretations. Specifically, the collective interpretation is missing in the *dou*-quantified subject/numeral-quantified object sentence in Mandarin Chinese. To acquire the distributivity of *dou*, L2 learners of Mandarin have to retreat from their L1 transfer and the potential overgeneralisation and overcome the insufficiency of linguistic input and pedagogical instruction.

Furthermore, the interpretation of *dou*-quantified subject/*wh*-object questions in Mandarin presents a POS problem as well. As shown in (21), if there is no stress or intonation on the interrogative, the pair-list answer tends to dominate and be highly accepted, while the individual answer seems to be unattainable. By contrast, in English

and Japanese, both interpretations are available and can be accessed consistently, as illustrated in (22).

(21) haizi-men *dou* mai-le shenme
kid-PL DOU buy-ASP what
'What did all the kids buy?'
a. Zhangsan bought a book and a pen, Lisi bought a book and a ruler, Wangwu bought a book and a tape…
b. ?? A book.

(22) English: What did *all* the kids buy?
Japanese: kodomo-tachi-wa *subete/minna/zen'in* nani-o katta no
kid-PL-TOP all what-ACC buy Q
a. Zhangsan bought a book and a pen, Lisi bought a book and a ruler, Wangwu bought a book and a tape…
b. A book.

Importantly, the POS learning situation does not necessarily happen, since there are various strategies for L2 learners to map items they perceive in the L2 input to feature bundles that have already been fully-assembled in their L1s. In the current study, besides mapping the distributive morpheme *dou* onto the [+universal] forms in English and Japanese, it is also possible to associate *dou* with the [+distributive] forms (e.g., *each* in English and *sorezore* in Japanese). In such cases, the POS problem may not arise. Given these crosslinguistic phenomena, this thesis investigates not only the learnability difficulties on the two distinct stages with the predictions of the FRH, but also the interpretive problems at the syntax-semantics interface that arise due to POS.

Chapter 3

The Features of *Dou* and Beyond

Dou has been a topic of enduring controversy and has been extensively discussed since the mid-twentieth century. Its unique distributions, properties and functions have been examined in both traditional Chinese grammar and modern linguistic literature. In the realm of traditional Chinese grammar, some linguists, such as Wang (1954), Ding (1961), Lv (1980), and Zhu (1999), argue that *dou* is an adverb of scope which is used to totalise the plural NPs to its left. Building upon this perspective, Huang (1982), Lee (1986), and Cheng (1995) further develop the notion of *dou* as an adverb of quantification.[1] At the same time, a series of competing analyses have been proposed at syntactic and semantic levels. Chiu (1993), following Sportiche (1988), suggests that *dou* is a floating quantifier, similar to *tous* 'all' in French. Lin (1998) adopts Schwarzschild's (1991, 1996) propositions and points out that *dou* is a generalised distributive operator. Wu (1999) further expands on Lin's (1998) and Li's (1997) proposals, providing a systematic Minimalist analysis of *dou*'s quantification. According to Wu, *dou* acts as a strong distributive quantifier and serves as the head of a functional projection, located between AgrsP and VP. Moreover, considering the various uses of *dou*, Giannakidou and Cheng (2006) and Xiang (2008) introduce an approach that treats *dou* as a maximality operator. Drawing inspiration from the works of Hamblin (1973) and Rooth (1985, 1992, 1996), the discussions of the definitions and functions of *dou* have been extended to the level of alternatives. Xiang (2016) identifies *dou* as a presuppositional exhaustifier, operating on sub-alternatives and exerting a pre-exhaustification effect. Tsai (2015) argues that *dou*, as the head of Modal Phrase, presents an agreement with a universal quantifier that assembles alternatives within the denotation of a quantificational phrase to *dou*'s left, and provides existential quantification over possible words semantically. Liao (2011) and Liu (2017) define *dou* as the equivalent of *even* in English, functioning as an alternative-sensitive operator. The distributor use of *dou* can be derived based on a universal scalar presupposition. Besides, apart from the details, *dou* has also been considered as a sum operator (Huang 1996), a unification operator (Fan & Fang 2003), a modal operator (Xu 2004) etc.

[1] Compared with Lee (1986) which regards *dou* as a quantifier, Cheng (1995) claims that *dou* has a dual function: a quantifier and an unselective binder.

In this chapter, I will review various approaches to the analysis of *dou*, including Lin's generalised D-operator analysis, G&C's and Xiang's maximality operator analysis and Xiang's presuppositional exhaustifier analysis as well as the corresponding syntactic derivations of *dou*. At the same time, I will identify the certain properties of *dou* that may give rise to learnability problems at the interpretive interface for L2 Mandarin learners. In addition, this thesis intends to take a small step forward on theoretic linguistics by introducing a new syntactic configuration for the derivation and representation of *dou*.

The remaining sections of this chapter are organised as follows: in Section 3.1, I will outline the multiple functions of *dou* and its properties. In Section 3.2, I will provide a detailed analysis of the aforementioned approaches from both semantic and syntactic perspectives. In Section 3.3, I will revisit these approaches and highlight the specific feature(s) possessed by *dou* that will be the focus of the current study, and address a new syntactic derivation of *dou*.

3.1 The Functions of *Dou* and its Properties

In this section, I will provide an overview of the diverse functions and meanings of *dou* , as well as its observed properties in the literature, to facilitate a better understanding of the subsequent contents. The section is divided into three parts: the functional diversity of *dou*, the properties of *dou* and an interim summary.

3.1.1 The Functional Diversity of *Dou*

3.1.1.1 Quantifier-Distributor

Let us consider the two sentences in (1) first. Compared with a plural noun phrase (NP) in a sentence without *dou* "all" (1a), one in a sentence with *dou* may have a different interpretation (1b). In (1a), *tamen* "they" refers to the entire group of people who bought the three computers jointly. By contrast, when *dou* is introduced in (1b), *tamen* no longer refers to the entire group but turns to denote each person in the group. As a result, (1b) means that each person bought three computers.

(1) a. tamen mai-le santai diannao
they buy-ASP three-CL computers
'They bought three computers together.'
b. tamen *dou* mai-le santai diannao
they DOU buy-ASP three-CL computers
'They each bought three computers.'

In Mandarin Chinese, the most common use of the morpheme *dou* in a basic declarative sentence is to universally quantify and distribute the properties denoted by the predicate down to the subparts of a preceding nominal expression that *dou* is associated with. In a broad sense, this use of *dou* in Mandarin Chinese is comparable to the use of post-nominal *all* in English. However, considering the sentences as given in (2), an ambiguity between a distributive reading and a collective reading can be observed. Regardless of whether *all* is inserted or not, both sentences can be interpreted in two ways: one is that the group of people bought three computers together, and the other is that each individual in the group bought three computers. That is to say, unlike English, the distributivity should be realised overtly in Mandarin Chinese.

(2) a. They bought three computers.
b. They all bought three computers

3.1.1.2 Universal Free Choice Item (FCI) Licenser

Another well-known function of *dou* is that *dou* can license a pre-verbal *wh*-word or *wh*-phrase and turn it into a universal FCI. As shown in (3a-c), *dou* licenses the *wh*-items which are marked optionally by *wulun* 'no matter' and forms a universal FC construction. This construction can be interpreted in the form of universal quantification with the notion of 'Freedom of Choice' (Vendler, 1967).

(3) a. (wulun) shei *dou* xihuan chi shuiguo
no matter who DOU like eat fruit
'Anyone/everyone likes fruit.'

b. (wulun) shenme jiu zhangsan *dou* xihuan
no matter what alcohol Zhangsan DOU like
'Zhangsan like any alcohol.'

c. (wulun) na-ge nvren *dou* xihuan zhubao
no matter which-CL woman DOU like jewelry
'Any/Every woman loves jewelry.'

Furthermore, as argued by Xiang (2016), with the insertion of a possibility modal, such as *keyi* 'can', the entity licensed by *dou* can be a pre-verbal disjunction, as demonstrated in (4a). In (4b-c), if the possibility modal *keyi* is omitted or replaced by a necessity modal *bixu* 'must', *dou* is not applicable in the sentences.

(4) a. zhangsan huozhe lisi (*dou*) keyi lai
Zhangsan or Lisi DOU can come
With *dou*: 'Both Zhangsan and Lisi can come.'
Without *dou*: 'Either Zhangsan or Lisi can come.'

b. zhangsan huozhe lisi (**dou*) lai
Zhangsan or Lisi DOU come

c. zhangsan huozhe lisi (**dou*) bixu lai
Zhangsan or Lisi DOU must come

In addition to *wh*-items and disjunctions, the polarity item *renhe* 'any' is eligible to be potential target of *dou*'s licensing as well, as given in (5). In this case, the item *renhe* can be paraphrased as a '*no matter* + *wh*' construction.

(5) a. renhe shuiguo zhangsan *dou* xihuan
any fruit Zhangsan DOU like
'Zhangsan like any fruit.'

b. renhe xuesheng *dou* keyi lai
any student DOU can come
'Any student can come.'

3.1.1.3 Scalar Marker

In other cases, *dou* can also serve as a scalar marker and contribute to a scalar reading. The scalar item *dou* associated with resides either within the *(lian)...dou* construction or in the base-generated position, and must be focused. In (6), the *(lian) ...dou* construction presents an 'even-like' interpretation, emphasising the most unlikely or maximally unexpected event as true. In (6a), the focused element Zhangsan represents the most unanticipated person to be late, yet he was. In (6b), the form 'one-CL-NP' is licensed as a minimiser in the focus position of the *(lian)...dou* construction, resulting in a scalar interpretation that Zhangsan did not leave even an apple, let alone any other fruits or food.

(6) a. (lian) zhangsan *dou* chidao le
EVEN Zhangsan DOU late ASP
'Even [Zhangsan]$_F$ arrived late.'
b. zhangsan (lian) yi-ge pingguo *dou* mei liu
Zhangsan EVEN one-CL apple DOU not leave
'Zhangsan did not leave even [an apple]$_F$.'

In (7), *dou* is associated with in-situ scalar items and indicates the unexpectedness or a relatively high rank on the contextually determined measure scale of the proposition. In (7a), the numeral phrase *shidian* 'ten o'clock' suggests that ten-o'clock is considered too late. (7b) implies a very high degree of anger on an angriness scale. (7c) represents that ten hours is perceived as quite long, and Zhangsan has already slept for such a length period of time.

(7) a. *dou* shi-dian le
DOU ten-o'clock ASP
'It is ten o'clock.'
⇝ Being ten o'clock is quite late.
b. zhangsan qi-de *dou* feng-le
Zhangsan angry-DE DOU crazy-ASP
'Zhangsan was so angry that he became crazy.'
⇝ Being crazy shows the extreme extent of anger.

c. zhangsan *dou* shui-le shi-ge xiaoshi le
Zhangsan DOU sleep-ASP ten-CL hour ASP
'Zhangsan has already slept for ten hours.'
⇝ Sleeping ten hours is quite long.

In accordance with the functional diversity of *dou* as discussed above, in the next section, I will outline a number of requirements and properties on the distribution and interpretations of *dou*.

3.1.2 The Properties of *Dou*

First, *dou* must be located before the verb in a sentence and quantify over something that is located outside the scope of *dou* to its left (Lee, 1986; Cheng, 1995). In (8b), the post-verbal *dou* leads to the ungrammaticality of the sentence, even though the noun phrase *tamen* 'they' is on the left side of *dou*. In (8c), the sentence is ungrammatical due to the prenominal location of *dou*. This characteristic is captured as the Leftness requirement, which constrains the quantification of *dou* to be leftward. This property can also be observed when *dou* serves as a universal FCI licenser, as shown in (9). In (9a) and (9b), besides NPs, both a full clause and a *wh*-item are required to be positioned on the left side of *dou*. In (9c), if the sentence is declarative, the *wh*-item would need to precede *dou* to guarantee grammaticality.

(8) a. tamen *dou* xiao-le
they DOU laugh-ASP.
'They all laughed.'
b.*tamen xiao-le *dou*
they laugh-ASP DOU
'They all langhed.' (Intended meaning)
c. **dou* tamen xiao-le
DOU they laugh-ASP
'They all laughed.' (Intended meaning)

(9) a. (wulun) ni mai shenme dongxi zhangsan *(*dou*) chi
no matter you buy what thing Zhangsan DOU eat
'No matter what you buy, Zhangsan will eat (it).'
b. (wulun) shenme dongxi zhangsan *(*dou*) chi
no matter what thing Zhangsan DOU eat
'Zhangsan eats everything.'
c.*zhangsan *dou* chi shenme dongxi
Zhangsan DOU eat what thing

Secondly, when *dou* works as a quantifier-distributor, the item associated with *dou* is required to have a plural interpretation or to be interpreted as non-atomic, either overtly or covertly (Cheng, 1995; Xiang, 2016).

(10) a. tamen *dou* yanwu wo
they DOU hate me
'They all hate me.'
b.*ta *dou* yanwu women
he DOU hate us
'He hates all of us.' (Intended meaning)
(11) zheben shu wo *dou* kanwan-le
this-CL book I DOU finish reading-ASP
'I have finished reading all this book'

In (10b), the pronoun *ta* 'he' fails to receive a plural interpretation, resulting in an ungrammatical sentence. Although the NP *women* "us" has a plural interpretation, *dou* cannot quantify over the NP to its right. In (11), the lack of plural NPs does not lead to ungrammaticality, since the topicalised object *zheben shu* 'this book' is divisible. The book consists of subparts (e.g., chapters, paragraphs) and the subject *wo* 'I' has read all the subparts and thus finished reading the whole book.

(12) zhangsan [(zhe-ji-dun)] *dou* chi de pingguo
Zhangsan this-several-meal DOU eat DE apple
'For all of these meals, the thing that Zhangsan ate was apple.'

In (12), there is no overt item that is eligible for *dou*'s quantification. As a consequence, a covert item *zhe-ji-dun* 'these several meals' is introduced to fulfil the requirement of being plural. This requirement is summarised as the Plurality requirement.

Thirdly, when *dou* works as a quantifier-distributor, the insertion of *dou* rules out the collective interpretation of a sentence that would otherwise accept both collective and distributive interpretations without *dou*. In (13a), the sentence can only be interpreted distributively as each person in the group participated in the car-buying event, rather than the group as a whole participating in a single car-buying event. In (13b), the presence of *dou* blocks the interpretation that Zhangsan and Lili married each other. The individuals they got married to must be someone else.

(13) a. tamen *dou* mai-le qiche
they DOU buy-ASP car
'They each bought a car/cars.'
b. zhangsan he lili *dou* jiehun-le
Zhangsan and Lili DOU get married-ASP
'Zhangsan and Lili each got married.

Fourth, there is only one *dou* per clause (Cheng, 1995; Li, 1997).

(14) a.*zhexie pingguo *dou* women *dou* chi-le
these apples DOU we all eat-ASP
'All of us ate all these apples.' (Intended meaning)
b. *women *dou* ba zhexie shijuan *dou* pan-wan-le
we DOU BA these test paper DOU mark-finish-ASP
'All of us marked all these test papers.' (Intended meaning)

Due to the presence of more than one *dou* in (14), the sentences become ungrammatical, despite satisfying the requirement that each *dou* is associated with a plural NP. Furthermore, even in the universal FC construction and scalar construction, having more than one *dou* per clause is not allowed, as given in (15) and (16). It is worth nothing that due to the obligatoriness of *dou* in the universal FC construction and *lian…dou* construction, the only possible solution to rescue the sentences, such as in (15b) and (16b), is to omit the *dou* that serves as a quantifier-distributor.

(15) a. (wulun) tamen ba shenme dai-lai *dou* keyi
no matter they BA what bring DOU can
'They can bring here anything.'
b. *(wulun) tamen *dou* ba shenme dai-lai *dou* keyi
no matter they DOU BA what bring DOU can
'All of them can bring here anything.' (Intended meaning)

(16) a. tamen (lian) he-bei-shui de shijian *dou* meiyou
They EVEN drink-glass-water DE time DOU not have
'They do not even have time for a glass of water.'
b. *tamen *dou* (lian) he-bei-shui de shijian *dou* meiyou
they DOU EVEN drink-glass-water DE time DOU not have
'All of them do not even have time for a glass of water.' (Intended meaning)

Fifth, instead of adjacent requirements, there are locality restrictions on *dou* and the item *dou* associated with.

(17) a. zhexie haizi wo *dou* xihuan
these children I DOU like
'I like all of these children.'
b.*zhexie haizi renwei wo *dou* xihuan tamen
these children think I DOU like them
'All of these children think that I like them.' (Intended meaning)

In (17a), *dou* acts on the topicalised object *zhexie haizi* "these children" and the subject *wo* "I" is situated between them. *Dou* and *zhexie haizi* are base-generated in the same clause, which allows the sentence to be grammatical. In comparison, in (17b), *dou* and *zhexie haizi* are not base-generated in the same clause. *Dou* is in the embedded clause and cannot quantify over the element in the matrix clause.

(18) a. shei *dou* zhidao women xihuan Zhangsan
who DOU know we like Zhangsan
'Everyone knows that we like Zhangsan.'
b. *shei zhidao women *dou* xihuan Zhangsan
who know we DOU like Zhangsan
'Everyone knows that we like Zhangsan.' (Intended meaning)

In (18), the *wh*-item *shei* 'who' is licensed by *dou* as a universal FCI. Locality restrictions require that both the *wh*-item and *dou* must originate from the same clause, as exemplified in (18a). However, in (18b), *dou* is base-generated in the embedded clause while the *wh*-item is from the matrix clause. This violation of locality restrictions leads to the failure of licensing and renders the sentence ungrammatical. In other words, the functions of *dou* are clause bound.

3.1.3 Interim Summary

In this section, starting from the diverse functions of *dou* as a quantifier-distributor, a universal FCI licensor and a scalar marker, I discussed the properties of *dou* including the Leftness requirement, Plurality requirement, Distributivity requirement, Oneness requirement and Locality restriction, which are widely accepted in the literature. At the end of this section, there are a few additional points I would like to point out.

First, taking all the examples cited in this section into consideration, it is evident that NPs with the plural suffix *-men*, such as *tamen* "they", *xueshengmen* "students" and *huaduomen* "flowers", proper names or nouns conjoined by *he* or *yu*, such as *Zhangsan he Lisi* "Zhangsan and Lisi", *xuesheng yu laoshi* "students and teachers", as well as NPs with plural demonstrative determiners, like *zhexie haizi* "these children" are eligible to be associated with *dou*, regardless of their functions. Additionally, kind-denoting bare NPs, which refer to common nouns without determiners, can potentially be associated with *dou*, as demonstrated in (19). It is noteworthy that in cases where *dou* functions as a quantifier, as in (19a), *dou*'s presence is not obligatory, in comparison with the *even*-focus construction in which *dou* is mandatory, as seen in (19b).

(19) a. tuzi (*dou*) chi hulubo
rabbit DOU eat carrot
'Rabbits (all) eat carrot.'
b. (lian) gou *dou* buchi
EVEN dog DOU not eat
'Even dog does not eat (this food).'

Moreover, in Mandarin Chinese, pre-verbal QPs introduced by determiner-like expressions such as *mei* 'every', *suoyou* 'all' and *dabufen* 'most' can be associated with *dou*. In these cases, the insertion of *dou* is compulsory for the sake of the grammaticality of the sentence. As shown in (20)-(23), there is a co-occurrence requirement between QPs and *dou.* When an NP contains a universal quantifier and appears in either subject pre-verbal position or non-subject pre-verbal position, the presence of *dou* is necessary to maintain sentence well-formedness. Tsai (2015) refers to this obligatory co-occurrence as the property of Doubling, which indicates that '*dou* is obligatory to a universal that already manifests universal quantification morphologically'.

(20) a. meige ren *dou* chidao-le
every-CL person DOU late-ASP
'Everyone was late.'
b. *meige ren chidao-le
every-CL person late-ASP
'Everyone was late.' (Intended meaning)

(21) a. meiben shu wo *dou* kanwan-le
every-CL book I DOU finish reading-ASP
'I have finished reading all the books.'
b.*meiben shu wo kanwan-le
every-CL book I finish reading-ASP
'I have finished reading all the books' (Intended meaning)

(22) a. suoyou/quanbu/dabufen de ren *dou* chidao-le
all all most DE person DOU late-ASP

‘All/most of the people were late.’

b.*suoyou/quanbu/dabufen de ren chidao-le
all all most DE person late-ASP
‘All/most of the people were late.’ (Intended meaning)

(23) a. suoyou/quanbu/dabufen de shu wo *dou* kanwan-le
all all most DE book I DOU finish reading-ASP
‘I have finished reading all/most of the books.’

b.*suoyou/quanbu/dabufen de shu wo kanwan-le
all all most DE book I finish reading-ASP
‘I have finished reading all/most of the books.’ (Intended meaning)

Moving on to the licensor use of *dou*, it is possible for *dou* to appear in a sentence containing more than one *wh*-item. In (24a), both *wh*-NPs have positions to the left of *dou*. However, *dou* is only associated with the *wh*-item that is closer to it, resulting in the possible interpretation given in (i). The other *wh*-item works as an interrogative word and undergoes topicalisation to the sentence initial place. In (ii), *dou* intends to associate with the topicalised object *wh*-item across the subject *wh*-item, but it fails to license it as a universal FCI. In (iii), the case where both *wh*-items are licensed by *dou* is unacceptable.

(24) a. shenme shei *dou* chi
what who DOU eat
(i) ‘What does everyone eat?’
(ii) *‘Who eat everything?’
(iii) *’Everyone eats everything.’

In addition, there is an exceptional case that seems to violate the Plurality requirement. Consider the sentence in (25). Both *wh*-items act as interrogative words, yet the sentence remains grammatical. According to the Leftness requirement, only the *wh*-subject *shei* ‘who’ can be associated with *dou*, even though it may not achieve a plural interpretation.

(25) shei *dou* chi-le shenme
who DOU eat-ASP what
'Who eat what?'

3.2 Previous Studies on the Semantics and Syntax of *Dou*

3.2.1 The Approaches on *Dou*'s Semantics

3.2.1.1 Lin (1998)

Following the work of Dowty and Brodie (1984), Link (1987), Schwarzschild (1996) and Beghelli and Stowell (1997), Lin (1998) first provides a systematic analysis of *dou*'s semantic function, syntactic position, as well as the treatments of *dou*'s restrictions and requirements. Lin's proposal consists of three key arguments: (i) *dou* is an overt operator of distributivity at the VP-level; (ii) the application of *cover* function makes the situation where *dou* co-occurs with certain types of collective predicate interpretable; (iii) *dou* is a head of functional projection and hosts a strong feature which must be checked before Spell-Out through Spec-Head relation, within the framework of Minimalism (Chomsky, 1995).[2]

In English, the distributive-collective distinction has once been attributed to the behaviour of different predicate types. For example, with a predicate like *laughed* in (26a), the sentence entails meaning that each person denoted by the subject NP *boys* laughed. However, with a predicate like *gathered in the classroom* in (26b), the sentence fails to entail meaning that each boy gathered in the classroom. Instead, it has to be interpreted as the group of boys gathered together in the classroom. Link (1983, 1987) proposes that the predicates like *laugh* and *be a pop star* are intrinsically distributive which must be associated with atomic individuals rather than groups. He defines such predicates as distributive predicates that apply to all the individuals making up the group denoted by the subject. In (27), if John and Paul are pop stars, it must be the case in which John is a pop star and Paul is a pop star as well.

(26) a. The boys laughed.

[2] Since Section 3.2.1 concentrates on *dou*'s semantic function, the syntactic derivations of *dou* and the relevant constructions will be discussed integratedly in Section 3.2.2.

b. The boys gathered in the classroom.

(27) a. John and Paul are pop stars.

b. John is a pop star.

For predicates like *bought a computer*, which Link calls mixed predicate, he proposes that the distributivity is realised by an optional D operator. The D operator is applied to the predicate and imposes a force of universal quantification on the plurality in the denotation of subject, as defined in (28) and (29) (Link, 1987). Without the D operator, the sentence would have a collective interpretation.

(28) $^{D} =_{df} \lambda P \lambda x \forall y[y \in x \rightarrow P(y)]$

(29) $^{D}p = \lambda x \forall y[y \in x \rightarrow P(y)]$

By means of the D operator, a sentence with a mixed predicate can be interpreted either distributively or collectively. (31) to (32) presents the yielding of the distributive reading of (30). Here, the D operator is introduced and takes a wider scope over the existential *a computer*. By contrast, as shown in (33), the absence of the D operator makes the collective reading the only proper interpretation.

(30) The boys bought a computer.

(31) $^{D}VP \Rightarrow \lambda x \forall y[y \in x \rightarrow \text{bought.a.computer'}(y)]$

(32) NP $^{D}VP \Rightarrow \forall y[y \in [\![\text{the.boys}]\!] \rightarrow \text{bought.a.compter'}(y)]$

(33) bought.a.computer'(the.boys)

Nonetheless, the proposal of the D operator is not an omnipotent solution. Gillon (1987) represents a paradigm example that demonstrates the availability of intermediate readings that are neither completely distributive nor collective, as quoted in (34).

(34) The men wrote musicals.

(Gillon, 1987, p. 211)

In this example, suppose *the men* denotes Rodgers, Hammerstein and Hart. The

sentence can be true even if Rodgers and Hammerstein wrote musicals together and Rodgers and Hart wrote musicals together or Rodger and Hart wrote together while Hammerstein wrote alone. The notion of strict distributivity or collectivity, where each person must write musicals individually or all of them must write musicals cooperatively, does not capture the full range of interpretations.

To address the ambiguity among collective, distributive, and intermediate readings, Schwarzschild (1994, 1996) puts forward the concept of a generalised D operator. He regards the D operator as *Part* and indicates that the Part operator is always accompanied by a context-sensitive free variable *Cov*. The value assigned to this variable always takes a form of a cover of a universe of discourse. A cover can be the partition of the plurality P if and only if the criteria in (35) are satisfied.

(35) a. C is a cover of P iff
(i) C is a set of subsets of P
(ii) Every member of P belongs to some set in C
(iii) ∅ is not in C

Compared with the meaning of the D operator in (28), the *Part* operator reveals a number of similarities when handling cases with distributive predicates. By applying the definition of the *Part* operator in (36) to the sentence in (26a), an interpretation as in (37) can be derived.

(36) $\text{Part} =_{df} \lambda P \lambda x \forall y[y \in \text{Cov}_i \ \& \ y \subseteq x \ \& \ \rightarrow p(x)]$

(37) $\forall x\ [x \in [\![\text{Cov}_i]\!] \ \& \ x \subseteq [\![\text{the.boys'}]\!] \rightarrow x \in [\![\text{laughed'}]\!]]$

Then, following Schwarzchild's proposal, a universal discourse is provided in (38) to assign concrete values to *Cov* and to evaluate the truth conditions of the sentence. If the cover C1 is assigned to Cov_i, the sentence naturally receives a distributive interpretation, as each boy possesses a singleton set of the cover C1.

(38) U = {a, b, c, j, s, k, {a, b}, {a, c}, {b, c}, {a, s}, {j, s, k}, {b, j, s, k} ...}
[[the.boys']] = {a, b, c}
C1 = {{a}, {b}, {c}, {j, s, k}}

C2 = {{a}, {c}, {b, j, s, k}}

C3 = {{a, b, c}, {j, s, k}}

From this perspective, the *Part* operator is not distinguished from the D operator. However, taking the case of (34) into consideration, if the value of a cover like C1 in (39) is assigned to Cov_i, an intermediate reading of the sentence is obtained, indicating that Rodgers collaborates with Hammerstein and Hart respectively to write musicals. Furthermore, if the cover C2 is assigned to Cov_i, the collective interpretation becomes available. If C3 is assigned, the sentence can be interpreted as Roger and Hart wrote musicals cooperatively and Hammerstein wrote musicals alone. If Cn is assigned, the distributive interpretation where each person wrote musicals by himself is derived.

(39) U = {a, b, c, r, h, t…}

C1 = {{a, b, c}, {r, h}, {r, t}}

C2 = {{a}, {b}, {c}, {r, h, t}}

C3 = {{a},{h}, {b, c}, {r, t}}

……

Cn = {{r}, {h}, {t}, {a, b, c}}

Given the interpretations mentioned above, the concept of the generalised D operator is introduced to replace the previous D operator. The definition in (40) outlines D as the distributive operator, α as a variable over predicates, and x and y as variables over the relevant domain in discourse. According to (40), the sentence in (30) can have multiple interpretations by applying different cover values to the variable Cov_i.

(40) $x \in ||D(Cov)(\alpha)||$ iff ||Cov|| is a cover of x and $\forall y\ [y \in ||Cov|| \rightarrow y \in ||\alpha||$

Suppose four boys Andy, Bill, Colin, and David, participated in the activity of buying a computer. Several possible covers are listed in (41). Assigning the value of C1 or C2 leads to a collective (C1) or distributive (C2) interpretation of the sentence, respectively. In addition, assigning the cover value like C3 results in an intermediate reading where Bill, Colin and David bought a computer jointly and Andy bought a computer by himself.

(41) $\forall x[x \in ||Cov_i|| \ \& \ x \subseteq ||the.boys'|| \rightarrow x \in ||bought.a.computer'||]$

U = {a, b, c, d, s, t, m, n, {a, b}, {a, c}, {a ,s, t}…}

||the.boys||={a, b, c, d}

C1 = {a, b, c, d}

C2 = {{a}, {b}, {c}, {d}}

C3 = {{a}, {b, c, d}, {s, t}}

Now, turn to Lin's D-operator approach to *dou* in Mandarin Chinse. Adopting Link's proposal which treats floating quantifiers such as *all* as a distributive operator, initially, Lin translates *dou* as an adverb denoting a function whose domain is in $D_{<e, t>}$ and whose range is in $D_{<e, t>}$.

(42) Preliminary Translation of *dou*:

dou $\Rightarrow \lambda P \lambda X \forall y[y \in X \ \& \ \rightarrow P(y)]$, where $P \in D_{<e, t>}$

As shown in (42), the definition of *dou* reveals that *dou* is a semantically D-operator that distributes the properties of a VP down to the plurality denoted by an NP *dou* associated with. This analysis works in the same way as Link's suggestion in the case such as *They all have a car*. However, this interpretation is inadequate when *dou* occurs with a collective predicate or when *dou* quantifies over a pre-verbal object, as illustrated in (43) and (44).

(43) xueshengmen *dou* juji zai jiaoshi li

student-PL DOU gather at classroom in

'The students all gathered in the classroom.'

(44) zhexie shu zhangsan *dou* kan-le

these book Zhangsan DOU read-ASP

'These books, Zhangsan had read them all.'

To address this issue, Lin takes a further step by adopting Schwarzschild's approach and revises *dou* as a generalised D operator, as shown in (45).

(45) ||*dou*|| = λP[∀y((y∈||Cov||∧||Cov||⊆X) → P(y))]

The key evidence supporting Lin's analysis comes from examples like (46) and (47). In (46), the truth conditions of the two sentences are not identical due to the distributive force of *dou*: in (46a), it is felicitous for the persons in the denotation of *tamen* 'they' to share a kitchen with any other persons not explicitly mentioned in the sentence. However, in (46b), it must be the case that the persons, as a group, share a kitchen together. In (47), it would be illicit if *dou* distributes over atomic individuals, since a single individual cannot form a couple, and not any random male-female pair can be considered a couple. Therefore, the entity of *dou*'s distributivity in this case should be specific husband-wife pairs, which can be captured by a cover ranging over real couples salient in the context.

(46) a. tamen *dou* heyong yige chufang
they DOU share one-CL kitchen
'They each share a kitchen with someone else.'
?'All of them share a kitchen.'
b. taman heyong yige chufang
they share one-CL kitchen
'They share a kitchen.'

(47) naxie ren *dou* shi fuqi
those people DOU be couple
'Those people are couple.'

Furthermore, Lin observes that there are restrictions on the types of collective predicates that can co-occur with *dou*. *Juji zai jiaoshi li* "gather in the classroom" and *shi yige jiti* "be a group" in (48) are both collective predicates, but the presence of *dou* with the latter leads to the ungrammaticality of the sentence. Dowty explains this distinction by dividing collective predicates into two categories: predicates like *gather, be alike, disagree, disperse* etc., belong to a group which has distributive sub-entailment, while predicates like *be numerous, be a large group, be a group of four*, etc., are devoid of any distributive entailment. The quantifier *all* in English is only capable of distributing the sub-entailments of the predicate over each member in the

domain of subject. [3]

(48) *xueshengmen *dou* shi yige jiti
student-PL DOU be one-CL group
'*The students are all a group.'

Lin extends Dowty's observations and suggests a different condition for the use of *dou*, as defined in (49). This condition explains the ungrammaticality of (48) by stating that *shi yige jiti* 'be a group' can only be true of the group argument as a whole, and any proper subset of that group is intolerable.

(49) Proper Subset Condition on the use of *dou*:
Dou only occurs with predicates which have a proper subset entailment on the group argument.

To summarise by far, Lin's approach mainly focuses on the quantifier-distributor use of *dou* by defining *dou* as a generalised D-operator that acts on the predicates with subset entailment and distributes over the associated plurality to the left of *dou*. Regardless of the other two functions of *dou*, Lin's approach still faces several challenges.

First, *dou* does not work as a "genuine" generalised D-operator. The introduction of generalised distributor is to analyse the vague of plurality among distributive, collective and intermediate, as discussed on (34). Therefore, it is reasonable to assume that a sentence with *dou* should demonstrate a three-way ambiguity as well. However, the Distributivity requirement of *dou* restricts the sentence to only receive the distributive reading, eliminating the possibility of collective and intermediate readings. As shown in (50a), the presence of *dou* excludes the collective reading where Zhangsan and Lisi bought a computer jointly. By contrast, in (50b), without *dou*, the sentence should be interpreted collectively.

[3] In Taub's argument (1989), he classifies collective predicates into four categories: collective states, such *as be a big group*, collective activities, such as *carry the piano around for an hour*, collective accomplishments, such as *gather in the hallway*, and collective achievement, such as *pass the pay raise* and *elect a president*. Taub's generalisation claims that collective activities and collective accomplishments allow *all*, collective states and collective achievement do not. Essentially, Taub's classification is identical to Dowty's classification.

(50) a. zhangsan he lisi *dou* mai-le yitai diannao
Zhangsan and Lisi DOU buy-ASP one-CL computer
'Zhangsan and Lisi each bought a computer'
b. zhangsan he lisi mai-le yitai diannao
Zhangsan and Lisi buy-ASP one-CL computer
'Zhangsan and Lisi together bought a computer.'

Xiang (2008) argues that if *dou* were a generalised distributor, it should be capable of distributing over a singleton set such as {{a ⊕ b ⊕ c}} denoted by the cover of a plurality like *tamen* and yielding a single-cover reading (viz. a collective reading). However, in fact, *dou* is unable to do so. In (51), the sentence can be true only if each of Zhangsan, Lisi and Wangwu carried a sofa by themselves. However, in the sense of Schwarzschild's cover-based theory, this sentence is compatible with an intermediate reading in which Zhang and Lisi carried a sofa together and Wangwu carried a sofa alone.

(51) zhangsan lisi he wangwu *dou* ban-le yizhang shafa
Zhangsan Lisi and Wangwu DOU carry-ASP one-CL sofa
'Zhangsan, Lisi and Wangwu each carried a sofa.'

Second, as Xiang (2016) mentioned, even though Lin provides a solution on the co-occurrence of *dou* and universal expressions, such as *mei*-NP and *dabufen*-NP, his approach does not capture the situation where *dou* can be associated with a distributive expression, as given in (52).

(52) a. tamen gezi *dou* you yige haizi
they each DOU have one-CL child
'They each has one child.'
b. They each (*each/*all) has one child.

Third, there is a need to differentiate between the pair of sentences in (53) that seem to share identical truth conditions. The lexical semantics of the predicate *xiao-le*

'laughed' inherently determines that the sentence must be interpreted in a distributive way. This suggests that *dou* may have an empathic function or another role beyond its quantifier-distributor function, which is not accounted for in Lin's analysis.

(53) a. tamen xiao-le
they laugh-ASP
'They laughed.'
b. tamen *dou* xiao-le
they DOU laugh-ASP
'They laughed.'

Brisson's (1998) proposal provides a concept of *good-fitting* covers to capture the semantic functions of *all* as 'maximising' and 'anti-weakening'. The notion of a *good fit* states that a cover is good fit if every element of the set is in a cell of the cover that is a subset of that set, as given in (54). The role of *all* here is to ensure that the value assigned to *Cov* is a good fit by eliminating any ill-fitting cover from the set of salient covers.

(54) Good fit: For some cover of the universe of discourse Cov and some DP denotation X, Cov is a good fit with respect to X iff $\forall y[y \in X \rightarrow \exists Z[Z \in Cov \ \& \ y \in Z \ \& \ Z \subseteq X]]$

Consider the example in (55) and its cover-based interpretation in (56). *All* eliminates the covers C3 and C4 and leaves C1 and C2 as possible values. The sentence can receive either a distributive interpretation with C1 or a collective interpretation with C2, both maximally.

(55) The boys all bought a computer.
(56) $\forall x[x \in ||Cov_i|| \ \& \ x \subseteq ||the.boys^{gf}|| \rightarrow x \in ||bought.a.computer'||]$
U = {a, b, c, {a, b}, {a, c}, {a, m}, {a, n}, {a, m, n} …}
||the.boys||={a, b, c}
C1 = {{a}, {b}, {c}, {m, n}}
C2 = {{a, b, c}, {m, n}}

C3 = {{a, c}, {b, m, n}}

C4 = {{a, b}, {c, m, n}}

On a par with *all* in English, the difference between (53a) and (53b) can be attributed to the effect of maximising of *dou*. The presence of *dou* asks the predicate denoted by the VP to act on the maximal elements in the range of the associated item. In (53a), if there is a group of kids, the sentence could be true if the majority of kids laughed while one or two did not. However, in (53b), with the insertion of *dou*, the sentence could be true only if all the kids laughed. According to Xiang (2016), this strict maximality is a semantic consequence of *dou*'s quantifier-distributor use, which she refers to as the Maximality requirement.

3.2.1.2 Giannakidou and Cheng (2006) and Xiang (2008)

Giannakidou and Cheng's observation (henceforth G&C) starts from the two types of FCIs cross linguistically: indefinite, such as English *any-NP* and definite, such as English *wh-ever* (G&C name the previous one as FCI-nominal and the later as one FC-free relatives (FC-FRs)). G&C argue that definite FCIs is distinguish from indefinite ones on two aspects: first, definite FCIs cannot occur independently or as a nominal modifier and are restricted to selecting a clausal complement, as shown in (57), and second, definite FCIs express a preference for the existence of an "expectation of existence" in the context, as presented in (58). In (57), *whoever* does not seem to indicate polarity behaviour, so that the absence of a clausal complement makes the sentence ungrammatical. In (58a), the sentence with *any* is a neutral statement in which I do not want to talk to anybody without an expectation that exact person(s) will actually call. In (58b), with *whichever students*, the definiteness of the FR gives rise to an expectation in which there is indeed someone will call.

(57) a. Whoever saw a fly in his soup complain to the manager.

b.*Whoever/whichever customer complained to the manager.

(58) a. If any student calls, I am not here.

b. Whichever student calls, I am not here.

The definite/indefinite distinction can be perceived on the presence/absence of *dou* in Mandarin Chinese as well.[4] As illustrated in (59), both sentences express a similar meaning, but (59b) reveals that there may be an expectation from the speaker in which there is a presumed set of students will call.

(59) a. ruguo (you) na-ge xuesheng da-dianhua lai
if have which-CL student telephone come
jiu shuo wo bu zai
then say I not in
'If any student calls, say that I am not here.'

b. (wulun) na-ge xuesheng da-dianhua lai
no matter which-CL student phone come
dou shuo wo bu zai
DOU say I not in
'Whichever student calls, say that I am not here.'

Furthermore, this distinction can be observed with bare *wh*-items. In (60a), the sentence is applicable for the situations where there is nowhere in specific that Zhangsan wants to go. By contrast, (60b) represents that there exists a contextually determined set of places, of which there is certainly no place that Zhangsan wants to go.

(60) a. zhangsan bu xiang qu na
Zhangsan not want go where
'Zhangsan does not want to go anywhere (in particular).'

b. zhangsan na *dou* bu xiang qu
Zhangsan where DOU not want go

[4] As given in (1), the insertion of *dou* is not obligatory in Mandarin Chinese for the realisation of a free choice reading. But, once the modal *keyi* 'can' appears in the sentence, the attendance of *dou* becomes indispensable, in (2).

(1) ta bu xiang mai naben shu
he not want but which-CL book
'He does not want to buy any book.'

(2) ta naben shu *(*dou*) keyi mai
he which-CL book DOU can buy
'He can buy any book.'

‘Zhangsan does not want to go anywhere at all/what-so-ever.’

In both cases, *dou* not only introduces the definite-like expressions depending on contextually determined sets, but also rules out the empty set. G&C claim that *dou* contributes to the definiteness and exhaustivity of FCIs in Mandarin Chinese and works as a maximality (iota) operator, as defined in (61). In this formula, *dou* takes an intensionalised property denoted by *wulun* (either overt or covert) as its input and returns the maximal plural individuals.

(61) $[\![dou]\!] = \lambda P\, \iota(\lambda x \cdot P(x))$

As exemplified in (62), (62b) reveals an exhaustive reading where for a contextually salient set of books, Zhangsan does not want to buy any of them at all. But in (62a), the salient set of books is absent, and there is not potential objective for the exhaustive evaluation. The reading of this sentence likes a simple utterance of a general fact.

(62) a. zhangsan bu xiang mai naben shu
Zhangsan not want buy which-CL book
‘Zhangsan does not want to any book (in particular).’
b. zhangsan (wulun) naben shu *dou* bu xiang mai
Zhangsan no matter which-CL book DOU not want buy
‘Zhangsan does not want to buy any book at all.’

For a better understanding on *dou*’s usage as a maximality operator, here, I adopt Xiang’s schema in the light of Schwarzschild’s proposal, as cited in (63).

(63) Let *Cov* be a cover of x, then [[*dou*]](x)
$= |Cov| > 1 \wedge \exists y \in Cov\, [\neg Atom(y) \wedge \forall z \in Cov[z \leq y]]$
$\iota y \in Cov\, [\neg Atom(y) \wedge \forall z \in Cov[z \leq y]]$
([[*dou*]](x) is defined only if the cover of *x* is non-singleton and has a unique non-atomic maximal element; when defined, the reference of [[*dou*]](x) is this maximal element.)

(Xiang, 2016, p.179)

Xiang (2008) builds upon the analysis proposed by G&C's and extends it to explain the scalar marker function of *dou*. As mentioned in Section 3.1.1.3, *dou* can be associated with a focused element, either in the *lian…dou* construction or in-situ, and it imposes a requirement to choose a maximal degree of unexpectedness or unlikelihood from a contextually determined measure scale. Xiang argues that in the scalar interpretation, *dou* is a maximality operator which contributes to maximality rather than scalarity and exerts exhaustivity on alternatives.

In (64a), even though *juran* or *jingran* '*even*' conveys a sense of low-likelihood regarding Zhangsan's failure, the sentence does not imply the extent to which other students are likely to fail under normal conditions. The discourse specifies that other students practically all received As in this examination. In (64b), the sentence implies that apart from Zhangsan, some students who are more likely to fail under normal conditions did not pass the examination. This implication contradicts the information provided in the discourse and renders (64b) unacceptable.

(64) zheci kaoshi hen jiandan henduo ren de A
this-CL exam very easy many people get A
'This examination is very easy and lots of people got A.'
a. keshi zhangsan juran/jingran meiyou tongguo
but Zhangsan even not pass
'But Zhangsan did not even pass.'
b. *keshi (lian) zhangsan *dou* meiyou tongguo
but even Zhangsan DOU not pass
'But even Zhangsan did not pass.' (Intended meaning)

However, in (65), the discourse has been modified to reflect a situation where the examination is exceptionally difficult so that few students could pass. In this scenario, Zhangsan, who is considered the most likely to pass, also failed the examination. Based on these observations, Xiang points out that in *lian…dou* construction, not only the event of the focused elements which is least likely to happen is true, but also the event of the alternatives which is more likely to happen is true as well.

(65) zheci kaoshi hen nan henduo ren meiyou tongguo
this-CL exam very difficult many people not pass
'This examination is very difficult and many people did not pass.'
(lian) zhangsan *dou* bu jige
even Zhangsan DOU not pass
'Even Zhangsan did not pass.'

Following Shyu (2004) and Rooth (1985), Xiang treats *lian* as a focus marker which inherently provides the set of alternatives and at the same time, introduces scalarity. As for *dou*, it imposes maximality on the set by picking out the maximal degree on the scale and yields strong exhaustivity. Based on the lexical entry of *even* in English, Xiang construes the *lian…dou* construction as given in (66).

(66) (i) $[\![\text{lian}(x)(P)]\!] = 1$ iff $P(x) = 1$
(ii) $\exists y[y \neq x \wedge C(y) \wedge P(y)]$ (C is the alternative set)
(iii) All the alternatives are (partially) ordered on a scale about expectedness, such $\forall y \neq x \rightarrow$unexpected (P(x)) > unexpected (P(y))

Moreover, the maximality of *dou* can be perceived under other scalar circumstances in which *dou* is associated with the in-situ focused element. In (67), the sentence reveals the maximal degree of astonishment by the fact that it is still not dark even though it is 10 o'clock. In the speaker's view, not being dark at 4 or 5 o'clock would be less surprising compared with 10 o'clock. In (68), *dou* picks out the maximal degree from the scale of angriness introduced by the gradable predicate and expresses the meaning Zhangsan was extremely angry and his anger drove him into crazy.

(67) *dou* yijing shidian le tian zenme hai meiyou hei
DOU already 10 o'clock ASP sky why still not dark
'It is 10 o'clock already. Why it is still not dark outside?'

(68) zhangsan qi-de *dou* feng-le
Zhangsan angry-DE DOU crazy-ASP
'Zhangsan was so angry that he went crazy.'

Indeed, G&C and Xiang's approaches provide a more nuanced explanation of *dou*'s functions in FC licensing and scalar interpretation deriving. They treat *dou* as a maximality operator rather than a single-purpose distributor and argue against the scalar marker use of *dou* by emphasising that *dou* contributes to the scalar reading on choosing the maximal degree of unexpectedness or unlikelihood from a measure scale provided by other elements, such as *lian* or *de*-construction. However, this account is criticised for the unsettlement of *dou*'s distributivity.

(69) tamen *dou* mai-le fangzi
they DOU buy-ASP house
'They all bought house.'

(70) sange xuesheng *dou* mai-le yiben shu
three-CL student DOU buy-ASP one-CL book
'The three students each bought a book.'

As illustrated in (61) and (63), *dou* is only responsible for the maximal element in the cover of *x*, rather than each element in the cover of *x*. In (69), suppose *tamen* refers to Mary, Jane and Lucy. If the cover is {m⊕j, m⊕j⊕l}, the maximality of *dou* restricts the interpretation to Mary, Jane and Lucy jointly bought houses, regardless of whether Mary and Jane bought a house together. More obviously, in (70), Cheng (2009) proposes that *dou* is no longer a distributive operator but a definite determiner which allows an indefinite NumP (i.e., number-classifier-noun), such as *sange xuesheng* 'three students' in the subject position, to achieve a definite expression and keeps the sentence grammatical. However, in this case, the sentence must be interpreted distributively as each of the three students bought a book. It is puzzling how a definite determiner *dou* can induce a distributive reading.

3.2.1.3 Other Accounts for *Dou*'s Semantic Interpretation

Inspired by Hamblin (1973), Rooth (1985, 1992, 1996), Kratzer and Shimoyama (2002) and Chierchia (2006, 2013), in recent years, a number of linguists have put forward unified semantics to explain the functional variety of *dou* in Mandarin Chinese (Xiang

2016, 2019; Tsai 2015; Liu 2017 etc.). With regard to the limited scope and objectives of this thesis, in this section, not all approaches will be reviewed in detail. Instead, I will outline Xiang's (2019) analysis as an example and demonstrate the basic idea of Alternative Semantics under the focus condition.

Xiang's study starts with the discussion of the semantics of *only* in English. According to Rooth (1985), a focused expression α involves a set of focus-alternatives 'F-ALT(α)' which share the same semantic type with α and carry a grammatical feature [+F].[5] The focus-alternatives grow point-wise (Hamblin, 1973), as defined in (71).

(71) Focus-alternatives:

a. For any lexical expression α,

$$\text{F-ALT}(\alpha) = \begin{cases} D_{type}[\![\alpha]\!] & \text{if } \alpha \text{ is focused} \\ \{[\![\alpha]\!]\} & \text{otherwise} \end{cases}$$

b. $\text{F-ALT}(\beta(\alpha)) = \{b(a) \mid b \in \text{F-ALT}(\beta), a \in \text{F-ALT}(\alpha)\}$

(Chierchia, 2013, p. 138)

Horn (1969) makes a pioneer assumption about the exclusive particle *only* and generalises its function as presupposing the truth of the prejacent proposition and negating the truth of the excludable alternatives. An alternative is considered excludable if it is not entailed by the prejacent proposition. In (72), suppose Mary should have invited some friends, namely John, George and Lucy. Mary invited John is the prejacent proposition which is presumed by *only* to be true. At the same time, Mary invited George is not entailed by Mary invited John and is therefore an excludable alternative. The presence of *only* eliminates all such alternatives and gives rise to the exhaustivity inference that Mary invited exactly one person, specifically John.

(72) Mary only invited JOHN$_F$.

⇝ Mary invited John.

⇝ Mary did not invite anyone other than John.

(Xiang, 2019, p.11)

[5] Besides the focus-alternatives, Alternative Semantics schematises other two alternatives: scalar-alternatives 'σ-ALT' of scalar items and domain-alternatives 'D-ALT' of quantifiers or disjunctions, which are triggered by the feature [+σ] and the feature [+D] respectively.

Moreover, Xiang argues that *only* could presuppose the existence of at least one excludable alternative within its quantification domain. This presupposition is called a non-vacuity presupposition. Integrating the three functions, Xiang indicates the meaning of *only* as follows:

(73) $[\![only_C]\!]$

$= \lambda p \lambda w: \exists q \in \text{EXCL}\ (p, C) \wedge p(w) = 1. \forall q \in \text{EXCL}\ (p, C)[q(w) = 0]$

a. Non-vacuity presupposition: The prejacent has as least one excludable-alternative.

b. Prejacent presupposition: The prejacent is true.

c. Exhaustivity assertion: All the excludable are false.

(Xiang, 2019, p.12)

Xiang defines the meaning of *dou* in a similar manner to *only*, but replaces the exhaustivity assertion with the anti-exhaustification assertion, as illustrated in (74). In the manner of this definition, *dou* as a special exhaustifier presupposes that there is at least one sub-alternative of the prejacent which *dou* can operate on and confirms the truth of the prejacent. At the same time, *dou* derives the anti-exhaustivity inference by negating the exhaustification of each sub-alternative, which is asymmetrically entailed by the prejacent, in contrast to excludable alternatives.

(74) $[\![dou_C]\!]$

$= \lambda p \lambda w: \exists q \in \text{SUB}\ (p, C)\ .\ p(w) = 1\ \wedge\ \forall q \in \text{SUB}(p, C)\ [\text{O}_C\ (q)(w) = 0]$

a. Non-vacuity presupposition: The prejacent has as least one sub-alternative.

b. Prejacent presupposition: The prejacent is true.

c. Anti-exhaustification assertion: The exhaustification of each sub-alternative is false.

(Xiang, 2019, p.12)

The semantics in (74) successfully captures the three uses of *dou*. As listed in Table 3.1, the variation in defining sub-alternatives corresponds to *dou*'s different functions. The first two definitions rely on logical strength, the third on the likelihood and the

fourth on the context-sensitive scale. It is important to note that Xiang suggests that the definition of sub-alternatives in Def (a) is primary, which triggers Def (b) and Def (c) through two semantic weakening operations. That is to say, the distributor function of *dou* is considered fundamental and more general compared with the less frequent and narrow usage of *dou*'s likelihood-based semantics.

Table 3.1. Definitions of sub-alternatives and the corresponding functions of *dou*

	Definition of sub-alternative	Functions of *dou*
Def (a)	Alternatives that are weaker than the prejacent	Distributor
Def (b)	Alternatives that are not I-excludable	Universal FC-licensor
Def (c)	Alternatives that are more likely than the prejacent	Even
Def (d)	Alternatives ranked lower than the prejacent	Scalar marker

(Xiang, 2019, p.34)

3.2.2 The Approaches on *Dou*'s Syntax

3.2.2.1 The Head of Distributive Phrase[6]

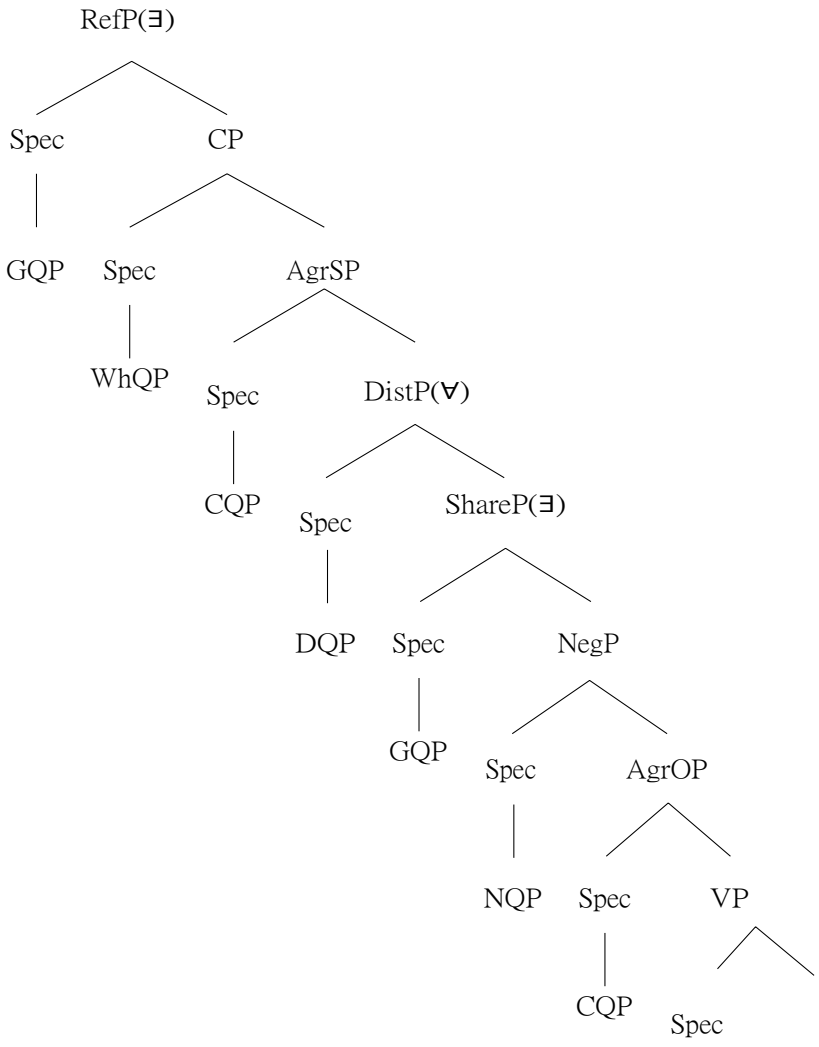
3.2.2.1.1 Lin (1998)

As mentioned in Section 3.2.1.1, Lin in particular follows Beghelli and Stowell's approach (1997) (henceforth B&S) and assumes that *dou* is a head projecting the Chinese Distributive Phrase (DistP). B&S accept the idea that not all quantifiers are equally created and suggest that different types of QPs take their scope by means of moving into different syntactic positions at LF, as demonstrated in (75). In this hierarchy of functional projection, interrogative QPs (WhQPs), e.g., *what* and *which NP*, take the scope in the Spec of CP and check the feature [+wh], negative QPs (NegQPs), e.g., *no one* and *no N*, in the Spec of NegP and check [+Neg], Distributive QPs (DQPs), e.g., *every N* and *each N*, in the Spec of DistP and check [+Dist] and group-denoting GPs (GQPs), e.g., *the students* and *all the students* (definite), *one student*, *three students* and *many students* (indefinites), in the Spec of RefP or ShareP and check [+group referent]. Counting QPs (CQPs), e.g., *few*, *few than five*, *at most six*,

[6] Except for the linguists mentioned in this section, Li (1992), Lin (1992), Hsieh (1994) and Li (1997) treat *dou* as the head of a functional projection as well. I will not access to their papers for the limited interests of my study.

between six and nine and *more (boys) than (girls)*, do not involve in the feature checking due to the lack of particular semantic features. Consequently, they stay in their case checking position, either in the Spec of AgrSP or in the Spec of AgrOP. B&S point out that indefinite QPs, such as *two boys* and *some sheep*, are ambiguous between GQPs and CQPs. If an indefinite QP possesses a [+group referent] feature, it has to move to the Spec of RefP or ShareP to check the feature with an existential operator ∃. If it does not possess that feature, it should remain in the case checking position.

(75)



Moreover, B&S indicate that the quantifiers like *every* and *each* are 'distributive quantifiers' and they always allow a distributive interpretation. QPs headed by these quantifiers are classified as DQPs and act as strong distributors, obligatorily enforcing the distributivity. On the other hand, *all* is a 'group denoting quantifier'. It always allows a collective interpretation but only allows a distributive interpretation under

certain conditions. QPs headed by *all* act as Pseudo-distributors, giving rise to optional Pseudo-distributivity. The properties of Strong distributivity and Pseudo-Distributivity are given in (76) and (77).

(76) Strong Distributivity

a. DQPs headed by *each/every* are Strong Distributors.

b. Strong Distributivity is obligatory.

c. Strong Distributivity can arise under an inverse scope construal, e.g., where the distributee is in Spec of AgrSP and the distributor is in Spec of AgrOP, for instance, a student bought every book (every book > a student).

(77) Pseudo-Distributivity

a. Plural definite and indefinite GQPs (including QPs headed by *all*) are Pseudo-Distributor.

b. Pseudo-distributivity is optional.

c. Pseudo-distributivity cannot arise under an inverse scope construal, e.g., where the distributee is in Spec of AgrSP and the distributor is in Spec of AgrOP, for instance, a student bought all the books (all the books > a student).

On par with *every* and *most* in English, Lin's assumption is based on the behaviour of universal NPs, such as *mei-ben shu* 'every book 'and NPs with the determiner *dabufen-de ren* 'most people', which must move overtly to a position preceding *dou*. In regard to the framework of Minimalism, the strong quantificational feature (and/or distributive feature) of *mei*-NP and *dabufen*-NP must be checked before Spell-Out via Spec-Head agreement. As a consequence, they are forced to move to the Spec of DistP to check their feature(s) and make the projection of DistP obligatory. Since the DistP is to be projected, *dou* must be presented. Moreover, Lin points out that definite NPs in Mandarin Chinese only optionally host a quantificational/distributive feature. If a definite NP bears the feature, it is required to move the Spec of DistP for feature checking; otherwise, it does not move even at LF.

Nonetheless, there are two issues that Lin's account cannot address. First, unlike *every* and *each*, *dou* can never serve as a determiner, which hinders the configuration of a DQP.

As show in (78a), the distributive operator *each* acts as a determiner and inherently carries the strong feature [+Dist], triggering movement to the Spec of DistP for feature checking. However, in (78b), the adverbial *each* does not occupy the same position as the determiner *each*. According to Beghelli (1995), the distribution of adverbial *each* aligns with that of covert floated *each*. The floated *each* contributes to the realisation of distributivity when a distributive quantifier is not overtly present in a sentence. It is located at the head position between AgrSP and AgrOP and c-commands the distributee QPs. The counterexample of *dou* in Mandarin Chinese is given in (79). In accordance with B&S's proposal, in this case, the DistP (either specifier or head) can no longer be a potential location for *dou*. Instead, *dou* has to float between AgrXPs, thereby conflicting with Lin's assumption.

(78) a. Each boy carried a piano.
(Determiner *each*)
b. The boys each carried a piano.
(Adverbial *each*)

(79) nanhai-men *dou* ban-le yijia gangqin
boy-PL DOU carry-ASP one-CL piano
'The boys each carried a piano.'

Second, the derivation of the functional hierarchy is proposed to account for the scope ambiguity arising from the interaction between different types of quantifier phrases. However, this kind of ambiguity does not exist in Mandarin Chinese. In (80a), the GQP *a book* has two potential landing sites, one c-commanding and the other c-commanded by the DQP *every student* at LF, leading to the ambiguity of the sentence. However, in (80b), with the specifier *mei*-NP, *dou* is base-generated in the head of DistP and makes the DQP *meige xuesheng* 'every student' always take a wide scope over the GQP *yiben shu* 'one book'. Therefore, the sentence must receive a subject-wide scope reading.

(80) a. Every student bought a book.
'For every student x, x bought a book.'
'There is a book x, that every student bought it.'
b. meige xuesheng *dou* mai-le yiben shu
every-CL student DOU buy-ASP one-CL book

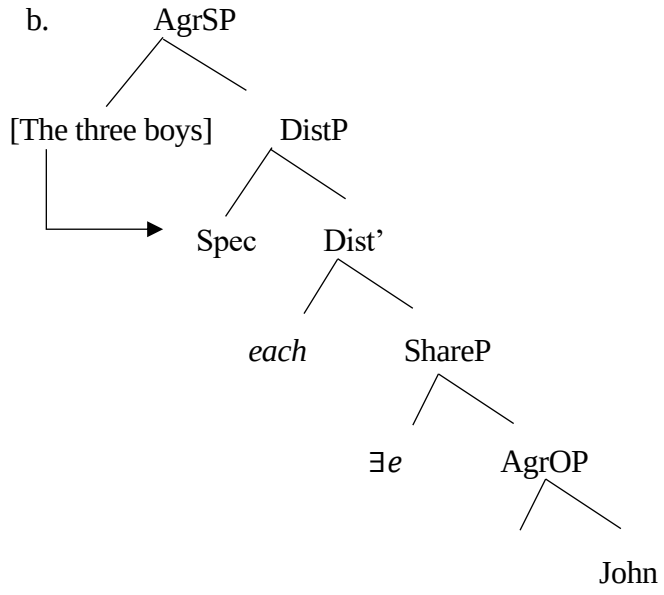
'The students each bought a book'

Sakaguchi (1998) offers a solution on the first issue by analysing the adverbial *each* in English in a contrastive way against Beghelli (1995). In Sakaguchi's treatment, the adverbial *each* is not syntactically parallel to either the silent *each* or the determiner *each*, as outlined in (81). She introduces the feature [+pl] for the feature checking of adverbial *each* and emphasises that this feature checking is achieved via the movement of certain QP to the Spec of DistP, while *each* remains in its base-generated position.

(81) a. Adverbial *each* is base-generated in the head of DistP.
b. The Spec of DistP activated by the presence of adverbial *each* in the head, attracts QPs that have [+pl] features. Only QPs that c-command the DistP move to the Spec of DistP.
c. Only QPs that finished Case-checking may move to the Spec of DistP.
(Sakaguchi, 1998, p. 57)

Consider the example in (82). Following Sakaguchi's suggestion, the subject QP *the three boys* undergoes the nominative case checking in the Spec of AgrSP at LF in the first place. Then, with the attraction of the feature [+pl] of the head *each*, the subject QP moves to the Spec of DistP to check the feature. The object DP *John* remains in the specifier position of AgrOP.

(82) a. The three boys each visited John.
b.

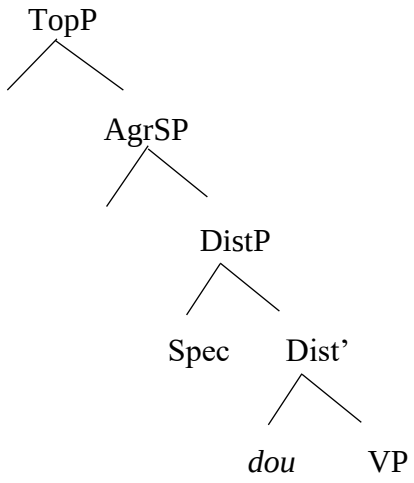


Despite the insights provided by Sakaguchi's account and the introduction of a specific feature for the adverbial *each*, there are a few uncertainties need to be taken into consideration. Sakaguchi's approach prioritises case checking in the syntactic derivation. Since the location of DistP is inflexible in this hierarchy, it could be the case in which the subject QP goes to the Spec of AgrSP for case checking first and then moves down to the Spec of DistP for feature checking. Sakaguchi does not provide a thorough explanation of the validity of QP lowering in this derivation. On the other hand, case can be regarded as a feature on a noun phrase and checked by a head. From this perspective, the checking of case feature has no priority over the checking of plurality feature. Additionally, Sakaguchi's account treats the Spec of DistP as the final landing site of the subject QP, leaving out any further movement to the left periphery. If topicalisation or focalisation takes place and asks the QPs to move out of the Spec of DistP to a higher position, the cyclicity and the Principle of Economy will be violated.

3.2.2.1.2 Wu (1999)

Wu (1999) brings forward a Minimal analysis of *dou*-quantification. In his analysis, *dou* is a functional head of Distributional Phrase (DistP). This projection is situated between AgrsP and VP, as demonstrated in (83). With respect to *dou*-quantification, Wu claims that *dou* hosts a strong Q-feature which has to be checked before Spell-Out through either Merge or Move. In terms of feature checking, a checker and a checkee must agree not only in their feature but also in their feature strength. Once the element designated for feature checking passes through the specifier position of DistP in the derivation, the quantificational relation between *dou* and the element can be established.

(83)



In (84), the subject NP *zhexie laoshi* 'these teachers' is base-generated in the Spec of VP and then moves to the Spec of DistP to check the strong Q-feature of *dou* and achieves a spec-head agreement. This feature checking is realised on overt syntax rather than at LF. The Leftward requirement is the consequence of the movement triggered by feature checking. In (84c), *dou*'s feature has not been checked at the point of Spell-Out, resulting in the ungrammaticality of the sentence.

(84) a. zhexie laoshi *dou* xihuan zhangsan
these teacher DOU like Zhangsan
'These teachers all like Zhangsan.'
b. [$_{DistP}$ zhexie laoshi$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_i$ [$_{V'}$ xihuan wo]]]]
c. *[$_{DistP}$ [$_{Dist'}$ *dou* [$_{VP}$ zhexie laoshi [$_{V'}$ xihuan wo]]]]

In (85), the object NP *zhexie shu* 'these teachers' undergoes movement to the Spec of DistP for the purpose of feature checking, while the subject NP *Zhangsan* raises to the Spec of AgrSP. The subject here cannot be the potential target of *dou*-quantification and participate in feature checking, because it does not satisfy the requirement of plurality, as shown in (85c).

(85) a. zhangsan zhexie shu *dou* xihuan
Zhangsan these book DOU like
'Zhangsan likes all these books.'
b. [$_{AgrSP}$ Zhangsan$_j$ [$_{DistP}$ zhexie shu$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_j$ [$_{V'}$ xihuan t$_i$]]]]]
c. *[$_{DistP}$ Zhangsan$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_i$ [$_{V'}$ xihuan zhexie shu]]]]

Moving on to the derivation of the locality restriction, as exemplified in (86b), the DistP is built within the embedded clause, and the object NP z*hexie xuesheng* 'these students' moves to the Spec of DistP to check the strong Q-feature of *dou*. The subject Lisi moves to the Spec of AgrSP. A VP is then merged in the matrix clause, yielding (86c). In the final step, the *dou*-quantified object moves out of the Spec of DistP to the Spec of TopP to check the [+topic] feature in the matrix (86d). In this derivation, both *dou* and its associate are initially generated in the embedded clause, ensuring that feature checking and *dou*-quantification are legitimate, even though the associate further moves across the clausal boundary.

(86) a. zhexie xuesheng wo xiangxi lisi *dou* hen xihuan
these student I believe Lisi DOU very student
'I believe that Lisi likes all these students.'

b. [$_{AgrSP}$ Lisi$_j$ [$_{DistP}$ zhexie xuesheng$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_j$ [$_{V'}$ hen xihuan t$_i$]]]]]

c. [$_{VP}$ wo xiangxin [$_{AgrSP}$ Lisi$_j$ [$_{DistP}$ zhexie xuesheng$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_j$ [$_{V'}$ hen xihuan t$_i$]]]]]]

d. [$_{TopP}$ zhexie xuesheng$_i$ [$_{VP}$ wo xiangxin [$_{IP}$ [$_{AgrSP}$ Lisi$_j$ [$_{DistP}$ t$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_j$ [$_{V'}$ hen xihuan t$_i$]]]]]]]

By contrast, in (87), the DistP headed by *dou* is located within the matrix clause, while the potential associate *zhexie xuesheng* is situated within the embedded VP. In order for the associate to be quantified by *dou* and check the strong Q-feature, it would need to move to the Spec of DistP across the finite Infl. However, the movement is prohibited because feature checking, as an instance of A-movement, is clause-bound. In other words, *dou* and its associate must be present in the same clause, whether it is embedded or matrix. Before moving the associate to a higher position or across the clausal boundary, feature checking as well as *dou*-quantification must be accomplished in advance.

(87) a. *zhexie xuesheng *dou* wo xiangxin lisi hen xihuan
these student DOU I believe Lisi very like
'I believe that Lisi likes all these students.' (Intended meaning)

b. *[$_{DistP}$ [$_{Dist'}$ *dou* [$_{VP}$ wo xiangxin [$_{VP}$ Lisi [$_{V'}$ hen xihuan zhexie xuesheng]]]]]

c. *[$_{DistP}$ zhexie xuesheng$_i$ [$_{Dist'}$ *dou* [$_{VP}$ wo xiangxin [$_{IP}$ [$_{VP}$ Lisi hen xihuan t$_i$]]]]]

Furthermore, Wu suggests a possible approach to account for the blocking effect of certain elements on *dou*-quantification. In (88), *dou* is able to quantify over the plural NP within the *ba*-phrase (88a), but not across the *ba*-phrase (88b). In comparison with (88), the insertion of a prepositional phrase does not obstruct the quantification. As presented in (89), *dou* can quantify over either a NP within the prepositional phrase or a subject NP that crosses the prepositional phrase. The existence of a PP does not block

the quantification of *dou*. The blocking effect can be observed on the manner adverb as well (90b-c), such as *jingjing-de* 'quietly' and *zixi-de* 'carefully', in contrast to the temporal adverb (90a), such as *zuotian* 'yesterday'.

(88) a. zhangsan ba zhexie shu *dou* mai-le
Zhangsan BA these book DOU buy-ASP
'Zhangsan bought all these books.'
b. *tamen ba naben shu *dou* mai-le
they BA that-CL book DOU buy-ASP
'They all bought that book.' (Intended meaning)

(89) a. zhangsan gei xuesheng-men *dou* mai-le zheben shu
Zhangsan to student-PL DOU buy-ASP this-CL book
'Zhangsan bought this book to all the students.'
b. xuesheng-men gei zhangsan *dou* mai-le zheben shu
student-PL to Zhangsan DOU buy-ASP this-CL book
'All the students bought this book to Zhangsan.'

(90) a. zhexie xuesheng zuotian *dou* qu-le xuexiao
these student yesterday DOU go-ASP school
'These students yesterday all went to school.'
b. zhexie xuesheng *dou* zixi-de jiancha-le geren wupin
these student DOU carefully check-ASP personal thing
'These students all carefully checked the personal belongings.'
c. *zhexie xuesheng zixi-de *dou* jiancha-le geren wupin
these student carefully DOU check-ASP personal thing
'These students all carefully checked the personal belongings.'
(Intend meaning)

Wu attributes the blocking effect on *dou*-quantification to the merging position of the elements. In line with the clause structure in (83), the VP is always preceded by the DistP. Any element that must be merged within the VP-projection will block the quantification if its final landing site is to *dou*'s left in the surface structure. Any element that can be directly merged above DistP will not block the quantification. *Ba*-phrase

and manner adverbs are both base-generated within the VP-projection and they are only allowed to move to the left of *dou* for feature checking. Otherwise, the derivation must be cancelled.

(91) a. [$_{DistP}$ [$_{Dist'}$ *dou* [$_{VP}$ Zhangsan [$_{VP}$ ba neixie shu$_i$ [$_{V'}$ mai-le t$_i$]]]]]
b. [$_{AgrSP}$ Zhangsan$_j$ [$_{DistP}$ ba neixie shu$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_j$ [$_{VP}$ t$_i$ [$_{V'}$ mai-le t$_i$]]]]]]

(92) a. [$_{DistP}$ [$_{Dist'}$ *dou* [$_{VP}$ tamen [$_{VP}$ ba naben shu$_i$ [$_{V'}$ mai-le t$_i$]]]]]
b. [$_{AgrSP}$ tamen$_j$ [$_{DistP}$ t$_j$ [$_{Dist'}$ *dou* [$_{VP}$ t$_j$ [$_{VP}$ ba naben shu$_i$ [$_{V'}$ mai-le t$_i$]]]]]]
c. *[$_{AgrSP}$ tamen$_j$ [$_{DistP}$ ba naben shu$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_j$ [$_{VP}$ t$_i$ [$_{V'}$ mai-le t$_i$]]]]]]

In (91), the *ba*-phrase is allowed to move to the Spec of DistP to check the strong Q-feature of *dou*, which results in its position to the left of *dou*. However, in (92), the *b*a-phrase is not eligible to check the feature due to semantic reasons. Therefore, the movement of *ba*-phrase to the Spec of DistP is not desired. Instead, the plural subject *tamen* 'they' can settle in the Spec of DistP for feature checking and then move to higher locations.

Wu's proposal not only offers a solution to the locality restriction, Leftness requirement and blocking effect of *dou*, but also addresses the functional diversity of *dou* with the identical clausal structure. Drawing on Rooth's (1985, 1992) theory of focus interpretation, Wu argues that in the focus construction (*lian*)*…dou*, the optional *lian* is the real focus marker that must co-occur with *dou* to fulfil its focusing role. *Dou*, on the other hand, acts as a distributor that distributes over every member in the domain of an alternative P-set.

(93) a. (lian) zhangsan *dou* mai-le naben shu
even Zhangsan DOU buy-ASP that-CL book
'(Even) Zhang bought that book.'
b. [(lian) ZHANGSAN *dou* mai-le naben shu]' = {P: P = x bought that book}

In (93), the P-set consists of all entities in the domain of the denotation of Zhangsan, in which Zhangsan is the least likely person to have bought that book. For the sentence to be true, everyone in the P-set, including Zhangsan, must have bought that book. *Dou*,

in this case, distributes the property of the predicate over each member in the alternative set. In Wu's proposal, in *(lian)…dou* construction, *dou* also acts as a universal quantifier which introduces an alternative P-set as the domain of its universal quantification and distributes over each member in that domain.

Moving on to *dou*'s function as a universal FC-licensor, Wu adopts the perspective that Chinese *wh*-NPs can be treated as variables which can be bound by any operator and yield a quantificational force. A *wh*-variable moves to the Spec of DistP to check the strong Q-feature of *dou*. At the same time, *dou*, the head of DistP, acts as a binder that endows the *wh*-variable a universal interpretation.

Furthermore, Wu indicates that Leftness requirement and locality restrictions are available in the cases where *dou* quantifies over *wh*-variables. In (94) and (95), whether in the subject position or the object position of the internal VP, the *wh*-variable must move to the Spec of DistP by virtue of feature checking, resulting in the *wh*-variable always appearing to the left of *dou*.

(94) a. shei *dou* canjia-le huiyi
who DOU attend-ASP meeting
'Everyone attended the meeting.'
b. **dou* shei canjia-le huiyi
DOU who attend-ASP meeting
'Everyone attended the meeting.' (Intended meaning)

(95) a. zhangsan shenme *dou* chi
Zhangsan what DOU eat
'Zhangsan eats everything.'
b. *zhangsan *dou* chi shenme
Zhangsan DOU eat what
'Zhangsan eats everything.' (Intended meaning)

Once again, *dou*-quantification can only take place when *dou* and the *wh*-variable are base-generated within the same clause. In (96a), the *wh*-variable *shei* 'who' is base-generated within the matrix VP. The DistP also merges within the matrix Infl. *Dou* and *shei* reside in the same clause, ensuring that the movement for feature checking is licit. However, in (96b), the *wh*-variable is in the matrix clause while *dou* in the embedded.

In order to check *dou*'s feature, *shei* would have to lower to the embedded clause and then move up to the matrix subject position. This movement violates the cyclicity. Similarly, in (96c), given that feature checking is an instance of A-movement, the embedded *shei* cannot move across the clausal boundary to check the feature in the matrix clause.

(96) a. shei *dou* xiangxin zhangsan hui lai
who DOU believe Zhangsan will come
'Everyone believes that Zhangsan will come.'
b. *shei xiangxin zhangsan *dou* hui lai
who believe Zhangsan DOU will come
'Everyone believes that Zhangsan will come.' (Intended meaning)
c. *zhangsan *dou* xiangxin shei hui lai
Zhangsan DOU believe who will come
'Zhangsan believes that everyone will come.' (Intended meaning)

Then, consider the pair of sentences in (97). Both sentences have more than one pre-verbal *wh*-variables on *dou*'s left side, indicating that either of the *wh*-variables is eligible for *dou*-quantification. However, only the *wh*-variables closest to *dou* are *dou*-bound and can be interpreted universally. The other *wh*-variables are Q-bound and function as interrogative words. Nonetheless, in (98), both NPs can be *dou*-bound, leading to ambiguous readings. The first reading can be derived if the object *zhexie pingguo* "these apples" moves to the Spec of DistP from the base-generated position to check the feature. Then, the subject *tamen* "they" moves to the Spec of AgrSP, and finally, the object raises to the Spec of TopP. In this reading, *dou* quantifies over the object across the subject. On the other hand, to achieve the second reading, the subject moves to the Spec of DistP and then lands at the Spec of AgrSP, while the object directly goes up to the Spec of TopP.

(97) a. shenme shei *dou* chi
what who DOU eat
(i) 'What does everyone eat?'
(ii) *'Who eat everything?'
(iii) *'Everyone eats everything.'

b. shei shenme *dou* chi
who what DOU eat
'Who eat everything?'

(98) zhexie pingguo tamen *dou* chi-le
these apple they DOU eat-ASP
(i) 'They ate all these apples.'
(ii) 'All of them ate these apples.'

Turning back to the derivation of the multiple-*wh* sentences, for (97a), in (99) the subject *wh*-variable *shei* 'who' first moves to the Spec of DistP for feature checking and obtains a universal interpretation. Then, it further raises to the Spec of AgrSP. At last, the object *wh*-variable *shenme* 'what' moves to the Spec of TopP. For (97b), in (100), the object moves up to check *dou*'s feature primarily. The subject makes a midway stop in the Spec of AgrSP and then moves further to the Spec of TopP.

(99) a. [$_{DistP}$ shei$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_i$ chi shenme]]]
b. [$_{AgrSP}$ shei$_i$ [$_{DistP}$ t$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_i$ chi shenme]]]]
c. [$_{TopP}$ shenme$_j$ [$_{AgrSP}$ shei$_i$ [$_{DistP}$ t$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_i$ chi t$_j$]]]]]

(100) a. [$_{DistP}$ shenme$_i$ [$_{Dist'}$ *dou* [$_{VP}$ shei chi t$_i$]]]
b. [$_{AgrSP}$ shei$_j$ [$_{DistP}$ shenme$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_j$ chi t$_i$]]]]
c. [$_{TopP}$ shei$_j$ [$_{AgrSP}$ t$_j$ [$_{DistP}$ shenme$_i$ [$_{Dist'}$ *dou* [$_{VP}$ t$_j$ chi t$_i$]]]]]

Accordingly, Wu suggests that anything the has check the feature of *dou* in Spec of DistP cannot raise further across a *wh*-NP. The movement should obey the No Crossed Linking requirement, as given in (101). Thus, the failure of the reading (ii) in (97) can be illustrated as follows:

(101) No Crossed Linking at Logical Form (LF).

(102) *Q shenme shei *dou*
what who DOU

To summarise Wu's proposal concisely, he considers *dou* as a universal quantifier that operates over ordinary NPs, *wh*-variables and denotations in the alternative P-set. On the one hand, it distributes the property of a predicate down to the quantified element. On the other hand, it acts as a binder when encountering a *wh*-variable and allows the variable to be interpreted universally. In the syntactic derivation, *dou* is the head of the functional projection DistP and possesses a strong Q-feature that must be checked before Spell-Out by either moving or merging an element in its specifier position. The Leftness requirement arises as a consequence of feature checking. Moreover, since feature checking is an A-movement, the checker and the checkee must reside in the same clause. Movement across clausal boundary is not allowed. Elements, such as *ba*-phrase and manner adverbs, which are base-generated lower than DistP, can only move to the left of *dou* for feature checking or remain in their generated position. Lastly, in the situation where multiple *wh*-variables appear to *dou*'s left, feature checking must adhere to the No Crossed Linking requirement.

3.2.2.2 The Head of Maximal Phrase

3.2.2.2.1 Badan and Del Gobbo (2015)

In Badan and Del Gobbo's approach (henceforth B&D), they extensively discuss the syntactic derivation of the construction *(lian)…dou* based on crosslinguistic evidence. They draw a comparison with the particle *perfino* in Italian and point out that both *lian* and *dou* contribute to the interpretation of even in this structure. *Lian*, similar to *perfino*, works as a focus particle, belonging to a distinct class of adverbs following the spirit of Cinque (1999). It is considered a 'minor functional head' that subcategorises for a maximal projection but does not project or modify itself. In other words, it cannot have theta-grids, bind theta-positions, or project category features. The focus particle *lian* integrates with the element to be focused in its base-generated position, and then the *lian*-phrase can move to a topic or focus position. In regard to *dou*, on the basis of G&C (2006), Cheng (2009), Xiang (2008) and Constant and Gu (2010), they regard *dou* as a maximality operator which is the head of a functional projection. According to Badan (2008), *dou* "operates over the set of alternatives, closes the domain and gives the maximal set of these alternatives, i.e., it maximises the set of presuppositions" (p.12).

Following Shyu's (1995, 2001) proposal, they assume that *lian*-XP can occur either in a sentence-internal position or in a sentence-initial position. The movement of *lian*-XP to different syntactic positions involves the application of different movement

strategies. When *lian*-XP is located internally with a sentence, it can only move within its base-generated clause, has no reconstruction effects and cannot co-occur with resumptive pronouns.

(103) *zhangsan lian mali renwei lisi *dou* bu xihuan
Zhangsan even Mali think Lisi DOU not like
'Zhangsan considers that Lisi does not like even Mary.'
(Shyu, 2001, p. 95)

(104) *wo lian zhangsan de shu *dou* bei ta qiangzou-le
I even Zhangsan DE book DOU BEI him rob away-ASP
'I was robbed of even Zhangsan's book by him.'
(Shyu, 1995, p. 83)

(105) *lisi lian mali *dou* hen xihuan ta
Lisi even Mali DOU very like her
'Even Mali, Lisi likes her very much.'
(Badan &Del Gobbo, 2015, p. 43)

In (103), the embedded object Mali, when combined with *lian*, cannot move across the clausal boundary into the matrix clause and instead remains between the subject and the verb. In sentence-internal position, *lian*-XP undergoes A-movement but cannot go long distance. In (104), the reconstruction effect for Principal C of the Binding Theory is absence. As a consequence, the co-reference between Zhangsan and its pronoun *ta* 'him' cannot be established. In (105), the presence of the resumptive pronoun *ta* 'her' for Mali in its base-generated position leads to ungrammaticality. To rescue this sentence, the resumptive pronoun must be omitted.

However, if *lian*-XP is positioned at the sentence-initial, the long-distance movement becomes achievable (106). The resumptive pronoun can co-refer with the focused constitute in *lian*-XP and remains in its 'original' object position (107). Additionally, topic markers, such as *a*, can follow the *lian*-XP, in contrast with the intolerance observed when *lian*-XP appears in the sentence-internal (108). These pieces of evidences support the notion that the movement of the sentence-initial *lian*-XP is an

A-bar movement. Compared with the sentence-internal *lian*-XP, which undergoes the focalisation, the sentence-initial *lian*-XP undergoes the topicalisation.

(106) lian mali zhangsan renwei lisi *dou* bu xihuan
even Mali Zhangsan think Lisi DOU not like
'Zhangsan thinks that Lisi does not like even Mali.'

(Shyu, 2001, p. 95)

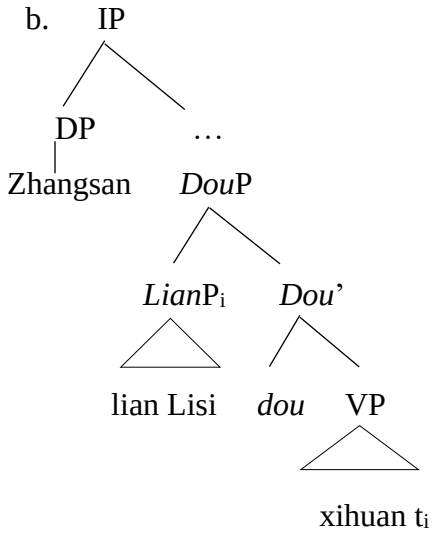
(107) lian mali lisi *dou* hen xihuan ta
even Mali Lisi DOU very like her
'Lisi likes even Mali.'

(Shyu, 1995, p. 83)

(108) a. lian zheben shu (a) zhangsan *dou* mai-le
even this-CL book TOP Zhangsan DOU buy-ASP
b. *zhangsan lian zheben shu (a) *dou* mai-le
Zhangsan even this-CL bool TOP DOU buy-ASP
'Zhangsan even bought this book.'

In accordance with the assumption that *dou* is a maximality operator, in the case of sentence-internal *(lian)…dou*, B&D suggest that the focused phrase moves from its base-generate position to the specifier position of the maximality operator *dou* in order to check the maximality feature. In their analysis, *dou* functions as the head of its own functional projection, called *Dou*P. The syntactic derivation of a sentence with sentence-internal *lian…dou* is exemplified in (109).

(109) a. zhangsan lian lisi *dou* bu xihuan
Zhangsan even Lisi DOU not like
'Even Lisi does not like Zhangsan.'

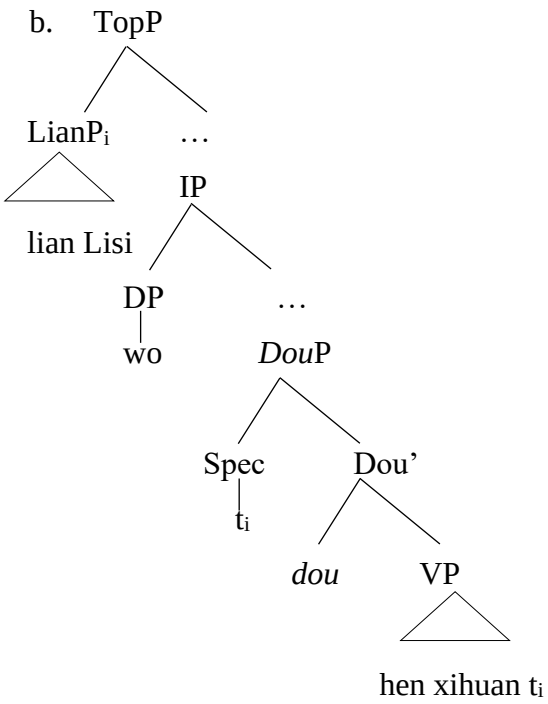


This derivation corresponds to the aforementioned properties of sentence-internal *lian*-XP. The feature checking here is a A-movement and clause-bound. Due to the spec-head relation between *lianP* and *dou*, no topic marker or pause can be inserted between them. The presence of resumptive pronouns in the base-generated position is not allowed.

The situation of sentence-initial *lian*-XP is more complicated. If there is no pronominal copy of *lian*-XP in the lower position of the clause, *lian*-XP will undergo further movement to the specifier position of TopP in the left periphery of the sentence after accomplishing feature checking. This movement occurs cyclically. On the other hand, if there is a pronominal copy, such as a resumptive pronoun, of *lian*-XP in the lower position, a base-generated operator with the same index as *lian*-XP will be present in the specifier position of *Dou*P. In this case, *lian*-XP will be directly merged into the specifier position of TopP.

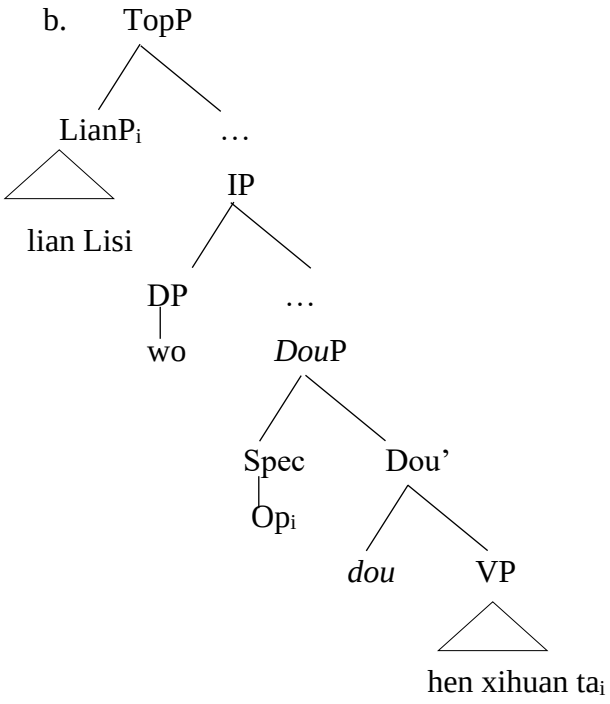
(110) a. lian lisi wo *dou* hen xihuan
even Lisi I DOU very like
'Even Lisi, I like him very much.'

b. TopP



(111) a. lian lisi wo *dou* hen xihuan ta
even Lisi I DOU very like him
'Even Lisi, I like him very much.'

b. TopP



As demonstrated in (110) and (111), the two sentences have the same semantics but differ in their syntactic derivations. The first sentence is derived through movement, while the second sentence is base-generated. Moreover, since sentence-initial *lian*-XP

can undergo long-distance movement, viz. an A-bar movement, it is permissible to insert a topic marker or a pause immediately following the *lian*-XP.

Besides, B&D introduce an articulate hierarchy of different types of topics in Chinese CP, as given in (112). In this hierarchy, the sentence-initial *lian*-XP, whether it is a moved topic or a merged topic, always resides in the lowest projection. Examples in (113) and (114) demonstrate different types of topics preceding the *lian*-XP in sentence-initial position, respectively.

(112) Aboutness Topic > Hanging Topic > Left-Dislocated > *lian*-Focus > IP
(Badan & Del Gobbo, 2010, p.21)

(113) hua lian meiguihua *dou* hen pianyi
flower even rose DOU very cheap
'As for flowers, even roses are cheap.' (Aboutness Topic > *lian*-Focus)
(Badan & Del Gobbo, 2010, p.17)

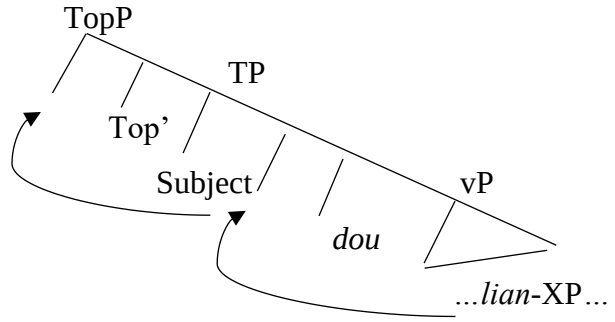
(114) zhangsan a lian xiaoyu *dou* piping-le
Zhangsan Top even Xiaoyu DOU criticise-ASP
'As for Zhangsan, even Xiaoyu, he criticised.' (Topic Particle > *lian*-Focus)
(Badan & Del Gobbo, 2010, p.17)

3.2.2.2.2 Constant and Gu (2010)

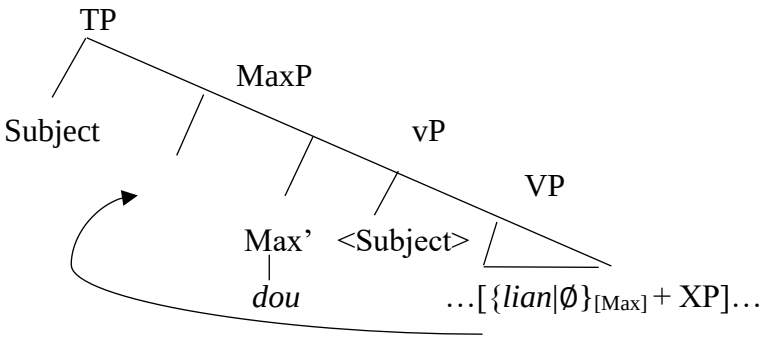
In Constant and Gu (2010)'s approach (henceforth C&G), they argue that the movement in the construction *(lian)…dou* is not triggered by focus or prosody, but rather by a covert maximality operator. This movement is purely syntactic and driven by the operator. In their analysis, the *lian*-phrase moves to the specifier position of *dou* to check the maximality feature first and then raises further to the Spec of TopP. The basic configuration of their analysis is shown in (115), which is similar to the analysis of B&D. However, there is a distinction between the two approaches regarding the nature of *dou*. In contrast to B&D's view of *dou* as the maximality operator itself, C&G treat *dou* as a head that probes for a maximality operator, similar to how the interrogative C probes for a Q particle. This maximality operator in Mandarin Chinese is unpronounced but can be detected through A-bar 'focus' movement. When *dou* is present, it triggers

the movement of the DP that the maximality operator is attached to, to the specifier position of *dou* for feature checking. This movement is long-distance, sensitive to island constraints, and licenses parasitic gaps. In (116), the revised configuration is presented.

(115)



(116)



In their analysis, C&G also provide an explanation for the partial focus movement observed in the *(lian)…dou* construction. As exemplified in (117), both the VP as a whole and the object can potentially be the target of focus. However, on the surface, it appears that only the object is moved for feature checking. To account for this, C&G adopt Chomsky's copy theory of movement (1993) and Laudau' proposal (2006, 2007) and suggest that it is actually the VP, rather than the DP, that undergoes movement to the higher position. In terms of Spell-Out, certain materials are required to be represented in both the focus position and the base position of the moved phrase. However, it is not permitted to pronounce an element more than once in the phonological form (PF). As a consequence, it is more optimal to pronounce the object in the focus position and the verb in the base position, rather than pronouncing both elements or the entire VP in the focus position. This approach allows for a more economical representation in the phonological output.

(117) ta lian toufa dou bu shu
he evenhair DOU not comb
a. 'He does not even comb [his hair]$_F$.'
b. 'He does not even [comb his hair]$_F$.'

3.2.2.3 Interim Summary

In this section, I reviewed the two different approaches to the syntactic derivation of *dou*: one treating it as the head of a functional projection DistP, and the other treating it as the head of a functional projection MaxP/*Dou*P. However, when considering the multiple semantic functions of *dou*, neither approach provides an ideal solution. This dilemma leaves us with two options: either *dou* would have only one syntactic position or it would have three.

In the next section, I will propose a new syntactic account of *dou* by arguing that *dou* is a distributive operator that is overtly expressed as the head of DistP. It can be associated with quantified NPs, focus phrases and *wh*-variables. The movement of these associates to the Spec of DistP is a strict syntactic requirement, rather than a semantic demand.

3.3 Beyond the Literature: A New Syntactic Derivation of *Dou* in Mandarin Chinese

As mentioned in Section 3.1.1, it has been widely acknowledged that the morpheme *dou* in Mandarin Chinese serves various functions, including being a quantifier-distributor, a universal FCI licenser and a scalar marker. The multifaceted nature of *dou* has not only attracted considerable attention in terms of its semantic properties but also sparked an ongoing debate concerning its syntactic features. The fundamental question of whether *dou* should be associated with three distinct locations or derivations, aligning with its three semantic functions, or whether it should have only a unified position, continues to be a pivotal issue that requires further investigation and analysis. Within the framework of Minimalism, the notion of *dou* being the head of a functional projection, such as DistP or MaxP/*Dou*P, has shed light on its different functions. However, neither of these proposals has successfully integrated all of *dou*'s functions within a single derivation. In the light of Yeo and Tsoulas (2013) (henceforth Y&T), this section aims to present a unified solution to the syntax of *dou*, by further developing Wu's approach.

In the following parts of this section, I will first elaborate on Y&T's account of the syntax of distributivity in Singapore English (SgE), particularly focusing on the element *also* and its distribution, which parallels that of *dou*. Then, following the path proposed by Y&T, I will derive a new syntactic structure of *dou* in regard to its various functions.

3.3.1 The Syntax of Distributivity in Singapore English

SgE, as a fusion of English and Chinese, represents a language where English serves as the dominant language and Chinese provides extensive grammatical phenomena. This blending effect can be observed in the behaviour of the element *also*. In general, *also* shares a few similarities with *dou* in terms of its distributions in three specific environments: universal quantification, discontinuous focus and free choice *wh*-constructions. However, it is important to note that within each of these environments, there are still evident asymmetries that need to be pointed out.

3.3.1.1 Universal Quantification

In Mandarin Chinese, it is well-known that a NP universal quantified by *mei* 'every' in a pre-verbal position must co-occur with *dou*, yielding a distributive interpretation. *Dou*, in this context, works as a quantifier-distributor that is obligatory and inseparable from the quantifier *mei*, generating universal quantification together.

(118) mei-ge haizi (**dou*) lai-le
every-CL kid DOU come-ASP
'Every kid has come.'

In SgE, it is possible to create a parallel construction as shown in (119), in which the presence of *also* is not mandatory.

(119) Every kid (*also*) come already.
'Every student has come.'

Then, if the quantifier *every* is replaced by the quantifier *all*, in (120), the presence of *also* becomes necessary for the sentence to achieve a distributive interpretation. In both English and SgE, the NPs quantified by *all* are ambiguous between a collective and a

distributive reading. However, when *also* is present, the sentence is forced to be interpreted distributively.

(120) a. All the students received a prize.
'All the students received a prize collectively.'
Or 'All the students each received a prize.'
b. All the students *also* received a prize.
'All the students each received a prize.'

In Mandarin Chinese, the presence of *dou* eliminates the collective reading and allows the distributive interpretation to be the only appropriate one for the sentence. Without the insertion of *dou*, the sentence would be interpreted collectively, implying that the students altogether received a prize. However, with the insertion of *dou*, the sentence is interpreted distributively, suggesting that each individual student received a prize.

(121) a. xuesheng-men huode-le yi-ge jiang
student-PL receive-ASP one-CL prize
'The students received a prize together.'
b. xuesheng-men *dou* huode-le yi-ge jiang
student-PL DOU receive-ASP one-CL prize
'The students each received a prize.'

However, in SgE, as exemplified in (122a-c), the presence of *also* cannot get along well with singular NPs, definite NPs or bare NPs and contribute to the distributive interpretation. Instead, *also* has to serve as an additive adverb, retaining its original meaning in standard English and yielding an additive reading.

(122) a. *Student(s) *also* received a prize.
b. * A student *also* received a prize.
c. * The student(s) *also* received a prize
*'The students each received a prize.'
'Students/A student/The student(s) received a prize, (as well as the teachers.)'

In both Mandarin Chinese and SgE, the object NPs associated with *dou* and *also* need to be situated in a pre-verbal (or higher) position. In (123), the violation of the Leftness and Plurality requirements precisely renders the ungrammaticality of the sentence. In (124), the in-situ object NP prevents the distributive use of *also*, and instead, only the additive interpretation is possible.

(123) a. naxie dianying yuehan *dou* kan-guo le
those movie John DOU watch-already ASP
'John has watched each of those movies.'
b. *yuehan *dou* kan-guo le naxie dianying
John all watch-already ASP those movie
'John has watched each of those movies.' (Intended meaning)

(124) a. All those movies John *also* watch already.
b. * John *also* watch all those movies already.
'John has watched each of those movies.'

Lastly, since *all* QP is inherently ambiguous between collectivity and distributivity, it can tolerate certain types of collective predicates, such as *gather in the courtyard*. However, when the distributive *also* is introduced in the sentence, it becomes incompatible with the collective predicate and turns the sentence into ungrammatical.

(125) a. All the students gathered in the courtyard.
'All the students gathered in the courtyard.'
b. * All the students *also* gathered in the courtyard.
'The students each gathered in the courtyard.'

To summarise the observations by far, the associates of distributive *also* in SgE should meet certain criteria. They should be definite, plural and overtly quantified. Additionally, the predicate in a sentence must be non-collective.

3.3.1.2 Discontinuous Focus and Scalarity

In Mandarin Chinese, the focus construction of *(lian)…dou* is employed to convey a sense of maximum unexpectedness or unlikelihood on a measurable scale determined

by context. The morpheme *lian* acts as a focus marker, attaching to a specific constitute to form the focused element. In SgE, the equivalent construction adopts the focaliser *even* from English and the distributive marker *also*. Similar to *lian*, *even* in this construction is optional.

(126) a. (Even) his own clothes he *also* sell.
'Even his own clothes, he sold.'
b. (Even) he *also* sell his own clothes.
'Even he sold his own clothes.'

When encountering situations where *lian* and *even* are absent, unlike Mandarin Chinese (127), SgE does not reveal ambiguity between a universal and a focused reading. In (128), only the focused reading is the possible interpretation of the sentence. Y&T emphasise that it is not the case where the requirement of plurality or quantification is abandoned or violated. In fact, a null *even* is involved, attaching to the unquantified NP *his clothes* and then associating with *als*o. In other words, it is the focused phrase, rather than the unquantified NP itself, that serves as the potential target of *also*.

(127) ziji-de yifu ta *dou* mai-le
REFL-POSS clothes he DOU sell-ASP
'He sold all his clothes.'
'He even sold his own clothes.'

(128) His clothes he *also* sell already.
'Even his clothes, he sold.'
*'He sold all his clothes.'

Indeed, in the construction *(even)…also*, the movement of the focused element to a pre-verbal position (or higher) is obligatory as long as the distributive *also* is present. Without such movement, the sentence must be interpreted additively.

(129) a. He sold even his own clothes.
b. * He also sold even his own clothes. (Additive *also* only)

In addition, in Mandarin Chinese, *dou* can be associated with the in-situ scalar items to express the unexpectedness or unlikelihood on the contextually determined measure scale of the proposition (for details, see Section 3.1.1.3). In SgE, the use of *also* is more restricted, but when combined with *until*, a scalar construction can effectively be coordinated with *also* as well.

(130) a. He (even) until now *also* haven't submit his thesis.
b. (Even) until now he *also* haven't submit his thesis.
'Even up till now, he still hasn't submitted his thesis.'

3.3.1.3 Free Choice

Finally, consider the usage of *dou* as a universal FCI licenser. In Mandarin Chinese, *dou* can license a pre-verbal *wh*-word or *wh*-phrase, a pre-verbal disjunction with the support of a possibility modal, such as *keyi* 'can', and the polarity item *renhe* 'any' and turn its associates into universal FCIs. Additionally, in accordance with Shyu (1995), the combination of *lian* and indefinite NPs is eligible to be licensed by *dou*. In SgE, not all of these elements are available. Based on empirical data, SgE allows for the combination of *even* and indefinites (131) as well as the free relative (FR) clause (132) to generate free choice readings.

(131) a. Even a book he *also* never read.
'He did not even read a book.' = 'He did not read any book.'
b. Even one book he *also* never read.
'He did not even read one book.' = 'He did not read any book.'

(132) a. He buy what I *also* like (what).
b. What he buy I *also* like (*what).
c. He buy whatever I *also* like (whatever).
d. Whatever he buy I *also* like (*whatever).
e. *I *also* like what(ever) he buy.
f. *I what(ever) he buy *also* like.
'Whatever he buys, I will like.'

As given in (132), there are two restrictions on the position of the FR clause. First, the

FR clause is asked to be in a clausal initial position to the left of *also* (132f). Second, as exemplified in (132a) and (132c), a bare *wh*-element can remain in its base object position, whereas the fronted *wh*-element within the FR clause in (132b) and (132d) cannot stay in-situ.

3.3.1.4 Interim Summary

Table 3.2-3.4 summarises the similarities and discrepancies in the distribution of *also* and *dou* across various environments. In the context of universal quantification, *dou* can be associated with both quantified and non-quantified NPs, while *also* requires a quantified NP as its associate. Additionally, *dou* is compatible with certain types of collective predicates, whereas *also* is not. In terms of focus and scalarity, both Mandarin Chinese and SgE introduce a focus construction, with SgE using *even* in combination with *also*. However, SgE imposes strict syntactic and semantic requirements on *also* and its associates. Regarding the free choice reading, SgE allows *also* to be associated with free relative clauses, 'any' NPs, and *even* + indefinites. By contrast, Mandarin Chinese permits a broader range of constructions to be associated with *dou* in generating the free choice interpretation.

Table 3.2. Universal Quantification

Environment	Chinese	SgE
Distributive morpheme	*dou*	*also*
Definiteness requirement	Yes	Yes (definite article)
Pre-verbal position (or higher)	Yes	Yes
Non-quantified NPs	Yes	No
Quantified NPs	Yes	Yes
Works with collective predicates	Yes	No

Table 3.3. Focus and Scalarity

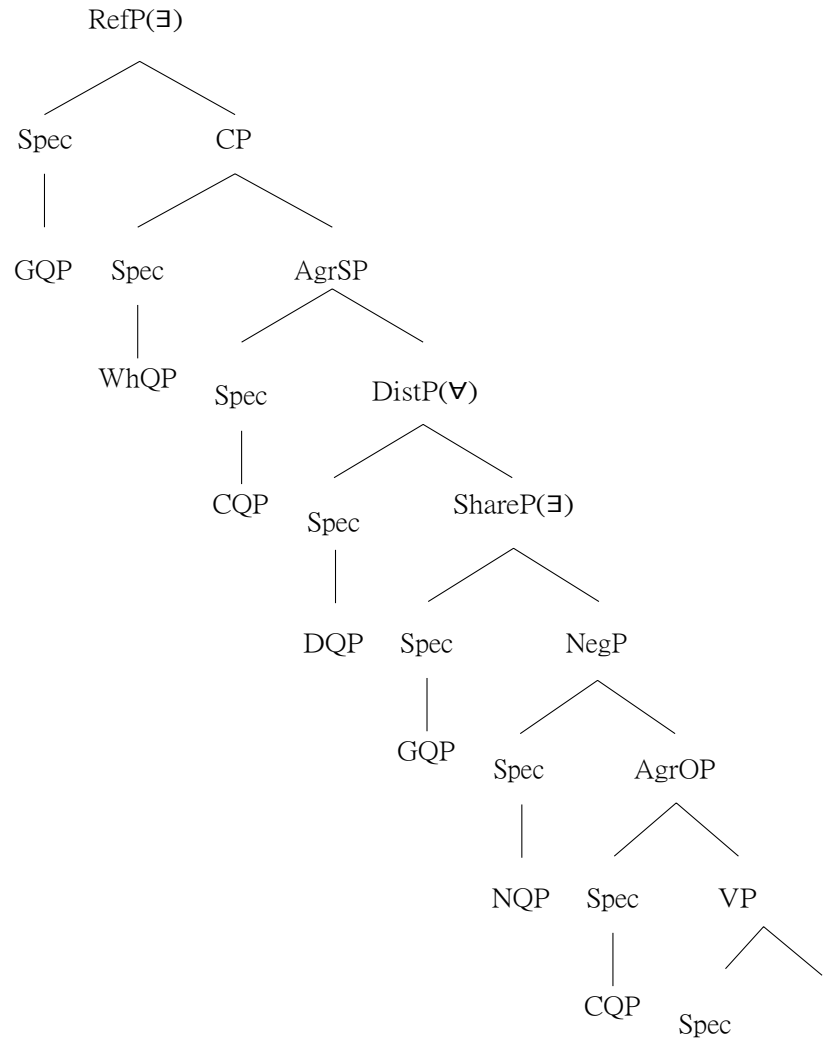
Environment	Chinese	SgE
Focus construction	*(lian)…dou*	*(even)…also*
Pre-verbal or higher	Yes	Yes
Scalar reading	Yes	Restricted

Table 3.4. Free Choice

Environment	Chinese	SgE
Focus + Indefinite = Free Choice?	Yes	Yes
Bare *wh*-phrases	Yes	No
Free relative clauses	Yes	Yes
'Which' NPs	Yes	No (whichever only)
'Any' NPs	Yes	Yes

3.3.2 The Syntactic Derivation of *Also* in SgE

(133)



Drawing on B&S's functional structure of different types of quantifier phrases (133), as well as Rizzi's left periphery structure (1997) and C-T-v-V functional hierarchy, Y&T propose a basic structure for the derivation of *also*, as shown in (134).

(134) Force > Top > Foc > T > Dist > v > V

Then, taking the position of modal into consideration, as demonstrated in (135), the distributive *also* must always precede the modal. In cases where *also* follows the modal, *also* can only be interpreted additively. Moreover, as shown in (136), the impossibility of word order alternation between *also* and the adjunct *later* provides evidence that *also* is not an adjunct. The inverse order of *also* and the modal results in the additive reading being the only available interpretation of the sentence.

(135) a. All you friends (*also*) can (**also*) come to my party.
'Every one of your friends can come to my party.'
b. Even snake John (*also*) can (**also*) eat.
'John can eat even snake.'

c. What he see John (*also*) can (**also*) draw.
'Whatever he sees, John can draw.'

(136) a. All your friends later *also* can come to my party.
b. *All your friends *also* later can come to my party.
c. * All your friends later can *also* come to my party. (Additive only)
'Every one of you friends can come to my party later.'

So far, two key findings have been established. First, there are two distinct manifestations of *also* in SgE: the distributive and the additive. Second, the position of the distributive *also* is fixed and follows a strict pattern. In the subsequent analysis, Y&T consider the effects of *do*-support, negation, and auxiliaries, and confirm that *also* must precede these elements as well (137). As a consequence, by assuming that a subject occupies the specifier position of TP, the following hierarchy is achieved: T_{subj} > Dist > Mod > Neg> v.

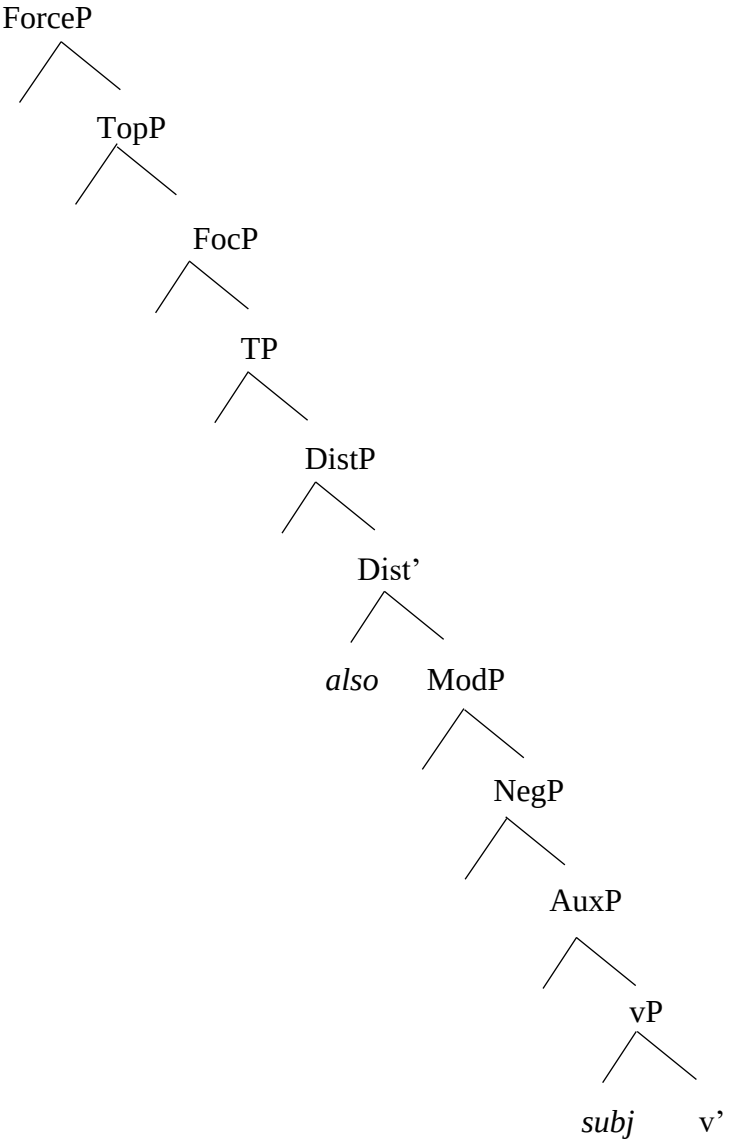
(137) a. All those movies John *also* cannot watch.
b. All those movies John *also* did not watch.
c. All those movies John *also* have not watch.

d. *All those movies John *also* watch not.

The movement of the subject to the Spec of TP is triggered by the Extended Projection Principle (EPP) feature independently and it is distinct from φ-agreement or Case assignment. Correspondingly, the functional projection DistP is positioned between TP and ModP. The final functional structure of the derivation of *also* is presented in (138).

In regard to the syntactic account of the distributive *also*, Y&T propose that *also* is the head of the functional projection DistP. The overt realisation of distributivity asks for the movement of the element associated with *also* to or through the specifier position immediately to the left of *also*. It should be noted that only heads, not adjuncts, occupy this specifier position.

(138)



The proposal of B&S distinguishes between *each*/*every* and *all* in English, where *each*/*every* is strictly distributive and *all* is optionally distributive. The NPs quantified by *each* and *every* belong to DQPs, which act as strong distributors and make distributivity obligatory. *All* quantified NPs belong to GQPs, which always allow a collective interpretation but only allow a distributive interpretation under certain conditions. Strong distributivity is identified in terms of the availability of a [*u*dist] feature. On *each* QPs, this feature is obligatorily present, giving rise to the movement into the Spec of DistP for feature checking or agreement. However, on *every* QPs, this feature is underspecified: when present, the QPs are distributive and move to the Spec of DistP, and when absent, the QPs are universal and do not undergo the movement. On *all* QPs, this feature is unavailable, since the QPs quantified by a group-denoting quantifier are not distributive inherently. As a result, the QPs are not allowed to move to the Spec of DistP. Here, SgE is different from standard English. *All* QPs in SgE are strongly distributive and host an underspecified [*u*dist] when *also* is present. The precondition of singularity mentioned by B&S is no longer effective. Instead, the presence or absence of a [*u*dist] feature on the associates of *also* becomes the determining factor for their association. Furthermore, in contrast to standard English, the distributivity in SgE can be realised through overt movement, not just LF movement. The projection of DistP exists in overt syntax, not just on LF. Y&T further stress that the movement of an associate of *also* to the specifier position of DistP is triggered by the EPP feature on Dist, and distributivity is achieved through the agreement between [dist] and [*u*dist] features, which takes place after the movement. This movement is a purely syntactic phenomenon that relies on the presence of *also*, since the EPP feature on *also* must be satisfied by lifting its associate to the specifier position.

In the context of discontinuous focus, according to Y&T's derivation, the focused *even* phrase raises to the Spec of DistP and then further moves to the Spec of FocP which is located above TP but below TopP. In this construction, following Rooth (1985), *also* is associated with the set of alternatives introduced by the focused phrase and serves as a D-operator that distributes the property over the least expected member of the set of alternatives, confirming that if the least expected member is true, then the more expected members of the set are also true. In the context of free choice, Y&T point out that *wh*-in-situ FRs are base-generated in the specifier position of DistP and bear the feature [*u*dist], while *wh*-moved FRs are base-generated in the object position

and then move to the Spec of DistP. They cannot remain in the Spec of DistP but pass through it and ultimately reside in a high position. In this case, *also* distributes over each member or atom in the set of alternatives provided by the *wh*-quantification of FRs and assigns the properties of predicate through agreement and the valuation/checking of the [*u*dist] feature.

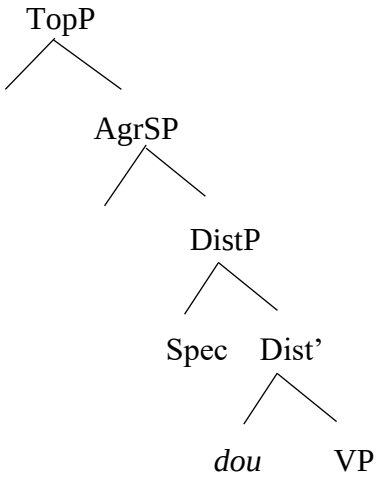
To summarise the key points of the derivation of distributivity in SgE: distributivity is realised overtly in SgE with the help of the distributive operator *also*. *Also* is the head of the functional projection DistP, which is situated between TP and ModP and can be observed in overt syntax, not just in LF. The associates of *also* vary among quantified NPs, focused phrases and FRs. All of these associates must undergo movement to or through the Spec of DistP in order to satisfy the EPP feature and achieve feature agreement/checking. Once the agreement between the [dist] and [*u*dist] features has been established, distributivity is realised. This movement is semantically independent and purely syntactic in nature.

3.3.3 The Syntactic Derivation of *Dou* in Mandarin Chinese

In this section, based on the insights from Y&T's study on *also* in SgE, I will propose a new syntactic account for *dou* in Mandarin Chinese. Drawing on the treatments claimed by Lin and Wu, I adopt the core aspects of Y&T's approach, considering *dou* as the head of the functional projection DistP in the overt syntax. Any associate of *dou* that carries a [*u*dist] feature must move or merge into the specifier position of DistP before raising to a higher position for the purpose of valuing or checking the feature. The successful realisation of *dou*'s distributivity relies on the agreement between the [dist] feature hosted by *dou* and the [*u*dist] feature hosted by the associate.

In Section 3.2.2.1.2, I reviewed Wu's derivation, which is repeated in (139). In my proposal, I replace Agr projections with the C-T-v-V functional hierarchy and extend the left periphery following Rizzi's scheme. Based on these modifications, I initially suggest the following syntactic structure in (140). It is important to note that the presence or absence of tense in Mandarin Chinese is still a topic of debate. For the scope of this study, I will not delve into this issue extensively but position TP above DistP and below FocP, marking it with a pair of brackets.

(139)



(140) ForceP > TopP > FocP > (TP) > DistP > vP > VP

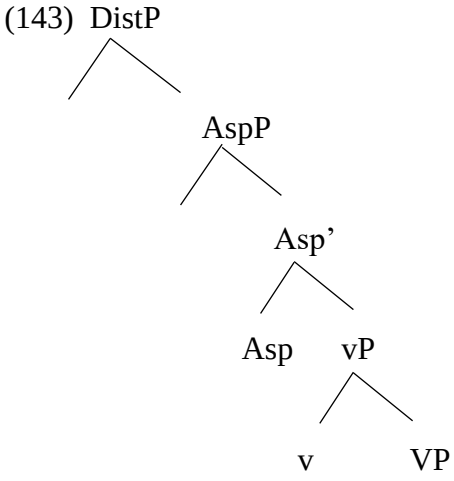
Then, take the Aspectual Phrase (AspP) into consideration. In Mandarin Chinese, aspect can be represented in two systems: pre-verbal and suffixal, as illustrated in (141) and (142), respectively.

(141) a. xuesheng-men *dou* zai tiaowu
student-PL DOU at dance
'All the students are dancing.'
b. haizi-men *dou* you hui jia
kid-PL DOU have return home
'All the kids went home.'

(142) a. xuesheng-men *dou* tiao-zhe wu
student-PL DOU jump-ZHE dance
'All the students are dancing.'
b. haizi-men *dou* hui-le jia
kid-PL DOU return-LE home
'All the kids went home.'

In the analysis of *dou* and aspects in Mandarin Chinese, it is proposed that the relative position of AspP and DistP is fixed, with AspP positioned above vP and below DistP (Huang et al., 2009). The requirement for *dou* to always precede the verb makes the hierarchy AspP > DistP incompatible and therefore needs to be ruled out.

(143)



Compared with aspects, the position of *dou* in relation to modal and negation is more complicated. *Dou* here can either precede or follow a modal or negation, giving rise to scopal ambiguity, as illustrated in (144) to (146).[7] In Mandarin Chinese, scope interactions must be realised in the overt syntax, which explains why different linear orders among *dou*, modal, and negation can lead to different interpretations. Instead of assigning an inflexible position to modal and negation as in English or SgE, I prefer leave this question open and analyse them in specific cases.

(144) a. tamen *dou* keneng ying
they DOU may win
'They each have a possibility of winning'
b. tamen keneng *dou* ying
they may DOU win
'They may all win.'

[7] According to Lin's classification (2011), modals in Mandarin Chinese fall into three general types: the epistemic modals (possibility and necessity), such as *keneng* 'be likely to' and *yinggai* 'should', the deontic modals (obligation), such as *bixu* 'must' and *dei/de* 'has to', and the dynamic modals (ability, permission and volition), such as *neng* 'be able to', *keyi* 'be permitted to' and *yuanyi* 'be willing to'. Tsai (2015) put forward that the projections of the three types of modals emerge on three different layers. Epistemic modals are associated with the information structure and encoded on the complementiser layer. Deontic modals are associated with the event structure and encoded on the inflectional layer. Dynamic modals are associated with the argument structure and encoded on the lexical layer.

(145) a. tamen *dou* mei ying
they DOU not win
'None of them win.'
b. tamen mei *dou* ying
they not DOU win
'Not all of them win.'

(146) a. tamen *dou* keneng bu lai
they DOU may not come
'Each of them has the possibility of not come.'
b. tamen keneng *dou* bu lai
they may DOU not come
'All of them may not come.'
c. tamen bu keneng *dou* lai
they not may DOU come
'It is not possible that all of them come.'

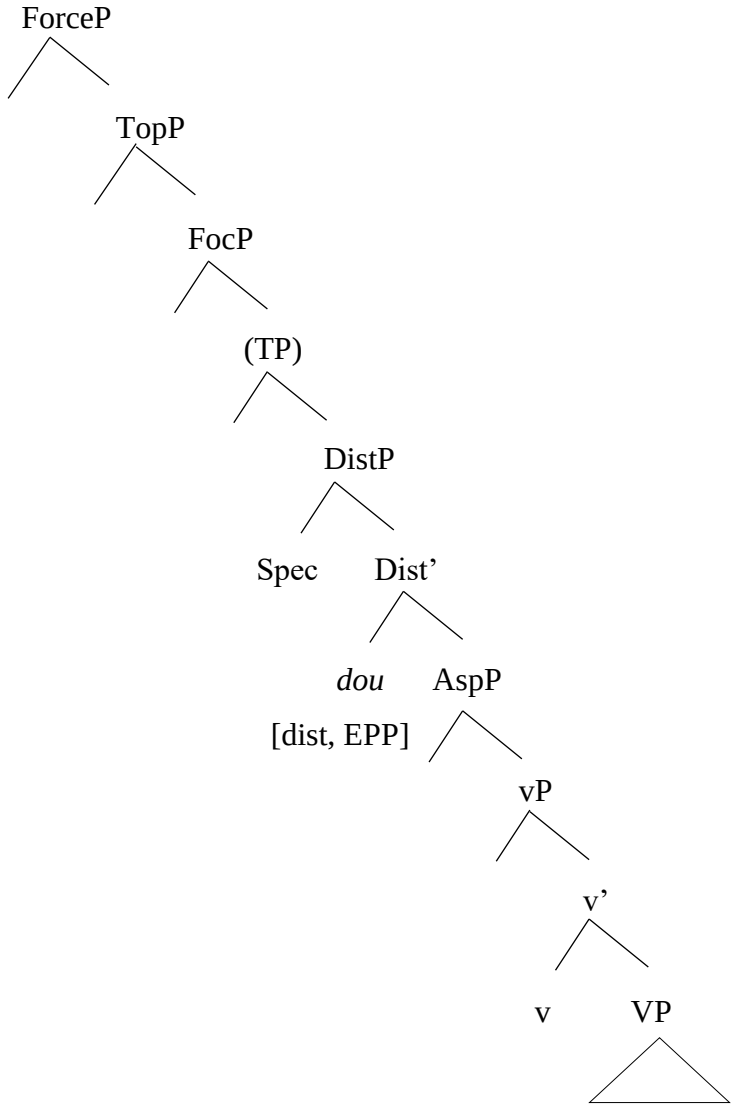
In summary, I propose that *dou* serves as the head of DistP which is situated below TP and above AspP. The functional structure is demonstrated in (147). The associate of *dou* must possess the [*u*dist] feature and undergo movement out of vP or VP to the immediate left of *dou*, occupying the specifier position of DistP. The distributivity of *dou* is achieved overtly through this movement. The movement is triggered by the requirement of EPP feature on the node Dist and the agreement between the [dist] and [*u*dist] features. Once feature checking and agreement has been accomplished, the associate can raise to a higher position from the Spec of DistP.

3.3.4 Conclusion

In this section, I reviewed the proposal of Y&G in regard to the multiple semantic functions of *also* in SgE as well as its potential syntactic derivation. Adopting their approach, I assumed that *dou* in Mandarin Chinese is a head of the functional projection DistP, which is present in the overt syntax. *Dou* carries a [dist] feature that must be checked before Spell-Out and receive a feature agreement with an associate bearing a [*u*dist] feature. The associate can either move to the specifier position of DistP or

directly merge into that position to facilitate feature valuing and feature checking. The realisation of *dou*'s distributivity relies on the agreement between the [dist] feature hosted by *dou* and the [*u*dist] feature hosted by the associate. Subsequently, I presented a syntactic derivation for *dou*, where DistP is situated between AspP and FocP, enabling the element associated with *dou* to undergo further movement to higher positions. The specific location of NegP was not explicitly discussed in this derivation. As scope interpretations of negation are implemented in the surface syntax, the position of NegP may vary. In the next chapter, I will move on to an empirical study focused on the interpretation of quantifiers, including *subete, minna, zen'in* and *dono-mo*, by native Japanese speakers, along with a review of the properties and distributions of these quantifiers in the existing literature.

(147)



Chapter 4

Universal Quantification in Japanese

In Chapter 3, I discussed the semantic and syntactic properties of the morpheme *dou* in Mandarin Chinese, particularly exploring its potential features, including distributivity, maximality, and exhaustivity. In regard to the aim of current SLA study, which focuses on the learnability problem of L1 English and L1 Japanese speakers on the acquisition of the distributivity of *dou*, in this chapter, I attempt to extend the observation to the interpretation of universal quantifiers in Japanese. On the one hand, the same as Mandarin Chinese, Japanese is a numeral classifier language. Bare nouns, for example, can receive various interpretations, including definite, indefinite and generic. Both languages present the phenomenon of scope rigidity, which means that an inverse scope reading is not allowed.[8] On the other hand, Japanese exhibits a range of universal quantifiers that are more flexible and less constrained than *dou*. Their flexibility is evident in various aspects, such as floating positions, 'double quantification' and (non)-split/(non)-adjacency. Moreover, as highlighted by Kuroda (1965), Japanese features a unique *wh*-indeterminate construction with quantificational force. By combining the 'indeterminate pronouns' listed in (1) with different particles, different quantificational forces can be expressed: the universal force with the particle *-mo*, the existential force with the particle *-ka*, and the free choice force with particle *-demo*.

(1)

dare	'who'	nani	'what'
dore	'which (one)'	dono	'which (Det)'
doko	'where'	itu	'when'
naze	'why'	doo	'how'

In the light of the similarities and discrepancies between the two languages, particularly concerning the well-known *wh*-indeterminate construction, in the following sections, I will provide an overview of the properties of four universal quantifiers in Japanese: *subete, zen'in/zenbu, minna* and *dono-mo*. In addition, I will introduce an empirical study, which examines how native Japanese speakers interpret sentences in the subject

[8] In Japanese, if the object is scrambled preceding the subject, both the surface scope reading and the inverse scope reading will be available. However, the scrambling is absent in Mandarin Chinese.

+ universal quantifier + object + VP structure with the four universal quantifiers. On the one hand, this study aims to bridge a gap by offering empirical data on the interpretation of these quantifiers by native Japanese speakers. On the other hand, it serves as a pilot version of the experimental format for the second language acquisition research (presented in Chapter 5).

The remaining sections of this chapter are arranged as follows: Section 4.1 will provide a comprehensive review *dono-mo*, as well as *subete/zen'in/zenbu/minna* individually. Section 4.2 will report the details of the experimental study on the interpretation of Japanese universal quantifiers, including experimental design, hypotheses, procedure and results. Finally, Section 4.3 will briefly summarise the arguments and findings presented throughout the entire chapter.

4.1 The Universal Quantifiers in Japanese

4.1.1 Generalised Quantifier (Barwise and Copper, 1981) versus A-quantification and D-quantification (Partee, 2008)

Before delving into the investigation of universal quantifiers in Japanese, it is necessary to revisit some foundational concepts to ensure a better understanding of the subsequent discussions. Drawing on the principle of generalised quantifier, to capture the quantification in a universal nature, Barwise & Cooper (henceforth B&C) propose an inherent notion that treats noun phrases as quantifiers. The term generalised quantifier, in fact, pertains to the denotation of quantified NP. As illustrated by Cann et al (2009), the denotation of a NP is understood to be a set determined by the restrictor, while the denotation of VP is considered to be a set determined by the main predicate (2).

(2) a. the set denoted by the restrictor → the NP denotation
b. the set denoted by the main predicate → the VP denotation

(Cann et al., 2009, p. 176-177)

According to B&C, quantifiers denote families of subsets of domain E of discourse as given in (3), where Q is a variable ranging over quantifiers. Under this notion, a sentence like *Many men sleep*, can be interpreted as equivalent to *Many men are men who sleep*.

(3) In a model M = <E, || ||>, a quantifier Q lives on a set A ⊆ E if Q is a set of subsets of E with the property that, for any X ⊆ E, X ∈ Q iff (X ∩ A) ∈ Q.

(Yokota, 2014, p. 124)

The core ideas of universal put forward by B&C can be concisely summarised as (4a-b), which indicates that it is impractical to find counterexamples to the following requirements in nature language.

(4) a. U1 NP-Quantifier universal: Every language has syntactic constituents (called noun-phrases) whose semantic function is to express generalised quantifiers over the domain of discourse.

b. Determiner universal: Every language contains basic expressions (called determiners) whose semantic function is to assign to common count denotations (i.e., sets) A, a quantifier that lives on A.

(Barwise & Cooper, 1981)

However, Japanese is a language which lacks overt determiner. Quantifiers in Japanese, unlike English, do not correlate to noun phrases. As a consequence, the requirements in (4) appear to lose their effectiveness. Bach et al (1995), for instance, argues that B&C's generalisation is not sustainable. Partee (1995) presents a different perspective on quantifiers in natural language. She divides the quantifications into two categories: D-quantification and A-quantification. D-quantification is the quantification suggested by NP-internal elements, such as determiners, while A-quantification is the quantification suggested by NP-external elements, such as adverbs. Partee claims that every language employs multiple strategies for expressing quantification. For example, in English, the notion of quantification can be realised both with NPs (5a) and with adverbs (5b).

(4) a. *Every* student does the homework. (*Most* students, *no* students, *three* students, *each* student, *many* students, *at least 10* students…)

b. The weather in the UK is *always* gloomy. (*often, never, seldom, generally, typically, usually, almost always, in most cases*…)

c. *Usually*, if a dog barks, it does not bite.

(Based on Partee, 2008, p. 2-3)

D-quantification, here, can be regarded as the composition of a D-quantifier (e.g., *all, each* and *every*) and a noun, quantifying over entities. By contrast, A-quantification concerns predicates, quantifying over events or situations. A-quantification can be expressed not only through adverbs but also through verbal affixes, auxiliaries, argument-structure adjusters, special distributivity operators, or other categories. Keenan and Paperno (2012) even suggest that in some cases, A-quantifiers may be derived from D-quantifiers, although the reverse pattern is extremely uncommon.

Nishiguchi (2007) challenges the applicability of generalised quantifier theory directly to Japanese. As a determiner-less language, Imani (1990) proposes that the quantification in Japanese is based on a relation between two predicates. However, Nishiguchi disagrees with this viewpoint by identifying that quantificational elements in Japanese do not always take exactly two arguments. In fact, the number of arguments is underspecified in Japanese. Nishiguchi states that "any number of NPs, provided there is a predicate—either a verb or an adjective—in the sentence final position" (p.155). Furthermore, Nishiguchi recognises that word order influences interpretations, such as definiteness/indefiniteness and collectivity/distributivity. Quantities are often expressed through predicative adjectives. In (5a), the prenominal quantifier phrase *3-nin-no gakusei* 'three students' denotes to a unique set of entities within the domain of discourse. Its interpretation is definite and exhaustive and it does not overlap with the following sentence. By contrast, in (5b), the postnominal quantifier phrase *gakusei-ga 3-nin* 'three students' is not exhaustive. It does not refer to exact three students in a domain or limit the number of students. As a consequence, the following sentence can suggest two other students felicitously. In other words, a non-split quantifier phrase presupposes a unique set of entities, which brings about the definiteness, while a split quantifier does not presuppose its referents, leading to the indefiniteness.

(5) a. #3-nin-no gakusei-ga kino hataraita mo hutari-mo hataraita
3-CL-GEN student-NOM yesterday worked more 2-CL-also worked
'The three students worked yesterday. Two others worked, too.'
(exhaustive)

b. gakusei-ga kino 3-nin hataraita mo hutari-mo hataraita
student-NOM yesterday 3-CL worked more 2-CL-also worked.
'Three students worked yesterday. Two others worked, too.'
(non-exhaustive)

(Nishiguchi 2007, p. 157)

The difference between non-split and split quantifier phrases can be observed on collective/distributive interpretations as well. As shown in (6a), the sentence with a non-split quantifier phrase can be interpreted either collectively or distributively. It implies that the object *keeki* 'cake' could take a wider scope over the subject *3-nin-no gakusei* 'three students. However, in (6b), the split quantifier phrase always takes a wider scope over the object NP. The distributive reading becomes the only possible interpretation of the sentence.[9]

(6) a. 3-nin-no gakusei-ga keeki-o tsukutta
3-CL-GEN student-NOM cake-ACC made
'The three students made a cake together.'
Or 'The three students each made a cake.'
b. gakusei-ga 3-nin keeki-o tsukutta
student-NOM 3-CL cake-ACC made
'Three students each made a cake.'

To summarise so far, how to define quantifiers in Japanese is a subject of debates for decades. Outlining the two mainstream views here is not meant to determine which methodology is prevailing, but rather to facilitate a better understanding of the

[9] The interpretation of floating numeral quantifier (FNQ) is debatable. There is a widely accepted assumption that the FNQ sentence generally call for a distributive reading and an FNQ is a distributive operator (Terada 1990; Kobuchi-Philip 2003, 2007; Nakanishi 2004, 2007, 2008). However, as exemplified in (i), it still nature for a sentence with an FNQ to obtain a non-distributive interpretation. According to Nakanishi (2004, 2007, 2008), the insertion of a prosodic boundary which represents a long pause will help to rule out the non-distributive reading.

(i) gakusei-ga (//) 5-nin tsukue-o mochiageta
student-NOM 5-CL desk-ACC lifted
'Five (of the) students each lifted a desk.' (distributive)
Or 'Five students lifted a desk together.' (non-distributive)

(Nakanishi, 2007, 2008)

following sections. The issue of the interpretation of FNQ can be observed with other quantifiers as well. I will move on to the particle *-mo* and indeterminates, followed by an examination of other quantifiers, including *subete, zen'in, zenbu* and *minna*.

4.1.2 *Wh*-indeterminate and particle *-mo*

Kuroda (1965) defines *wh*-phrases in Japanese as indetermined pronouns (henceforth indeterminates) based on their interpretations in association with particles. For example, when combined with the particle *-mo*, indeterminates can receive a universal expression (7a). When associated with the particle *-ka*, indeterminates can obtain an existential expression (7b).

(7) a. *dare-mo*-ga hon-o yonda
ind-MO-NOM book-ACC read
'Everyone read a/the book(s).'
b. *dare-ka*-ga hon-o yonda
ind-KA-NOM book-ACC read
'Someone read a/the book(s).'

Table 4.1 presents some of the indeterminates and their corresponding universal interpretations when combined with the particle *-mo*. *Nani-mo* and *naze-mo* cannot be accepted as universal quantifiers for specific reasons, as indicated by the asterisks.

Table 4.1. Indeterminates and the corresponding interpretations with particle *-mo*

Indeterminate	Particle *-mo*
dare 'who'	dare-mo 'everyone'
doko 'where'	doko-mo 'everywhere'
dore 'which'	dore-mo 'everything'
nani 'what'	*nani-mo
itu 'when'	itu-mo 'always'
naze 'why'	*naze-mo
dono-hon 'which book'	dono-hon-mo 'every book'

(Yatsushiro, 2009)

Now, the question arises in regard to the role of the particle *-mo* in cases where a universal interpretation can be generated. Literally, similar to the morpheme *dou* in Mandarin Chinese, *-mo* in Japanese exhibits functional diversity. In (8a), when associated with the indeterminate *dono-hito* 'which person', it reveals a universal quantification force in affirmative declarative sentences (Watanabe, 1992; Shimoyama, 2001, 2006; Kobuchi-Philip, 2008, 2009, 2010). In (8b), with a negated verb, the combination of *-mo* and an indeterminate pronoun *dare* 'who' yields the interpretation of "none" (Aoyagi, 1994; Watanabe, 2004). In (8c), it functions as part of a minimizer NPI in a numeral classifier construction (Watanabe, 2004). In (8d), it serves as an additive particle (Shudo, 2002).

(8) a. *dono-hito-mo* hashitta
which-person-MO ran
'Everybody ran.'
b. *dare-mo* hashira-na-katta
who-MO run-NEG-PAST
'Nobody ran.'
c. hito-ri-*mo* hashira-na-katta
one-CL-MO run-NEG-PAST
'Not one person ran.'
d. John-*mo* hashitta
John-MO ran
'John also ran.'

(Kobuchi-Philip, 2009, p.1)

Due to the aim of current study, I will primarily engage in the universal quantificational use of *-mo* and leave its other semantic usages as an open question for further discussion. Notably, Shimoyama (2001, 2006) puts forward a significant proposal known as the 'direct restrictor' analysis of indeterminate phrase quantification. In this proposal, Shimoyama adopts the view of earlier works and treats *-mo* as a universal quantifier. Furthermore, Shimoyama points out that it is *mo*'s entire sister phrase that serves as the restrictor of the universal quantifier *-mo*. Therefore, the restrictor of *-mo* in (9) would be the entire NP *dono gakusei-no okaasan* 'which student's mother', rather than the

embedded NP *dono gakusei* 'which student'. In other words, the surface syntax precisely determines the configuration of -*mo* with its restrictor.

(9) *dono*-gakusei-no okaasan-*mo* odotta
which-student-GEN mother-MO danced
'Every mother of a student danced.'

(10) presents the definitions of -*mo* and X-*mo* in accordance with Shimoyama's proposal[10]. In this analysis, if X is the nominal element associated with the particle -*mo*, -*mo* itself is an element of type <<e, t>, <<e, t>, t>> and X-*mo* becomes a generalised quantifier of type <<e, t>, t>. From this perspective, it is not surprising that -*mo* can be considered a universal quantifier, comparable to *every* in English.

(10) a. mo = $\lambda P \lambda Q \forall x[P(x) \rightarrow Q(x)]$, where $x \in D_{\iota}$, and $P, Q \in D_{<\iota, t>}$
b. [[X]-mo] = $\lambda Q \forall x[P(x) \rightarrow Q(x)]$, of type $<<\iota, t>, t>$

Even though Shimoyama's treatment has made a substantial improvement over the analysis of embedded restrictor, it is not an all-in-one solution when encountering cases like (11) and (12).

(11) a. *dono-hito-mo* odotta
which-person-MO danced
'Every person danced.'
b. gakusei-no okaasan-ga *dono-hito-mo* odotta
student-GEN mother-NOM which-person-MO danced
'All the mothers of the students danced.'

(12) a. John-ga *dono-hito-mo* hometa
John-NOM which-person-mo praised
'John praised every person'

[10] ι is a variable ranging over any semantic type.

b. John-ga gakubu-no gakausei-o *dono-hito-mo*
John-NOM department-GEN student-ACC which-person-MO
hometa
praised
'John praised every student in the department.'

(Kobuchi-Philip, 2009, p.3)

In (11a), the *mo*-phrase can be regarded as the subject of the sentence, but in (11b), except for the *mo*-phrase, there is already an overt subject in the sentence initial position. Similarly, in (12a), the *mo*-phrase can serve as the object, but in (12b), an overt object explicitly co-exists with the *mo*-phrase. In line with Shimoyama's analysis, (11b) and (12b) would be considered ungrammatical, whereas in reality, both are grammatically acceptable. Taking these cases into consideration, Kobuchi-Philip (2008) points out that the *mo*-phrase is an adjunct rather than an argument. Sentences like (11a) and (12a) essentially contain a null subject or a null object. Kobuchi-Philip's suggestions are listed in (13).

(13) a. *Mo*-phrase is a modifier of type <<e, t>, <e, t>>, thus there is a phonologically null subject for sentences which lack an overt one.
b. The semantic value of a null subject is drawn from the NP in the *mo*-phrase.
c. mo = λPλRλx[xΠ⊕(P ∩ AT(⊕R)) ∧ |AT(x)| ≥ 2

Kratzer and Shimoyama (2002) (henceforth K&S) examine the semantics of indeterminates and the particle -*mo* employing the Hamblin mechanism (for details, see Chapter 3). They indicate that indeterminates introduce sets of alternatives that continue expanding until they encounter an operator which picks them. With respect to the variety of semantic types among the alternatives, such as individuals, properties and propositions, a quantifier capable of handling alternatives of any semantic type is required. The universal quantifier -*mo* in this approach plays a role of regular generalised quantifier. In addition, the Hamblin approach allows for an analysis of long-distance association between indeterminates and particles, as exemplified in (14).

(14) [[*dono*-hon-o yonda] kodomo]-*mo* yoku nemutta
which-book-ACC read child -MO well slept
'For every book x, the child who read x slept well.'

In (14), the indeterminates *dono hon* 'which book' and the particle -*mo* reside in different clauses. According to the Hamblin's approach, it is arbitrary to draw a conclusion that indeterminates must be associated with the closest available operator. Instead, the alternatives introduced by the indeterminate can cross over the relative clause boundary by means of expansion and be selected by the first relevant operator encountered along its path.

Yatsushiro focuses on the distribution of -*mo* when the particle is not adjacent to the indeterminate and argues that the indeterminate must be c-commanded by the particle it is associated with, as given in (15). Otherwise, the absence of the particle leads to the ungrammaticality, as given in (16).

(15) a. taroo-ga [*dono* gakusei-ga kaita hon]-*mo* yonda
Taro-NOM which student-NOM wrote book-MO read
'Taro read books that every student wrote.'
b. **dono* gakusei-ga [taroo-ga kaita hon]-*mo* yonda
which student-NOM Taro-NOM wrote book-MO read

(16) * taroo-wa nani-o yonda
Taro-TOP what-ACC read

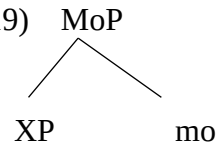
(Yatsushiro, 2009, p.144)

Comparing the sentences in (17), it can be found that although -*mo* is eligible to be attached to an element which is a direct object, it cannot be associated with the element that is an argument of another noun. In (18), the indeterminate and the noun *tomodati* 'friend' together form an argument of the postposition that the particle -*mo* is conjoined with. However, when -*mo* is inserted between the noun and the postposition, the sentence turns into ungrammatical.

(17) a. taroo-wa [*dono* gakusei]-*mo* syootausita
Taro-TOP which student-MO invited
'Taro invited every student.'
b. *taroo-wa [*dono* gakusei]-*mo*-no tomodati-o syootaisita
Taro-TOP which student-MO-GEN friend-ACC invited
(Yatsushiro, 2009, p. 145)

(18) a. taroo-wa [*dono* gakusei]-no tomodati-kara-*mo* tegami-o
Taro-TOP which student-GEN friend-from-MO letter-ACC
uketotta
received
'Taro received a letter from a friend of every student.'
b. *taroo-wa [*dono* gakusei]-no tomodati-*mo*-kara tegami-o
Taro-TOP which student-GEN friend-MO-from letter-ACC
uketotta
received
(Yatsushiro, 2009, p. 146)

Yatsushiro summarises the distribution of -*mo* with the configuration presented in (19). Here, -*mo* is the head of the projection MoP, which takes a phrase containing an indeterminate as its argument. As exemplified above, it is inappropriate to place -*mo* in the phrase-intermediate position. The entire MoP is ineligible to serve as an argument of a noun or a postposition in cases where the particle and the indeterminate are split.

(19)


Moreover, Yatsushiro specifies that -*mo*, as a universal quantifier, should take sentential scope. In (20), the application of the particle -*mo* on different elements directly results in contrasting interpretations. In (20a), where the particle and the indeterminate are non-split and reside in the same relative clause which is the subject of the sentence, the sentence should be interpreted as *there is a book (or books) that*

everyone co-wrote. That book is/ books are interesting. The event involving everyone must be understood collectively. However, in (20b), the particle is suffixed to the phrase containing the indeterminate. In this case, the sentence must be interpreted distributively, indicating that *everyone wrote their own books individually, and each of those books is interesting*.

(20) a. [[dare-mo-ga kaita] hon]-ga omosirokatta
who-MO-NOM wrote book-NOM was interesting
'The book that everyone wrote is interesting.'
b. [[dare-ga kaita] hon]-mo omosirokatta
who-NOM wrote book-MO was interesting
'Every book that a person wrote is interesting.'

(Yatsushiro, 2009, p. 148)

4.1.3 *Subete, Zen'in, Zenbu, Minna*

Compared with the extensive literature on the construction of indeterminates and particles, there is limited research on the universal quantifiers, such as *subete, zen'in/zenbu* and *minna*, in Japanese. Thus, in this section, I will provide fragments of information from the literature as evidence for further investigation into these quantifiers.

First of all , *subete, zen'in, zenbu* and *minna* can generally perform as floating quantifiers (FQs) as well as determiner quantifiers (DQs). (21) gives an example of *subete* which serves as both an FQ (21a) and a DQ (21b). It is important to note that during personal communication with native Japanese speakers, some pointed out that sentences like (21a), where *subete* is inserted between the subject and object without a comma or an overt pause preceding or following it, may seem ambiguous. Supposedly, the universal quantifier *subete* could apply to either the subject or the object. However, I cannot find a source to support this view. To avoid any potential confusion during the experimental process, I included a comma after each occurrence of *subete* when designing test items. Furthermore, Kobuchi-Philip (2007) claims that *minna* may not always occur as a DQ in the form Q-no NP, but can occur as an argument without any dominant NP, as shown in (22). Here, the ungrammaticality of (22b) only arises due to

the intended meaning. It is legitimate for *minna*, suffixed by the genitive particle *-no*, to be associated with an NP and yields the meaning "everyone's NP".

(21) a. gakusei-ga *subete* hon-o katta
student-NOM all book-ACC bought
'The students all bought a book.'
b. *subete*-no gakusei-ga hon-o katta
all-GEN student-NOM book-ACC bought
'All the students bought a book'

(22) a. gakusei-ga *minna* kita
student-NOM all came
'The students all came.'
b. * *minna*-no gakusei-ga kita
all-GEN student-NOM came
'All the students came.' (Intended meaning)
c. *minna*-ga kita
all-NOM came
'All came.'

(Kobuchi-Philip, 2007, p. 821)

Second, in Japanese, it is possible to have 'double quantification' in a single sentence. Mizuguchi (2014) presents an analysis on the co-occurrence of two quantifiers. Following Gunji and Hasida (1998), Mizuguchi argues that the pre-nominal 'quantifier' is a cover rather than a quantifier (for the details of cover, see Chapter 3). That is to say, the role of the pre-nominal 'quantifier' is to identify the range over which post-nominal quantifier scopes, based on the set of sets selected from universal discourse. However, Mizuguchi fails to provide a systematic semantic derivation of post-nominal quantifiers or a further explanation as to why floating universal quantifiers in the sentences, as shown in (23a-b), can be omitted. In (23b), the indeterminate with universal quantification *dono sakuhin-mo* 'every piece of work' gets along well with the universal quantifier *zenbu* 'all' and remains grammatical even when *zenbu* is absent.

(23) a. Arayuru-toi-ni (*subete*) kotaeru
all-question-LOC (all) answer
'I answer all the questions.'

b. *dono-sakuhin-mo* (*zenbu*) rikisakuda
which-work-MO (all) outstanding
'Every piece of work is outstanding.'

Third, numeric quantifiers can co-occur with universal quantifiers, but under certain conditions. First, the linear order of a numeral and a universal is inflexible (24). Second, only a universal quantifier can be preceded by a numeric quantifier, resulting in a floating/stranded universal numeric quantifier (25). Any other quantifier, such as *hotondo* 'most' and *takusan* 'many', cannot be applied in this way. Third, the combination of a numeric quantifier and a universal quantifier is not compatible with a partitive interpretation (26).

(24) a. taroo-wa gyoza-o hyaku-ko *subete* tabe-ta
Taro-TOP dumpling-ACC 100-CL all eat-PAST
'Tare ate all of the 100 dumplings.'
b. *taroo-wa gyoza-o *subete* hyaku-ko tabe-ta
Taro-TOP dumpling-ACC all 100-CL eat-PAST
'Taro ate all of the 100 dumplings.' (Intended meaning)

(25) a. taroo-wa tsukue-ni aru gyooza-o *takusan/hotondo*
Taro-TOP table-DAT be dumpling-ACC many/most
tabe-ta
eat-PAST
'Taro ate many/most of the dumplings on the table.'
b. taroo-wa tsukue-ni aru gyooza-o hyaku-ko
Taro-TOP table-DAT be dumpling-ACC 100-CL
**takusan/*hotondo/subete* tabe-ta
*many/*most/all eat-PAST
'Taro are *many/*most/all of the 100 dumplings on the table.'

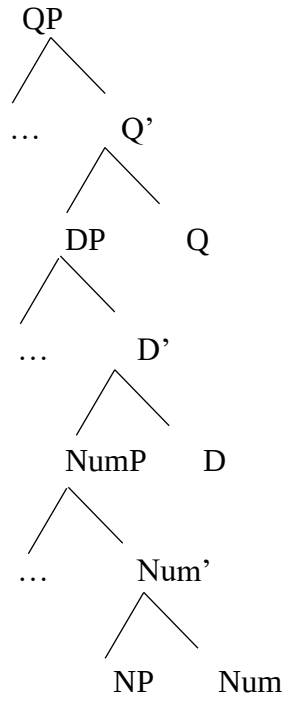
(26) a. taroo-wa tsukue-ni aru gyooza-o hyaku-ko *subete*
Taro-TOP table-DAT be dumpling-ACC 100-CL all
tabe-ta
eat-PAST
'Taro ate all of the 100 dumplings on the table.'

b. * taroo-wa tsukue-ni aru hyaku-ko-no gyoza-o
Taro-TOP table-DAT be 100-CL-GEN dumpling-ACC
sanjyu-ko *subete* tabe-ta
30-CL all eat-PAST
'Taro ate all of the 30 dumplings out of the 100 dumplings on the table.'
(Intended meaning)

Adopting Matthewson's proposal on the categorisation of quantifiers (2001, 2013), Oho (2020) puts forward a typological analysis of Japanese quantifies, including *subete* and *hotondo*. Matthewson classifies the strong quantifier into two types: D-quantifier (type <et, <et, t>>) and Q-quantifier (type <e, <et, t>>). To identity the semantic type of *subete* and *hotondo*, Oho starts with the nominals, i.e., bare nouns, that the strong quantifier associated with and reveals that similar to the semantic type of bare nouns in English, bare nouns in Japanese are type-e as well. That is to say, Japanese strong quantifiers belong to Q-quantifiers. With the help of the felicity/infelicity of generic-episodic readings and the possibility of partitive readings on par with *all* in English, Oho further confirms that strong quantifiers, such as *subete* and *hotondo* in Japanese, are Q-quantifiers with the semantic type <e, <et, t>>.

Taking into account the scrambling of numerals, approximate numerals and quantifiers, Kawashima (1998) demonstrates a single constituent analysis of extended nominal phrases, as illustrated in (27). In this structure, the quantifier, such as *subete*, is the head projecting its own maximal projection QP and takes DP as its complement. DP, in turn, selects NumP as its complement, and NumP selects NP as its complement. In this single constitute construction, Q, the quantifier, projects the highest nominal projection.

(27)



(Kawashima, 1998, p. 8)

Based on the structure in (27), it is evident that a quantifier is eligible to directly follow the noun phrase it associated with (28a). Furthermore, a numeral can co-occur with a quantifier and together follow the noun phrases they associated with (28b). However, there is a restricted order where the quantifier must follow the numeral (28c).

(28) a. gakusei-ga hon-o *subete* katta
student-NOM book-ACC all bought
‘A student bought all the books.’
b. gakusei-ga hon-o 3-satu *subete* katta
student-NOM book-ACC 3-CL all bought
‘A student bought all the three books.’
c. *gakusei-ga hon-o *subete* 3-satu katta
student-NOM book-ACC all 3-CL bought

(Kawashima, 1998, p. 5)

Homma (2013) probes into the scope properties of *zen’in* and *zenbu* in a comparative study with English *all*. He first identifies two types of QPs in Japanese: Type 1 are presuppositional which has a quantifier in the specifier position of DP and undergoes quantifier rising (QR), such as *subete-no* N ‘all of the Ns’, *hotondo-no* ‘most

of the Ns' and *san-nin-no* N 'three of the Ns', and Type 2 are nonpresuppositional in most cases which does not have a quantifier in the specifier position of DP and does not undergo QR, such as N-*ga/o san-nin/subete/hotondo* 'three/ all of the/ most of the Ns'. Then, he points out that the scope of *zen'in/zenbu* is not identical to the scope of Type 1 QPs, and the features possessed by *zen'in/zenbu* are not similar to those possessed by Type 2 QPs.

Zen'in and *zenbu* can be considered as bimorphemic words consisting of a universal quantifier *zen-* 'all' and a morpheme *-in*, which is restricted to humans, and *-bu*, which is restricted to non-humans. In comparison with Type 1 QPs, on the one hand, *zen'in/zenbu* reveals the same scope regarding the acceptability of object-wide reading when scrambling takes place, as exemplified in (29) and (30). On the other hand, *zen'in/zenbu* cannot take a wide scope over negation but must take a narrow scope under negation, whereas object Type1 QPs can take either a wide scope or a narrow scope, as shown in (31) and (32).

(29) a. hutari-no sensai-ga *subete*-no gakusei-o sidoo-sita
two-CL-GEN teacher-NOM all-GEN student-ACC supervised
'Two teachers supervised every student.'
[2 > ∀, *∀ > 2]

b. *subete*-no gakusei-o hutari-no sensai-ga sidoo-sita
all-GEN student-ACC two-CL-GEN teacher-NOM supervised
'Every student, two teachers supervised.'
[2 > ∀, ∀ > 2]

(Homma, 2013, p. 28)

(30) a. hutari-no sensai-ga *zen'in*-o sidoo-sita
two-CL-GEN teacher-GEN all-ACC supervised
'Two teachers supervised everyone.'
[2 > ∀, *∀ > 2]

b. *zen'in*-o hutari-no sensai-ga sidoo-sita
all-ACC two-CL-GEN teacher-NOM supervised
'Everyone, two teachers supervised.'
[2 > ∀, ∀ > 2]

(Homma, 2013, p. 29)

(31) taroo-wa *subete*-no hito-o seme-nak-atta
Taro-TOP all-GEN person-ACC blame-NEG-PAST
'Taro did not blame all the people.'
[∀ > Neg, Neg > ∀]

(Homma, 2013, p. 30)

(32) taroo-wa *zen'in*-o sema-nak-atta
Taro-TOP all-GEN blame-NEG-PAST
'Taro did not blame all.'
[??∀ > Neg, Neg > ∀]

(Homma, 2013, p. 30)

Homma attributes this scope difference between *zen'in/zenbu* and Type1 QPs to the lack of QR in the former. He claims that *zen'in/zenbu* itself is the head N in the entire structure of DP. Since the prefix *zen-* already serves as a universal quantifier, the specifier position of DP should keep vacant. As a consequence, it cannot satisfy the requirement for QR. By contrast, Type 1 QPs consist of a quantifier in the specifier position of DP and a noun under NP. The [q] feature hosted by the quantifier triggers the QR by means of covert movement. Homma suggests that if the [q] feature covertly adjoints to TP, the QP is capable of taking a wide scope over the negation. If the [q] feature attaches to vP, the wide scope of negation arises. The landing site of the [q] feature, whether it c-commands or is c-commanded by the NegP, determines the scope relation between the QP and negation.

Moreover, Homma finds out that even though both *zen'in/zenbu* and Type2 QPs do not undergo QR, the latter prevents the scrambled object QP from taking a wide scope over the subject QP, as illustrated in (33). By contrast, *zen'in/zenbu* is capable of taking a wider scope over the subject QP in the situation where *zen'in/zenbu* is scrambled to the left of the subject (34).

(33) a. gakusei-o san-nin *subete*-no hito-ga semeta
student-ACC three-CL all-GEN person-NOM blamed
'Three students, every person blamed.'

[∀ > 3, *3 > ∀]

b. hon-o ni-satu *dare-mo-ga* yonda
book-ACC two-CL who-MO-NOM read
'Two books, everyone read.'
[∀ > 2, *2 > ∀]

(Homma, 2013, p. 36)

(34) a. *zen'in*-o hutari-no sensai-ga sidoo-sita
everyone-ACC 2-CL-gen professor-NOM supervised
'Everyone, two professors supervised.'
[∀ > 2, 2 > ∀]

b. *zenbu*-o hutari-no gakusei-ga utatta
everything-ACC 2-CL-GEN student-NOM sang
'Everything, two students sang.'
[∀ > 2, 2 > ∀]

(Homma, 2013, p. 37)

Homma proposes that *zen'in/zenbu* possesses a [+topic] feature that distinguishes them from Type2 QPs. According to Miyagawa (2010), the subject in Japanese moves from its base-generated position, i.e., the Spec of vP, to the Spec of TP due to the attraction of the [+topic] feature on T. When the object is scrambled to the left of the subject, the [+topic] feature on the object is attracted by the [+topic] on T, leading to the movement of the object from the specifier position of VP to the specifier position of TP. At the same time, the subject remains in its original position. Since the object is in a position that c-commands the subject, it can take a wide scope. In summary, *zen'in/zenbu* differs from Type 1 QPs in not undergoing QR, and it differs from Type 2 QPs as its scope may depend on the [+topic] feature.

4.1.4 Interim Summary

Based on the literature, it can be observed that although *dono-mo, zen'in/zenbu, minna* and *subete* present different semantic and syntactic properties, they are all treated as universal quantifiers or elements with universal quantification force. *Minna*, can work as an argument in a sentence lacking a host NP or as a FQ, instead of being a DQ or a

pre-nominal quantifier associated with the genitive particle *-no*. *Subete,* when placed between the subject NP and the object NP without the insertion of additional elements like modifiers (PP, episodic context, etc.), appears to evoke ambiguous interpretations. *Zen'in/zenbu*, being a bimorphemic word, does not fit neatly into the categories of typical floating or determiner quantifiers. The universal quantifier *zen-* can combine with other base morphemes, such as *koku* 'nation', *kai* 'committee' and *koo* 'school', and denotes the totality of the entities denoted by the base morpheme, rather than the maximum number in the set of entities. In the case of *dono-mo*, the *wh*-indeterminate construction presents a universal quantification force, wherein the particle *-mo* serves as a universal quantifier. On the whole, *dono-mo, zen'in/zenbu, minna* and *subete* can all function as floating quantifiers and are compatible with other universal quantifiers/interpretations within the same sentence. However, unlike the interpretation of floating numeral quantifiers which has been discussed in section 4.1.1 (distributive versus collective), the specific interpretation of these four universal quantifiers are still underspecified in the existing literature. There is no clear answer as to which type(s) of readings, a sentence with these quantifiers requires naturally. In the next section, I will introduce an experimental study on the comprehension of these four universal quantifiers by native Japanese speakers in collective and distributive conditions.

4.2 Experimental Study on Universal Quantifier in Japanese

4.2.1 Methodology

In this preliminary study, a sentence-picture matching task was administered to a group of native Japanese speakers. The objective of this study was to investigate the interpretation of the four universal quantifiers by native Japanese speakers and to offer new empirical data in an underexplored research domain.

In the sentence-picture matching task, each critical item consisted of one or two pictures depicting an event and its consequence, along with a simple SVO sentence containing a universal quantifier inserted between the subject and object NPs. The scenario depicted in the pictures expressed a sense of either collectivity or distributivity. The subject NP was composed of a noun and the plural suffix *-tachi*, and the verbs were all in the past tense. Examples of the critical items with the four universal quantifiers are exemplified in (35a) to (35d). To avoid ambiguity, a comma was inserted between

the quantifier and the object NP in the sentence with *subete*, as shown in (35a), so that *subete* only quantified over the subject NP. In (35d), in order to keep the critical items in a similar linear pattern, instead of using *dono-mo* alone as the subject (e.g., *dono-kodomo-mo yukidaruma-o tsukutta* 'every kid made a snowman'), the indeterminate was applied together with a host subject NP to express universal quantification force.

(35) a. kodomo-tachi-wa *subete*, yukidaruma-o tsukutta
kid-PL-TOP all snowman-ACC made
'The kids all made a snowman.'

b. kodomo-tachi-wa *minna* yukidaruma-o tsukutta
kid-PL-TOP all snowman-ACC made
'The kids all made a snowman.'

c. kodomo-tachi-wa *zen'in* yukidaruma-o tsukutta
kid-PL-TOP all snowman-ACC made
'The kids all made a snowman.'

d. kodomo-tachi-wa *dono-hito-mo* yukidaruma-o tsukutta
kid-PL-TOP which-person-MO snowman-ACC made
'The kids all made a snowman.'

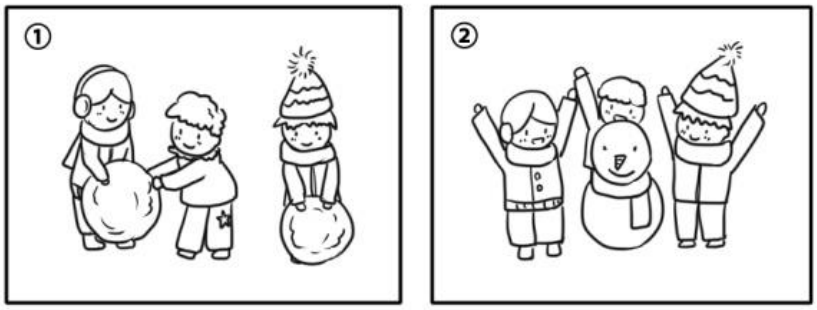
Figure 4.1 and Figure 4.2 demonstrate the collective and distributive conditions for the sentence given in (35). The collectivity of the event is indicated through the pictures of the kids working together to build ONE snowman in Figure 4.1, while the distributivity is presented through the pictures of each kid building a SEPARATE snowman in Figure 4.2. In total, six out of the twelve critical sentences were presented with a collective condition and six with a distributive condition. Moreover, two sets of test items were created: one with *subete* and *minna* items, and the other one with the *zen'in* and *dono…mo* items. Within each set, two lists were created, referred to as List 1 and List 2 (representing *subete* and *minna* items), and List 3 and List 4 (representing the *zen'in* and *dono…mo* items). Taking List 1 and List 2 as an example, in Table 4.2, the sentences from List 1 were paired with the quantifier *minna,* while from List 2 were paired with the quantifier *subete.* Similarly, the sentences from List 1 were associated with the quantifier *subete*, while from List 2 were associated with the quantifier *minna*. Overall, for each universal quantifier, three out of six sentences were paired with the

collective condition, and three with the distributive condition. The four lists had no overlapping items, and each combination appeared only once.

Table 4.2. The distribution of critical items in List 1 and List 2

List 1				List 2			
subete		*minna*		*subete*		*minna*	
coll.	dist.	coll.	dist.	coll.	dist.	coll.	dist.
Item 1	Item 7	Item 4	Item 10	Item 4	Item 10	Item 1	Item 7
Item 2	Item 8	Item 5	Item 11	Item 5	Item 11	Item 2	Item 8
Item 3	Item 9	Item 6	Item 12	Item 6	Item 12	Item 3	Item 9

Note. coll = collective condition, dist = distributive condition.



kid-PL-TOP *subete / zen'in / minna / dono-hito-mo* snowman-ACC made

'The kids all made a snowman.'

+collective

Figure 4.1. The critical item with a collective picture

kid-PL-TOP *subete / zen'in / minna / dono-hito-mo* snowman-ACC made

'The kids all made a snowman.'

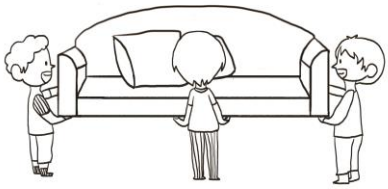
+distributive

Figure 4.2. The critical item with a distributive picture

Furthermore, adopting the distributive quantifier *sorezore* 'each', six distractor items were created, aligning with six pictures. Among these, three distractor items were associated with the collective condition, while the other three with the distributive condition.[11] The distractor items corresponding to the sentence provided in (36) are presented in Figure 4.3 and Figure 4.4. Here, Figure 4.4 represents the only possible picture-sentence combination wherein the picture demonstrates a distributive context. The picture in Figure. 4.3 is incompatible with the sentence in (36).

(36) otoko-tachi-wa *sorezore* sofa-o hakonda
man-PL-TOP each sofa-ACC carried
'The men each carried a sofa.'

[11] *Sorezore* is a distributive quantifier in Japanese which could occur in different syntactic positions, including prenominal, floating and binominal (Sakaguchi, 1998; Kobuchi-Philip, 206). In comparison with the four universal quantifiers whose interpretation(s) is indistinct in the literature, a sentence with *sorezore* will generally receive a distributive interpretation. The application of *sorezore* as a distractor is an attempt to find out whether there is a discrepancy of the native speakers' comprehension between universal quantifiers and distributive quantifier in Japanese.



man-PL-TOP *sorezore* sofa-ACC hakonda

'The men each carried a sofa.'

+collective

Figure 4.3. The distractor including *sorezore* with a collective picture

man-PL-TOP sorezore sofa-ACC hakonda

'The men each carried a sofa.'

+distributive

Figure 4.4. The distractor including *sorezore* with a distributive picture

In addition, to avoid the target structures of the critical items becoming too noticeable, twenty fillers based around pictures were included and mixed quasi-randomly with

critical items and distractor items. Each filler was accompanied by only one picture. The fillers contained two conditions as well: match and mismatch. Both the matches and mismatches were intended to be extremely obvious. In total, in each list, there are 36 items, including critical, distractor and filler.

4.2.2 Procedure and Hypotheses

The experiment was conducted using the online survey software, Qualtrics (Provo, UT). Forty native Japanese speakers were recruited for the test. Before participating, they were provided with an information sheet (see Appendix A) about the experiment and confirmed their consent to participate (see Appendix B). They were evenly divided into four groups. Each group was allocated to one of the four lists. During the test, the participants viewed one sentence with its corresponding picture on each web page. They were then asked to indicate "Does the sentence match the picture/pictures on the screen?" Four options *Yes, No, Not sure* and *I don't know* were displayed under the question. *Not sure* means "Understand the meaning of sentence and picture but cannot make judgement", while *I don't know* means "Cannot understand the meaning of either the picture or the sentence". The on-screen instructions, characters and options, and operations were displayed all in Japanese. Instead of allowing the participants to take as long as they like and plan their responses carefully, a 15-second time limit was imposed for each item (picture-sentence and options). They were required to select their response within the time limit and click "Next" to proceed to the next item. In cases where participants failed to make a response within 15 seconds, the task would automatically proceed to the next item, and the system would record the response as blank. A countdown timer was shown on each web page to indicate the remaining time. The participants were not allowed to review the previous questions or change their answers throughout the test. This time limit aims to put the participants under time pressure and elicit their implicit knowledge (Ionin & Zyzik, 2014).

Due to the absence of conclusive evidence concerning the interpretation of the four universal quantifiers, in this context, I adopt the crosslinguistic proposals drawn from the behaviour of *all* in English, and assume that the four universal quantifiers are capable of yielding both distributive and collective interpretations. The hypotheses for the experiment are outlined in (37):

(37) **Hypothesis A**: The native Japanese speakers will accept all four universal quantifiers (*dono…mo/subete/zen'in/minna*) in both collective and distributive conditions.

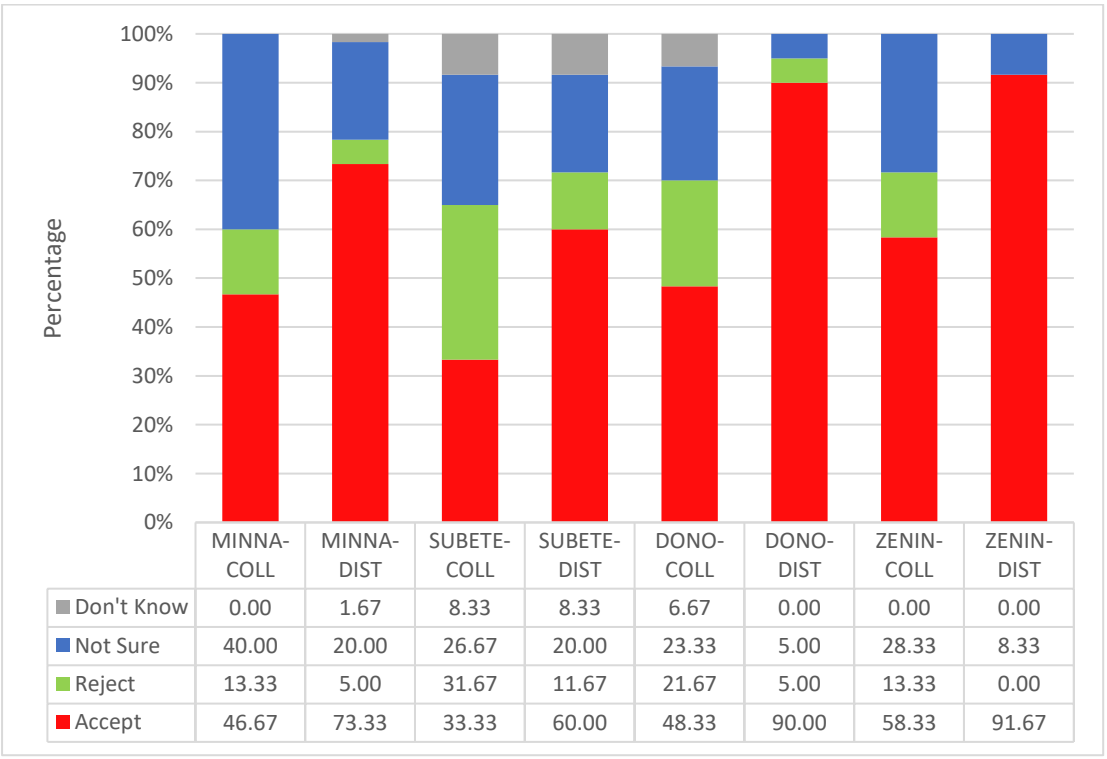
Hypothesis B: The native Japanese speakers will highly accept the distributive quantifier *sorezore* in the distributive condition and strongly reject the collective condition.

4.2.3 Results

The participants' responses were recorded in terms of their selections among the four options, *Yes*, *No, Not sure* and *I don't know*. The raw data were analysed using Excel on the proportion of each option, serving as an initial step in identifying differences between conditions and among quantifiers. With regard to the procedure of data analysis, each answer of option *Yes* was relabelled into *Accept* and *No* into *Reject*. Considering the volume of data, responses for the same quantifier were collapsed together to determine the participants' preference for each condition, even though each combination of quantifier and condition only appear once across all four lists. The comparative results between the lists sharing the same quantifiers will be presented later in this section.

Figure 4.5 illustrates the results for the four critical universal quantifies. First, the rates of *I don't know* option are very low (≤1.67%), except for *subete*, in which the rate is slightly higher at 8.33% for each condition. This suggests that, in general, the participants were able to comprehend the sentences and pictures. Next, consider the rates of the quantifier *minna*. At first glance, it is evident that the participants reveal a strong preference for the distributive condition (73.33%) compared with the collective condition (46.67%). Moreover, the participants selected a considerable number of *Not sure* when encountering items associated with a collective context (40.00%). By contrast, the rate of *Not sure* responses is considerably lower in the distributive context (20%). Essentially, the participants did not reject *minna* in either condition with a rejection rate of 13.33% for the collective and 5.00% for the distributive. Moving on to the rates of the quantifier *subete*, in the collective condition, the acceptance rate (33.33%) is very close to the rejection rate (31.67%), with the proportion of *Not sure* responses at approximately 26.67%. This suggests that it is inconclusive whether *subete*

is compatible with a collective context. On the other hand, in the distributive condition, there is an apparent acceptance rate (60.00%) compared with the rejection rate (11.67%), with the proportion of *Not sure* responses at 20.00%. On the whole, it appears more consistent for the participants to associate the quantifier *subete* with a distributive interpretation, rather than a collective one. In regard to the rates of *dono…mo*, the participants indicated a strong preference for accepting the distributive condition (90%), with small proportions of rejection (5%) and *Not Sure* responses (5%). Moreover, in the collective condition, the acceptance rate of *dono…mo* is considerably lower, although it still represents the majority response at 48.33%. A certain number of rejections (21.67%) and *Not sure* responses (23.33%) can be observed as well. Turning to the quantifier *zen'in,* the acceptance rate of the distributive condition is very high and close to the ceiling (91.67%), with only 8.33% of *Not sure* responses. Furthermore, it is worth mentioning that the acceptance rate for the collective condition has surpassed the half ratio for the first time (58.33%). In addition, there are notable proportions of rejection (13.33%) and *Not sure* responses (28.33%) within this quantifier group.

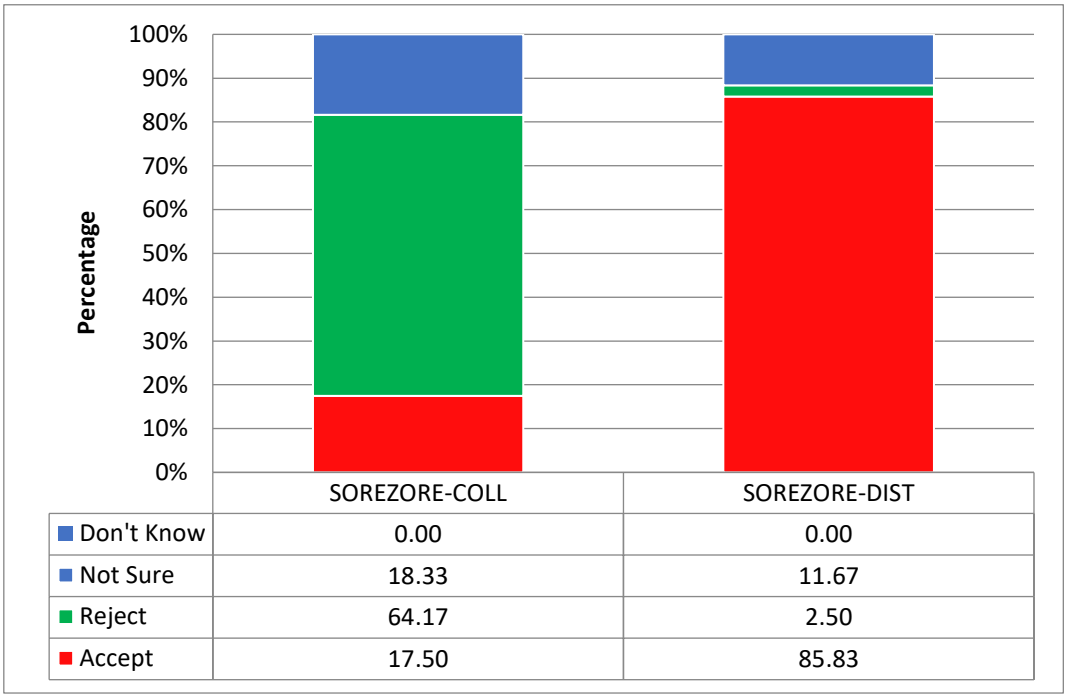


	MINNA-COLL	MINNA-DIST	SUBETE-COLL	SUBETE-DIST	DONO-COLL	DONO-DIST	ZENIN-COLL	ZENIN-DIST
Don't Know	0.00	1.67	8.33	8.33	6.67	0.00	0.00	0.00
Not Sure	40.00	20.00	26.67	20.00	23.33	5.00	28.33	8.33
Reject	13.33	5.00	31.67	11.67	21.67	5.00	13.33	0.00
Accept	46.67	73.33	33.33	60.00	48.33	90.00	58.33	91.67

Figure 4.5. The rates (percentage) of participants' responses on critical items including *minna, subete, dono…mo* and *zen'in*, by condition

Overall, among the four universal quantifier groups, the participants revealed a higher preference for the distributive condition over the collective condition. They presented a clearer and more unequivocal idea towards the distributive interpretation, as indicated by the lower number of *Not sure* responses. When encountering the collective condition, on the one hand, the participants did not intrinsically reject any of the quantifiers; on the other hand, they appeared to struggle in making their judgments between *Accept* and *Not sure*. Sorting the quantifiers based on their acceptance in both conditions, the hierarchy would be: *zen'in* > *dono-mo* > *minna* > *subete*.

Regarding the results for the distractor items, as shown in Figure 4.6, the participants exhibited a distinct preference for accepting the distributive condition (85.83%) and rejecting the collective condition (64.17%). The noticeable between-condition contrast and the lower percentage of *Not sure* responses (11.67%) imply that the participants had a very clear preference for a distributive interpretation when the quantifier *sorezore* was present. In comparison with the universal quantifiers, even though the participants did not completely get rid of the collective condition, only a small number of acceptance (17.50%) were selected when *sorezore* was involved.



	SOREZORE-COLL	SOREZORE-DIST
Don't Know	0.00	0.00
Not Sure	18.33	11.67
Reject	64.17	2.50
Accept	17.50	85.83

Figure 4.6. The rates (percentage) of participants' responses on distractor items *sorezore*, by condition

In conclusion, the participants' behaviour indicates that *dono-mo, zen'in/zenbu, minna* and *subete* represent a universal quantification force, with both collective and distributive interpretations being appropriate for the sentences. At the same time, they showed a more robust preference for the distributive interpretation among the four quantifiers. With respect to the distractor items, the participants' stronger preference for the distributive condition, as well as the lower acceptance of the collective condition, reveal that the quantifier *sorezore* is a distributive quantifier that is only compatible with the distributive interpretation.

To interpret the data further and find out whether there are significant associations within each quantifier group between the conditions and the participants' response options, chi-square analyses were run on the critical item data using the statistical programme R (R Core Team, 2022). Table 4.3 illustrates the results of the chi-square test for each quantifier group. The independent variable is the *condition* (collective versus distributive), and the participants' responses are classified into different answer types. Here, *I don't know* responses are treated as missing data and relabelled as NA.

As shown in the Table 4.3, a significant association between each quantifier and the conditions can be observed. For the quantifier *minna*, χ^2 (1) = 9.821, $p < .05$, the odds of choosing *Yes* are 4.19 times higher than choosing *No* between-condition. For the quantifier *subete*, χ^2 (1) = 10.681, $p < .05$, the odds of choosing *Yes* are 4.89 times higher than choosing *No*. For the quantifier *dono-mo*, χ^2 (1) = 20.785, $p < .001$, the odds of choosing *Yes* are 8.07 times higher than choosing *No*. For the quantifier *zen'in*, χ^2 (1) = 18.990, $p < .001$, the odds of choosing *Yes* are 1.57 times higher than choosing *No*. The odds being greater than 1 for all four quantifiers indicate that the participants selected the option *Yes* more frequently than *No* when encountering either of the conditions. The p-values further support the significant main effect between conditions for each quantifier. The participants demonstrated a preference for one condition over the other, showing a stronger tendency towards accepting the distributive condition than the collective condition, as illustrated in the bar chart in Figure 4.5. Additionally, a chi-square analysis was run on the responses of acceptance among the four universal quantifiers by conditions. At this time, χ^2 (1) = 0.432, $p = .933$ reveals that there is no significant between-quantifier difference in the number of *Accept* response by conditions. In other words, for each condition, the participants' judgments were relatively fair regardless of the quantifier encountered.

Table 4.3. Pearson's chi-square test results of four universal quantifier groups

quantifier	x-squared	df	p-value
minna	9.821	2	0.007
subete	10.681	2	0.005
dono-mo	20.785	2	< .001
zen'in	18.990	2	< .001

4.3 Conclusion

This chapter provided an in-depth exploration of four universal quantifiers in Japanese: *dono-mo, zen'in*, *minna*, and *subete*, focusing on their semantic and syntactic properties. While *dono-mo* has received more attention in the literature due to its indeterminate nature, the other quantifiers have been relatively overlooked. To address this gap and investigate how native Japanese speakers interpret these quantifiers, an empirical study was conducted using a sentence-picture matching task. Forty participants were divided into four groups. Each group was assigned to one of the four item lists, and each list contained only two target quantifiers. The distributive quantifier *sorezore* was also examined as distractor alongside the universal quantifiers.

The results of the study confirmed the hypotheses that native Japanese speakers accepted both collective and distributive conditions regardless of which universal quantifier was involved in the sentence. Moreover, they strongly rejected the collective condition as well as accepted the distributive condition when *sorezore* was present in the sentence. However, it is evident that the participants did not treat all conditions or quantifiers identically. They suggested a significant preference for the distributive condition over the collective condition. Their responses built up a hierarchy on the basis of the acceptance rates of both conditions, with *zen'in* > *dono-mo* > *minna* > *subete*. In the upcoming chapter, the focus will shift to the formal experiment of the current study conducted within L1 English-L2 Mandarin and L1 Japanese-L2 Mandarin groups, including the methodology, L2 hypotheses, procedure, data analysis and results.

Chapter 5

The Experimental Design and Predictions

5.1 Introduction

In the previous chapters, I reviewed the Feature Reassembly Hypothesis and its relevant researches, as well as the learnability problems arising from syntax-semantics mismatch and poverty of the stimulus at the interpretive surface. Furthermore, I introduced an empirical study focused on the interpretation of universal quantifiers in Japanese, including *subete, minna, zen'in* and *dono-mo*. The study reveals that native Japanese speakers exhibited a higher preference for the acceptance of the distributive interpretation, but they did not entirely reject the collective interpretation. Instead, they showed a considerable proportion of acceptance for the collective interpretation across the four quantifiers. In this chapter, I will delve into the formal experiments conducted in the current study. This study is an attempt to address four issues related to the acquisition of the distributivity of *dou* in Mandarin Chinese by L1 English and L1 Japanese speakers:

(1) a. How is the initial mapping established, and which mapping possibility(s) can be observed in the experiment?
b. Does the reassembly take place in the L2 acquisition task, and if so, how do the L2 learners reassemble the feature bundles to conform the target?
c. Is there any divergency in task performance between different L1 groups and between different proficiency levels?
d. Can the learning problem of POS be overcome with the access of the innate mechanism, namely UG?

To address these questions, two experimental methods were employed: a sentence-picture matching task and a picture-based acceptability judgment task. These methods were used to collect data and examine the L2 learners' knowledge of the target subjects. In the upcoming sections, I will outline the hypotheses of current study with the predictions of the FRH. Subsequently, I will provide further details about the formal experiment, including the participants' background, the proficiency test and the overall

procedure of the study. In Section 5.5, I will present a comprehensive overview of the two data collection methods, along with the predictions for each task.

5.2 The Hypotheses of the Current Study

5.2.1 English-Chinese

As discussed in Chapter 2, the acquisition of the distributivity of *dou* is challenged by a mismatch in how features are assembled into lexical items between the L1 and the L2, as well as poverty of the stimulus in the overt input. In accordance with the predictions of the FRH, English-speaking learners of Mandarin may encounter difficulties in both the stage of mapping and the stage of reassembly. Taking the semantic functions, syntactic derivations and grammatical meanings into consideration, I assume that L1 English-L2 Mandarin learners may reveal two ways of mapping, as shown in (2).

(2) **Hypotheses of mapping on the acquisition of *dou*'s distributivity by L1 Engslih-L2 Mandarin learners:**
(a). Mapping 1: *dou* maps onto the [+universal] form *all*
(b). Mapping 2: *dou* maps onto the [+distributive] form *each*

Under the influence of L1 transfer and pedagogical input, it may be challenging for L1 English-L2 Mandarin learners to identify the distributive force of *dou*. Instead, they might treat *dou* as something universal and transfer the [+universal] feature from their L1 to account for the contrast between the L1 and the L2. On the other hand, there is no reason to rule out the alternative, i.e., mapping *dou* onto the [+distributive] form *each*, with which the mismatch of feature assembles no longer exists.

Due to the presence of a mismatch in Mapping 1, the process of feature reassembly becomes necessary for reconfiguring the feature bundles of *dou* from the way they are assembled in L1 into new target representation in L2. The hypothesis for feature reassembly is as follows:

(3) **Hypothesis of reassembly of *dou*'s features on the acquisition of *dou*'s distributivity by L1 English-L2 Mandarin learners:**

Abandon the feature [+universal] and add the feature [+distributive] which is available in L1 grammar.

Since the [+distributive] feature of *dou* is present in English, it is reasonable to assume that higher proficiency learners would successfully reassemble the feature from the way it is represented in their L1 into the new formal configuration in the L2 (i.e., *all* → *dou*, [+universal] →[+distributive]). However, the accomplishment of feature reassembly does not imply the successful acquisition of the distributivity of *dou*, as the problem of POS still exists. To overcome this, there is a requirement of the accessibility of universal semantic computation mechanism so that it could support the learners in getting rid of the L1 transfer and demonstrating a target-like performance.

5.2.2 Japanese-Chinese

According to the proposal of the FRH, language learners may initially associate the lexical item they perceive in the target input with the assembled feature bundles of the similar morpholexical correspondence in their L1, based on the strength of meaning or grammatical function. In regard to L1 Japanese-L2 Mandarin learners, I assume that there are two expected mapping possibilities, similar to the L1 English-L2 Mandarin learners: one is mapping *dou* onto the universal, and the other is mapping *dou* onto the distributive, as illustrated in (4).

(4) **Hypotheses of mapping on the acquisition of *dou*'s distributivity by L1 Japanese-L2 Mandarin learners:**

(a). Mapping 1: *dou* maps onto the [+universal] form *subete/minna/zen'in*

(b). Mapping 2: *dou* maps onto the [+distributive] form *sorezore*

Moreover, the presence of *wh*-indeterminates introduces another potential mapping possibility for L1 Japanese-L2 Mandarin learners. When attached to a *wh*-element, such as *dono* 'which', the particle *-mo* gives the *wh*-element a universal interpretation. Those similarities between *-mo* and *dou* in terms of their multiple semantic functions could serve as a cue for learners to map *dou* onto *-mo*. However, it is crucial to note that there

are notable differences in the syntactic distributions of *dou* and *-mo*. The morpheme *dou* can be used alone or even omitted in some circumstances, while the particle *-mo* must be associated with other elements and does not have the ability to act independently. Therefore, the *wh*-indeterminate *dono-mo* is characterised by two distinct features: [+universal] and ∨ (disjunction), with the latter contributed by the particle *-mo*. This additional mapping possibility is shown in (5).

(5) **Hypotheses of mapping on the acquisition of *dou*'s distributivity by L1 Japanese-L2 Mandarin learners:**

(c). Mapping 3: *dou* maps onto the [+universal, ∨] form *dono-mo*

With respect to the hypotheses of Mapping 1 and Mapping 3, there are two distinct feature reassembly processes involved for each L1-L2 contrast, as outlined in (6).

(6) **Hypotheses of reassembly of *dou*'s features on the acquisition of *dou*'s distributivity by L1 Japanese-L2 Mandarin learners:**

(a) Reassembly 1: Abandon the feature [+universal] and add the feature [+distributive] which is available in L1 grammar.

(b) Reassembly 2: Abandon the features [+universal, ∨] and add the feature [+distributive] which is available in L1 grammar.

Both reassembly tasks involve the removal of the feature [+universal] or features [+universal, ∨] and the accession of the feature [+distributive] to achieve a new target combination of *dou* in the L2 Mandarin grammar. Additionally, the learners are likely to face the POS problem in the acquisition process. The natural input they receive may not provide sufficient evidence about the unavailability of the collective interpretation of *dou* in certain cases. The successful acquisition asks for the learners to retreat from the overinfluence of their L1 transfer and potential overgeneralisation. Table 5.1 offers an overview of the hypotheses on different mapping possibilities and their corresponding reassembly processes.

Table 5.1. The summary of mapping and reassembly predictions[12]

Stage 1: Mapping	Stage 2: Reassembly
all → dou	**[+universal] → [+distributive]**
each → dou	**NA**
subete/minna/zen'in → dou	**[+universal] → [+distributive]**
dono-mo → dou	**[+universal, ∨] → [+distributive]**
sorezore → dou	**NA**

5.3 The Information of the Proficiency Test and the Participants

A proficiency test was applied to assess the language proficiency of the participants in both L2 groups (L1 English-L2 Mandarin and L1 Japanese-L2 Mandarin). It was designed as a fill-the-blank task, with multiple choice options for each blank. The test comprised ten paragraphs taken from the mock reading test of the TOCFL Exam (The Test of Chinese as a Foreign Language) in Band B (intermediate) and Band C (advanced), as provided in Appendix D. Each paragraph contained 5 to 6 blanks, and the participants were asked to select the most appropriate answer from four options for each blank. The native control group also took the same test before the formal experiment started. There was no time limit for each paragraph. Instead, the response time of each participant for the entire proficiency test was recorded. In total, 55 blanks were included in this proficiency test.

To assess the participants' performance and divide the L2 learners into different proficiency levels, a scoring system was employed for the proficiency test. Each correct answer in the test was awarded 1 point, while each incorrect answer received 0 points. The maximum score achievable for the entire test was 55 points. The sum of the points earned by each participant was their final proficiency score. Table 5.2 demonstrates the data of the proficiency test and shows the division of the participants into proficiency groups. The cut-offs for beginning-intermediate and intermediate-advanced were set at 18 and 36 points, respectively. In fact, the decision on the cut-off is always arbitrary, since there might be no difference between a participant scored 18 and a participant

[12] In addition to the feature [+distributive], there is a bunch of features hosted by *dou*, e.g., [+exhaustive] and [+maximal]. To limit observations to the objective of current research, this table only presents the mapping and reassembly of [+distributive]. Here, NA does not imply that the reassembly does not take place on other features.

scored 19 on their task performance. In order to maintain balanced distributions of participants in each proficiency group, 18 and 36 points were eventually determined as the cut-offs. Due to the limited number of Japanese participants, the learners were not divided into different proficiency levels, but treated as a whole for the analysis.

The participants for both L2 groups were recruited online through flyers posted on various social media platforms, including YouTube, Facebook, Weibo, Lines and WeChat. In the L1 English group, there are 51 participants from different countries, including the United States, the United Kingdom, Canada, India, New Zealand, Australia and Cameroon. The age range of the participants was 19 to 59, with 30 male participants and 21 female participants. All of them had received classroom teaching of Mandarin Chinese, with durations ranging from 6 months to 12 years, and 37 out of them were taking Mandarin classes every week when they took part in this study. Around 66.67% of the participants had taken the HSK test and passed at least Level 3. Moreover, 12 participants had experience studying or working in China (either mainland or Hong Kong), with durations ranging from 1 year to 9 years. In addition, 19 out of 51 participants had learned a third or fourth foreign language, including French, German, Dutch, Korean, Japanese and Hebrew. In the L1 Japanese group, there are 18 participants, with 11 studying at Japanese universities, 1 at a UK university, and 6 already working when they took part in this study. The age range of the participants was 21 to 53, with 15 female participants and 3 male participants. The durations of their Mandarin learning ranged from 1 year to 8 years and 7 of them were taking Mandarin classes every week. Furthermore, 8 participants had taken the HSK test and passed at least Level 4, and 7 participants had experience studying or working in China Mainland, with durations ranging from 1 year to 6 years. Additionally, 15 out of 18 participants had received compulsory English education, and 4 of them had learned a third or fourth foreign language, including French, German and Italian.

The native speakers of Mandarin were recruited online with specific requirements regarding their geographic location, education and length of studying English. All native participants were from the northern areas of China mainland and had attained a higher education degree. Their ages range from 19 to 40 years old. Approximately 90% of the participants had received classroom teaching of English for over 10 years, and a significant portion of them had taken one or more English proficiency tests. Specifically, 56.7% of the participants had successfully passed the CET4/6 Test, and 30.0% of the participants had taken either the IELTS or TOEFL exams. Moreover, 33.3% of the

participants had experience living or studying in English-speaking countries, ranging from 0.25 year to 7 years. Furthermore, 40% of the participants had learned a third or fourth foreign language, including Japanese, Korean, French and Russian. In total, 51 L1 English learners,18 Japanese learners and 30 native Mandarin speakers were recruited for this L2 Mandarin study.

Table 5.2 The scores of proficiency test among three groups

	Group Size	**Mean (SD)**	**Range (0-55)**
CC	30	53.1 (1.60)	48-55
EC advanced	16	45.1 (6.13)	38-54
EC intermediate	14	27.5 (5.80)	19-35
EC beginning	21	15.3 (2.40)	11-18
JC	18	33.2 (10.12)	16-53

Note. CC=native Mandarin group, EC=L1 English-L2 Mandarin group, JC= L1 Japanese-L2 Mandarin group

5.4 The Procedure of the Experimental Study

The entire experimental study was conducted using an online questionnaire system called Qualtrics (Provo, UT). At the beginning of the study, the participants were provided with an information sheet (see Appendix A) that explained the aims and contents of the research. The risks involved in this study, the usage and confidentiality of their data, and the compensation for their participation were informed to the participants at the same time. The participants were encouraged to ask any questions related to the research and tasks during this stage. Subsequently, they were asked to sign a consent form (see Appendix B) if they agreed to take part in the study, followed by a background information questionnaire (see Appendix C). Before the formal experiment started, the participants were required to complete a proficiency test, which consisted of 10 paragraphs with 55 blanks. Based on their responses, the learners were divided into three proficiency groups: advanced, intermediate and beginning. Following the proficiency test, the sentence-picture matching task was administered, followed by the picture-based acceptability judgment task. The participants were allowed to take a short break between the two tasks and had the right to quit the study

at any time. No further instructions were provided by the researcher during the two tasks. After they accomplished all tasks, their responses as well as their reaction time were recorded by Qualtrics automatically. Throughout the entire experiment, the use of English and Japanese was avoided, and all stimuli presented to the participants were in Mandarin Chinese. In addition, a Pinyin version of the study was provided, and the participants could choose either the Chinese character version or the Pinyin version based on their proficiency. In the following sections, I will introduce the two tasks in terms of their methodologies and predictions, respectively.

5.5 The Methodology and Experimental Design

5.5.1 The Sentence-Picture Matching Task

5.5.1.1 The Experimental Design

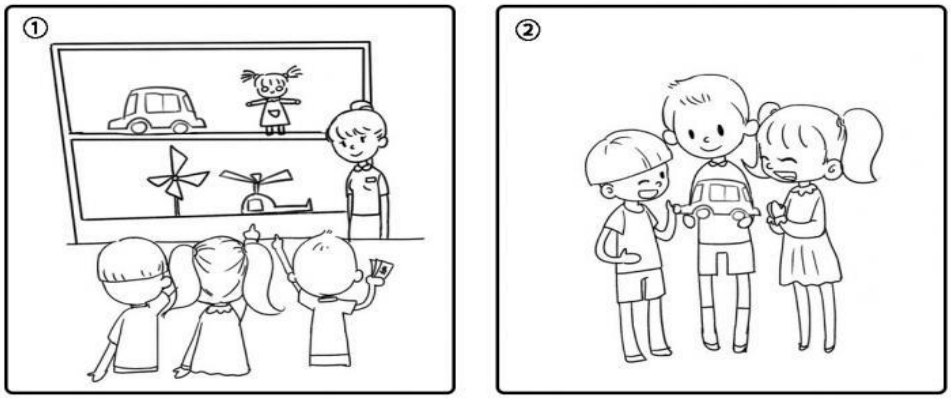
In this task, each critical item consisted of a series of two pictures that illustrated either a collective or a distributive event, accompanied by a sentence that included the quantifier *dou.* Examples of test items are shown in Figure 5.1 (collective interpretation) and Figure 5.2 (distributive interpretation), for the sentence given in (7).

(7) haizi-men *dou* mai-le yi-ge wanju
child-PL DOU build-ASP one-CL toy
'The children each bought a toy.'

Consider the sentence structure of the critical items as exemplified in (7). With respect to the subjects, the suffix *-men* serves as a plural maker attaching to personal nouns. Here, it is worth noting that the properties of the suffix *-men* are still a topic of debate. Some linguists, such as Iljic (1994) and Cheng and Sybesma (1999), argue that the 'plural' suffix *-men* in Mandarin Chinese should be regarded as a collective marker rather than a 'true' plural marker. On the other hand, Li (1999) opposes the "collective marker" view and claimed that suffix *-men* has the properties of a plural morpheme and carries the features [+plural] and [+definite]. For the purpose of this study, Li's suggestion is adopted, and *-men* is treated as a plural-marker that imparts definite interpretations to the nouns it suffixes.[13] In regard to the objects in the critical items,

[13] If *-men* is omitted, the bare noun in subject or topic position can be interpreted as definite or generic. Besides, it can be interpreted as singular or plural. In (i), the bare noun *tuzi* "rabbit" presents a generic

the number *yi* "one" accompanied by an appropriate classifier is employed to avoid the ambiguity of cumulative readings and ensure clear interpretations.



child-PL DOU buy-ASP one-CL toy

'The children each bought a toy.'

+*dou*, +collective

(Infelicitous in native Mandarin)

Figure 5.1. The critical item including *dou* with a collective picture

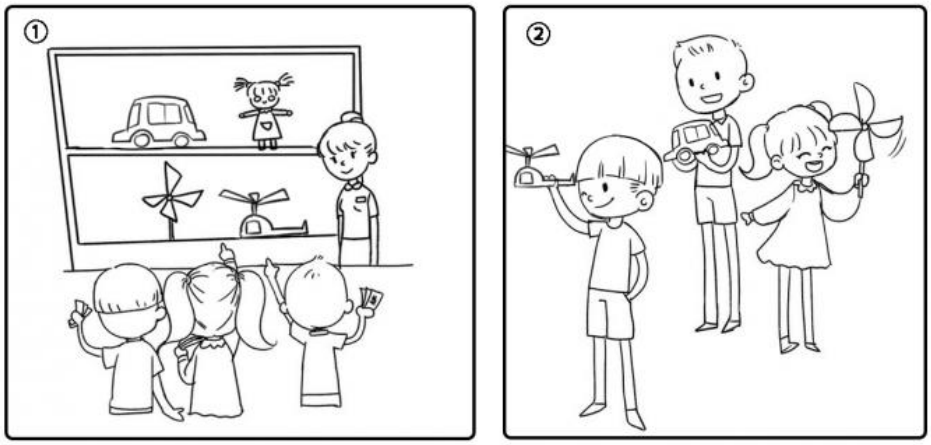
In Figure 5.1, the collective event is depicted through pictures showing the children jointly buying ONE toy, while the distributive event in Figure 5.2 is presented with pictures of each child buying a SEPARATE toy. The participants were asked to look at each picture sequence and judge whether the sentence matched the sequence by choosing from four options: *Yes*, *No*, *Not sure* and *I don't know*, based on their knowledge and comprehension. A total of 6 out of the 12 critical sentences were

meaning in the generic context. In (ii), the absence of singular/plural article or marker results in the ambiguity of interpretation.

(i) tuzi hen keai
rabbit very cute
'Rabbits are very cute.'

(ii) tuzi pao-le
rabbit run-ASP
'The rabbit(s) ran away.'

presented with a collective context, and the remaining six were presented with a distributive context (see Appendix E).



child-PL DOU buy-ASP one-CL toy
'The children each bought a toy.'
+ *dou*, +distributive

Figure 5.2. The critical item including *dou* with a distributive picture

In Figure 5.1, the combination of picture and sentence is infelicitous. *Dou*, which distributes the property of the predicate onto the subject, makes the sentence incompatible with a collective interpretation. However, the combination in Figure 5.2 is feasible, as a distributive context is provided in the pictures. Furthermore, another distributive operator *ge* "each" was adopted as distractor. Figure 5.3 and Figure 5.4 exemplify the distractor items. Unlike *dou*, which can integrate with a collective predicate and distribute down to group atoms, *ge* is on par with *each* in English and *sorezore* in Japanese, working as a strict distributive operator that can only distribute down to individual atoms of plural NPs. Figure 5.4 represents the only possible combination of picture and sentence wherein the picture depicts a distributive scenario. Consequently, it is plausible to assume that English-speaking and Japanese-speaking

learners of Mandarin may strongly reject *ge* in the collective condition and highly accept *ge* in the distributive condition.

man-PL *ge* sing-ASP one-CL song

'Each man sang a song.'

+ge, +collective

(Infelicitous in native Mandarin)

Figure 5.3. The distractor including *ge* with a collective picture

In addition, to minimise the salience of the target structures in the critical items, 18 fillers based around pictures were mixed with critical items and distractor items quasi-randomly. Each filler was accompanied by only one picture, unlike critical items and distractors items, which had a sequence of two pictures. [14] The sentence structures for the fillers were selected from HSK Level I and Level II textbooks to ensure easy comprehension. The fillers contained two conditions as well: match and mismatch, with 10 items in the match condition and 8 in the mismatch condition. [15] Both the matches and mismatches were designed to be conspicuously evident, as illustrated in Figure 5.5.

[14] For fillers, the design is not ideal: they would have blended in better if they had had a two-picture sequence.

[15] Here is a manipulation mistake when arranging items in Qualtrics, which leads to the uneven numbers between match and mismatch conditions.

man-PL *ge* sing-ASP one-CL song

'Each man sang a song.'

+ge, +distributive

Figure 5.4. The distractor including *ge* with a distributive picture

Jimmy BE watch TV

'Jimmy is watching TV.'

Matching

book at chair top

'The book is on the chair.'

Mismatching

Figure 5.5. The fillers with matching and mismatching conditions

Table 5.3 summarises the distributions of conditions for all items in the sentence-picture matching task.

Table 5.3. The distributions of conditions of test items in the sentence-picture matching task

Type	Conditions		Total
Critical items	Distributive n = 6	Collective n = 6	n = 12
Distractors	Distributive n = 4	Collective n = 4	n = 8
Fillers	Matching n =10	Mismatching n =8	n = 18

During the test, the participants viewed one sentence along with its relevant picture on each web page and were asked to judge "Does the sentence match the picture/pictures displayed on the screen?" Four response options were provided under the question: *Yes*, *No*, *Not sure* and *I don't know*. *Not sure* indicated that the participants were uncertain about whether the picture fully expressed the meanings of the sentence, while *I don't know* meant they couldn't understand the meaning of either the picture or the sentence. The explanations of these options were provided in Mandarin Chinese in the instruction section, so that the participants could understand what the options represented clearly. Instead of allowing participants to take as long as they like and planning their responses carefully, a 15-second time limit was set up for each item (picture sentence and options). Consequently, the participants were exposed to a time pressure situation, in which their implicit knowledge was more likely triggered when making judgments (Ellis, 2005). They were required to select their response within the time limit and then click "Next" to proceed to the next item. Failure to respond within 15 seconds would result in the task automatically advancing to the next item, with the system recording the response as blank. The choice of 15-second was based on feedback from native Mandarin speakers in a post-pilot questionnaire, where most participants found this duration suitable for observing the picture, reading the sentence, scrolling down the page and choosing an option. A countdown timer was displayed on

each web page. The participants were not allowed to review the previous questions or change their answers throughout the test.

Before the test formally began, the participants were instructed to rely on their immediate intuition when making judgments. They were provided with two examples in order to familiarise them with the format of the test. Furthermore, an explanation of the pictures was given to help the participants better understand that the pictures represented two parts of an event: those numbered as ① illustrated the process of the actions, and those numbered as ② illustrated the results of the actions.

Pilot studies were conducted for both the Mandarin and the English versions of the task using Qualtrics. The participants included 30 native Mandarin speakers from China Mainland and 20 native English speakers from the UK. The results aligned with the existing literature, where native Mandarin speakers only accepted the match between the items including *dou* and distributive pictures, while native English speakers accepted the match between the items including *all* and both distributive and collective pictures. Additionally, according to post-test interviews, some of the test sentences and pictures were revised or replaced.

5.5.1.2 Predictions

This task is an attempt to investigate whether English-speaking and Japanese-speaking learners of Mandarin Chinese can acquire the knowledge of the distributivity of *dou* in sentences with mix predicates (*dou*-quantified subject/ numeral-quantified object sentence). As a reminder, compared with *dou*, the corresponding sentences in English with *all* and in Japanese with *subete/minna/zen'in/dono-mo* could receive both a distributive reading and a collective reading. In Chapter 3, it is argued that *dou* is a functional head projecting to DistP, possessing a strong [+distributive] feature that needs to be checked before Spell-Out, either by Move or by Merge. The element undergoing this checking process first resides in the Spec of DistP before potentially moving to a higher position. In this case, the subject has an inherent [*u*dist] feature which is eligible for the feature checking movement to the Spec of DistP. Through this movement, the quantificational relation between *dou* and the subject can be established. *Dou* quantifies over the subject by distributing the properties of the predicate down to each atom or subgroup in the domain of the subject and makes the distributive reading the only appropriate interpretation of the sentence.

Considering the L2 hypotheses of mapping, reassembly and the problem of POS, four alternative predictions are made for the participants' behaviour in the sentence-picture matching task, as follows:

(8) **Sentence-Picture Matching Task Prediction A:**

***dou–each/sorezore* mappings**

If L2 Mandarin learners map *dou* onto the [+distributive] form *each/sorezore*, both lower and higher proficiency learners will accept the distributive interpretation and reject the collective interpretation in the sentence-picture matching task (i.e., their behaviour will be target-like), due to L1 transfer.

(9) **Sentence-Picture Matching Task Prediction B:**

***dou–all/ subete/minna/zen'in* and *dou-dono-mo* mappings**

If L2 Mandarin learners map *dou* onto the [+universal] form *al/subete/minna/zen'in* or the [+universal, ∨] form *dono-mo*, lower proficiency learners will demonstrate a non-target-like acceptance of both distributive and collective interpretations, due to L1 transfer. Higher proficiency learners, who undergo the reassembly process (abandon the feature [+universal] or the features [+universal, ∨] and add the feature [+distributive]), will accept the distributive interpretation and reject the collective interpretation, due to Universal Grammar access.

(10) **Sentence-Picture Matching Task Prediction C:**

***ge-each/sorezore* mappings**

If L2 Mandarin learners map *ge* onto the [+distributive] form *each/sorezore*, both lower and higher proficiency learners will accept the distributive interpretation and reject the collective interpretation (i.e., their behaviour will be target-like), due to L1 transfer.

(11) **Sentence-Picture Matching Task Prediction D:**

***ge-all/ subete/minna/zen'in* and *ge-dono-mo* mappings**

If L2 Mandarin learners map *ge* onto the [+universal] form *all/subete/minna/zen'in* or the[+universal, ∨] form *dono-mo*,

lower proficiency learners will demonstrate a non-target-like acceptance of both distributive and collective interpretations, due to L1 transfer. Higher proficiency learners, who undergo the reassembly process (abandon the feature [+universal] or the features [+universal, ∨] and add the feature [+distributive]), will accept the distributive interpretation and reject the collective interpretation, due to Universal Grammar access.

5.5.2 The Picture-Based Acceptability Judgment Task

5.5.2.1 The Experimental Design

In the scenario depicted in (12), three students named Mary, John, and George went to a market to buy some fruits. Mary bought apples and bananas, John bought apples and oranges, and George bought apples and pears. When they returned, their teachers discussed what each student bought.

(12) Teacher A: xuesheng-men mai-le shenme
student-PL buy-ASP what
'What did the students buy?'

Teacher B: (a) mali mai-le pingguo he xiangjiao yuehan
Mary buy-ASP apple and banana John
mai-le pingguo he juzi qiaozhi mai-le
buy-ASP apple and orange George buy-ASP
pingguo he li
apple and pear
'Mary bought apples and bananas, John bought apples and oranges and George bought apples and pears.'
(Pair-list reading)

(b) pingguo xiangjiao juzi he li
apple banana orange and pear
'Apples, bananas, oranges and pears.' (Type reading)

(c) mali mai-le pingguo he xiangjiao yuehan
Mary buy-ASP apple and banana John
mai-le pingguo he juzi
buy-ASP apple and orange

‘Mary bought apples and bananas and John bought apples and oranges.’ (Non-maximal reading)

(d) pingguo
apple
‘Apples.’ (Individual reading/non-maximal reading)

As exemplified in (12), without the insertion of any overt quantifiers in the interrogative sentence, four types of answers are available, including the non-maximal ones in (12c) and (12d). It is worth noting that the answer in (12d) is ambiguous and can be interpreted as either an individual reading or a non-maximal reading of the answer in (12b). However, in (13), with the insertion of the quantifier *dou* in the question, the features [+distributive] and [+exhaustive] restrict the possible answers. Non-maximal readings are no longer valid in this context. Therefore, the answer in (13d) can only be interpreted individually.

(13) Teacher A: xuesheng-men *dou* mai-le shenme
student-PL DOU buy-ASP what
‘What did all the students buy?’

Teacher B: (a) mali mai-le pingguo he xiangjiao yuehan
Mary buy-ASP apple and banana John
mai-le pingguo he juzi qiaozhi mai-le
buy-ASP apple and orange George buy-ASP
pingguo he li
apple and pear
‘Mary bought apples and bananas, John bought apples and Oranges and George bought apples and pears.’
(Pair-list reading)

(b) pingguo xiangjiao juzi he li
apple banana orange and pear
‘Apples, bananas, oranges and pears.’ (Type reading)

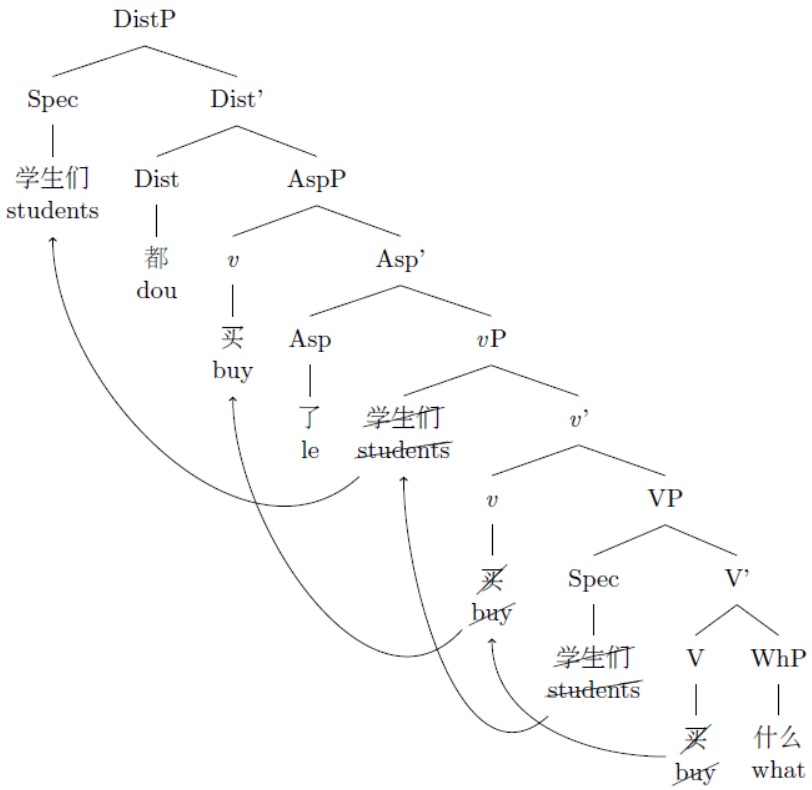
(c) mali mai-le pingguo he xiangjiao yuehan
Mary buy-ASP apple and banana John
mai-le pingguo he juzi
buy-ASP apple and orange

‘Mary bought apples and bananas and John bought apples and oranges.’ (*Non-maximal reading)

(d) pingguo
apple
‘Apples.’ (Individual reading/*non-maximal reading)

In (14), the syntactic structure of the interrogative sentence in (13) is presented. As proposed in Chapter 3, *dou* functions as the head of the functional projection DistP. In the derivation, both the plural subject *xueshengmen* ‘students’ and the verb *mai* ‘buy’ move out of the base-generated VP first to the specifier position and head position of *v*P, respectively. Then, the verb further moves to the Spec of AspP, attaching to the aspect marker *le*, and the subject raises to the Spec of DistP to check the strong feature [+distributive] of *dou*. The *wh*-object *shenme* ‘what’ remains in-situ. By means of this feature checking movement, the quantificational relation between *dou* and the subject is established. This allows the quantifier *dou* to distribute the properties of the predicate down to each individual or subgroup in the domain of the subject, leading to the pair-list answer.

(14)

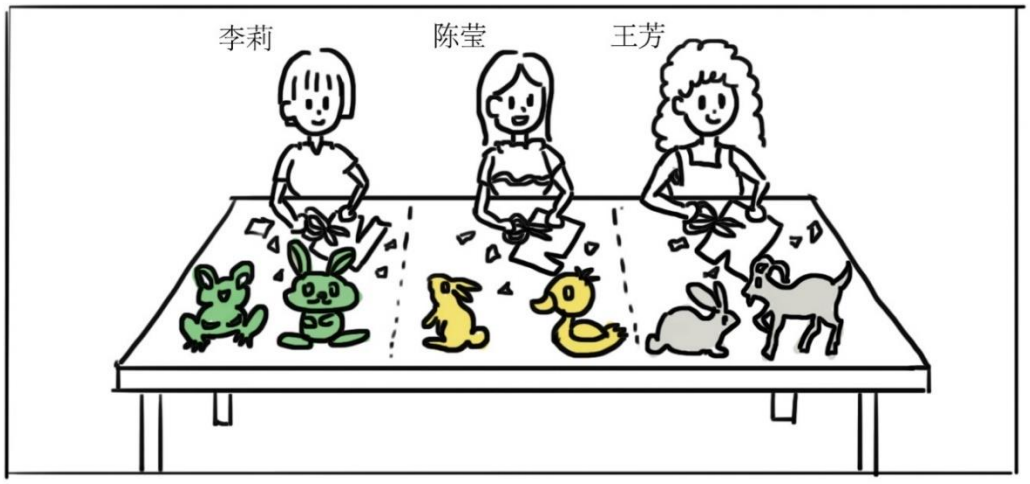


The picture-based acceptability judgment task was designed based on the methodology proposed by Marsden (2008) with the aim of examining the L2 learners' knowledge of the distributivity of *dou* in yielding the pair-list answer. The task consisted of twelve critical items in *dou*-quantified subject/*wh*-object construction, as given in (15) (see Appendix F).

(15) nvhai-men *dou* jian-le shenme
girl-PL DOU cut-ASP what
'What did all the girls cut?'

To accompany each question, twelve pictures were created, providing an informative context for either the pair-list answer (n=6) or the individual answer (n=6). Each question and its corresponding picture were presented only once during the test. Examples of the two types of answers are shown in Figure 5.6 and Figure 5.7, respectively. In addition to the critical items, twelve distractor items were designed to blend with them quasi-randomly. These distractor items contained single or multiple *wh*-words but lacked any overt quantifier. Unlike the critical items, the distractor items were based around six pictures, with each picture appearing twice during the test. In total, there were 24 items included in this task.

The task was manipulated as a paced judgment task using the Qualtrics system. On each webpage, a picture was displayed for 10 seconds initially. After that, an audio recording presented the question and its answer only once. When the audio ended, the same question and answer were revealed below the picture. The participants were given an additional 10 seconds to view the picture and the question-answer pair together. They were asked to rate to what extent they could accept the answer in the context of the question and the picture using a 7-point scale, ranging from -3 (completely unacceptable) to +3 (completely acceptable). A score of 0 on the scale indicated a neutral response (neither acceptable nor unacceptable). The option *I don't know* was not provided in this task. The audio content was recorded by native Mandarin speakers who were linguists and had a clear understanding of the purpose of the test. Special attention was given to avoid any stress or intonation, especially on *dou*, during the recording process. Pre-test training and instructions were available for the participants to familiarised them with the operation and pace of the test before starting the actual task.

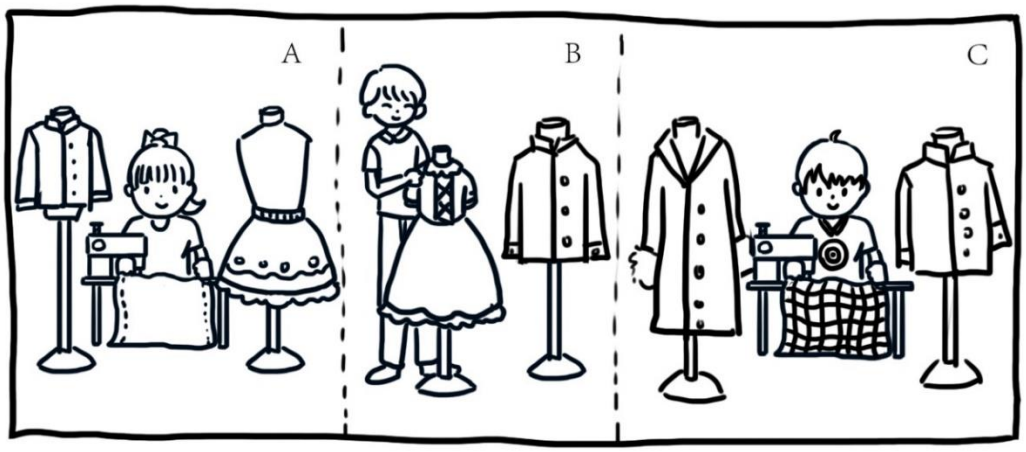


Q: nvhai-men *dou* jian-le shenme
girl-PL DOU cut-ASP what
'What did all the girls cut?'
A: yizhi tuzi
one-CL rabbit
'A rabbit.'

Figure 5.6. The test items with an individual answer

Before the formal test, a pilot study was conducted with the Mandarin version of the task using the Qualtrics system. A total of eighty native Mandarin speakers from China Mainland were recruited. In the pilot study, four types of answers were examined, including pair-list answer, individual answer, type answer and bare noun answer.[16] The results revealed that native Mandarin speakers accepted all types of answers, regardless of numerals and classifiers. None of the answer types were virtually rejected; instead, they were favoured to varying degrees. The hierarchy of acceptance for the four types of answers is as follows: pair-list > type > individual > bare noun. To control for variance and focus specifically on the acquisition of *dou*'s distributivity, type and bare noun answers were excluded in the formal test.

[16] Here, pair-list and individual answers contained numerals and classifiers, such as *yi-ge* "one" and *yi-xie* "some", while type and bare noun answers excluded these. Bare noun answers could be regarded as individual answers without numerals and classifiers.



Q: caifeng-men *dou* zuo-le shenme
tailor-PL DOU make-ASP what
'What did all the tailors make?'

A: caifeng A zuo-le yijian chenshan he yitiao duanqun caifeng B
tailor A make-ASP one-CL shirt and one-CL skirt tailor B
zuo-le yijian chenshan he yitiao lianyiqun caifeng C zuo-le
make-ASP one-CL shirt and one-CL dress tailor C make-ASP
yijian chenshan he yijian dayi
one-CL shirt and one-CL coat
'Tailor A made a shirt and a skirt, Tailor B made a shirt and a dress, Tailor C made a shirt and a coat.'

Figure 5.7. The test item with a pair-list answer

5.5.2.2 Predictions

This acceptability judgement task aims to explore the learnability issues of L2 Mandarin learners on the interpretation of *dou*-quantified subject/*wh*-object questions. The task investigates whether L2 learners could acquire the knowledge that the distributivity of quantifier *dou* gives rise to the pair-list answer, and at the same time, examines the extent to which native speakers and L2 learners accept the individual answer.

In regard to the various mapping possibilities and their corresponding reassembly processes, as well as the problem of POS, two alternative predictions are proposed, as indicated in (16) and (17).

(16) **Acceptability Judgment Task Prediction A:**

***dou-each/sorezore* mappings**

If L2 Mandarin learners map *dou* onto the distributive quantifier *each* or *sorezore*, which hosts a [+distributive] feature, both lower proficiency and higher proficiency learners will accept the pair-list answer and reject individual answer, due to L1 transfer.

(17) **Acceptability Judgment Task Prediction B:**

***dou-all/subete/minna/zen'in* and *dou-dono-mo* mappings**

If L2 Mandarin learners map *dou* onto the universal quantifier *all/subete/minna/zen'in*, which hosts a [+universal] feature, or the universal *wh*-indeterminate *dono-mo,* which hosts [+universal, ∨] features, lower proficiency learners will accept both the pair-list and individual answers due to L1 transfer. Higher proficiency learners, who undergo the reassembly process (abandon the feature [+universal] or the features [+universal, ∨] and add the feature [+distributive]) will accept the pair-list answer and reject the individual answer, due to Universal Grammar access.

In the next chapter, I will move forward onto the process of data analysis and the results of the two experimental tasks. The discussion of the results and the predictions will be provided at the end of the chapter.

Chapter 6

Data Analysis, Results and Discussions

6.1 Data Analysis and Results

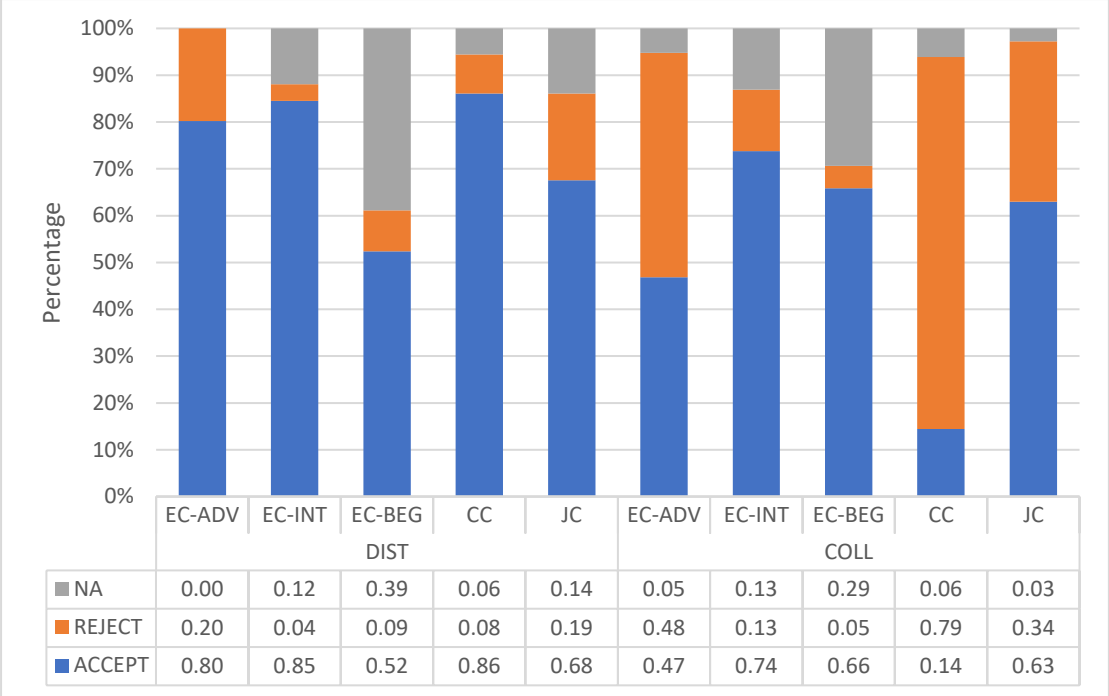
6.1.1 The Sentence-Picture Matching Task

In this task, the participants' behaviours were recorded in terms of their selections among the four response options: *Yes*, *No*, *Not sure* and *I don't know*. The proportion of selection of each option was calculated as an initial step to examine between-group and between-condition differences. The statistical analysis was conducted based on the data of 51 L1 English learners, 18 L1 Japanese learners and 30 native Mandarin speakers. The responses of *Yes* were coded as *Accept*, *No* as *Reject*, and the responses of *Not Sure* and *I don't know* were collapsed together and coded as *NA*. The *Accept* and *Reject* responses were then coded for accuracy. Specifically, in the distributive condition (for both the critical items with *dou* and the distractor items with *ge*), *Yes* was coded as *Right* and *No* was coded as *Wrong*. In the collective condition, *No* was coded as *Right* and *Yes* was coded as *Wrong*. All *NA* responses were coded as *Wrong* as well. Correct judgments on both conditions were taken as a representation that the L2 learners had acquired the knowledge of the distributivity of *dou*. Generalised linear mixed-effects models were applied to further analyse the L2 data. The analysis procedures were carried out in the R environment (R Core Team, 2021) using the package *lme4* (Bates et al., 2015). *P*-values were calculated with the *glmer* function from this package. Following standard practice in second language acquisition research, a *p*-value of less than .05 is considered to denote a statistically significant effect. The results of filler items were not included since they were adopted to make the target structures less noticeable.

Figure 6.1 illustrates the response rates of participants on the critical items (test items including *dou*) among four groups: beginning L1 English-L2 Mandarin learners, intermediate L1 English-L2 Mandarin learners, advanced L1 English-L2 Mandarin learners, L1 Japanese-L2 Mandarin learners and native Mandarin controls. Starting with the native Mandarin group, their responses aligned with expectations, showing a high acceptance rate in the distributive condition (86.11%) and a high rejection rate in the collective condition (79.44%). The beginning EC group had the lowest acceptance

in the distributive condition (52.4%) and the second highest acceptance in the collective condition (65.9%). It is the only group that preferred the collective to the distributive. Notably, the beginning EC group chose the *Not Sure* option quite frequently for both conditions (38.9% in the distributive condition and 29.3% in the collective condition). In the post-test interviews, the participants explained that they selected this option because they genuinely had uncertainties about whether the sentences matched the pictures, not due to a lack of understanding of either the pictures or the sentences. Moving on to the intermediate EC group, the participants revealed the highest acceptance rates in both conditions. They exhibited a native-like performance in accepting the distributive condition (84.5%), but also displayed a significant preference for the collective with 73.8% acceptance. The advanced EC group did not select the *Not sure* option at all and performed as predicated, with a higher acceptance rate in the distributive condition (80.2%) in comparison with the collective condition (46.9%). However, their acceptance rate for the collective condition was still higher than that of the native controls, indicating that even the advanced learners in the L1 English group cannot not fully understand the distributive nature of *dou* in essence and reject the incompatible collective condition decisively. In regard to the JC group, the participants showed relatively equal acceptance in both conditions (67.6% for distributive and 63.0% for collective). By comparing the proportions of rejection and *Not Sure* responses, it can be observed that the participants were more likely to reject the collective condition than the distributive one.

In summary, when encountering the critical items with *dou*, the intermediate EC, beginning EC and JC groups tended to allow for both a distributive and a collective reading. At the same time, they revealed some uncertainty by selecting a considerable number of *Not Sure* options. The advanced EC group demonstrated a higher proficiency in achieving the distributive reading and rejecting the collective reading, although their performance was still distinguished from native-like behaviour. It is worth noting that the intermediate EC group outperformed the advanced EC group in accepting the distributive condition but underperformed the beginning EC group in rejecting the collective condition, which requires further investigation. On the other hand, the native control group showed high acceptance rate of the distributive reading and low acceptance rate of the collective reading, which is consistent with expectations.



	EC-ADV	EC-INT	EC-BEG	CC	JC	EC-ADV	EC-INT	EC-BEG	CC	JC
	DIST					COLL				
NA	0.00	0.12	0.39	0.06	0.14	0.05	0.13	0.29	0.06	0.03
REJECT	0.20	0.04	0.09	0.08	0.19	0.48	0.13	0.05	0.79	0.34
ACCEPT	0.80	0.85	0.52	0.86	0.68	0.47	0.74	0.66	0.14	0.63

Figure 6.1. The rates (percentage) of participants' responses on critical items (*dou*), by group

To explore the task performance of L2 learners in terms of proficiency, four scatter plots were created, presenting each participant's responses for the two conditions. In the plots, the x axis represents the range of proficiency scores, and the y axis represents the number of critical items. Each data point stands for each participant's responses of acceptance in this condition. Consider the patterns in Figure 6.2 and Figure 6.3. A slight trend can be observed, indicating that with increasing proficiency, learners in the EC group were more inclined to accept the distributive condition as well as reject the collective condition. A considerable number of maximum acceptances can be found in the middle and at the right end of the distributive plot, and several minimum acceptances appear at the right end of the collective plot. These patterns suggest that some intermediate and advanced EC learners could recognise that the quantifier *dou* is only compatible with the distributive condition. Now, considering the patterns in Figure 6.4 and Figure 6.5 for the JC group, although the data size is relatively small, it is detectable that learners with higher proficiency were more likely to accept the distributive condition and reject the collective condition. In conclusion, the scatter plots provide evidence of the relationship between L2 learners' task performance and proficiency scores, particularly in their comprehension of the distributive nature of *dou*. As proficiency increased, learners tended to demonstrate a more accurate grasp of the

appropriate conditions for *dou*, resulting in more consistent patterns of acceptance and rejection.

The results for the distractor items (with *ge*) are presented visually in Figure 6.6. In the control group, the participants explicitly accepted the distributive condition (89.2%) and unequivocally rejected the collective condition (97.5%). The beginning EC group performed similarly to the intermediate EC group, with acceptance rates of 63.1% and 62.5% for the distributive condition, and 48.8% and 44.7% for the collective condition, respectively. What differentiates the two groups is that the beginning learners chose more *Not Sure* options when encountering the distractor items with the collective condition. In regard to the advanced EC group, the acceptance rate for the distributive condition achieves 75.0%. Moreover, compared with the critical items, the participants in this group distinctly rejected the collective condition (70.3%), which is much more native-like. In the JC group, the participants revealed a preference for accepting the distributive condition (58.3%) as well as rejecting the collective condition (61.1%). Additionally, the proportion of *Not Sure* responses in this group remains high.

To summarise, the beginning and intermediate EC groups seemed to treat *ge* as a universal quantifier rather than a strong distributive quantifier, on par with *each* in English. As a result, they considered that both the distributive and the collective readings are available for the distractor items including *ge*. By contrast, the participants in the advanced EC and JC groups tended to believe that those sentences could only be interpreted distributively. They exhibited a performance akin to that of native speakers by readily accepting the distributive condition, yet faced challenges in thoroughly rejecting the collective condition.

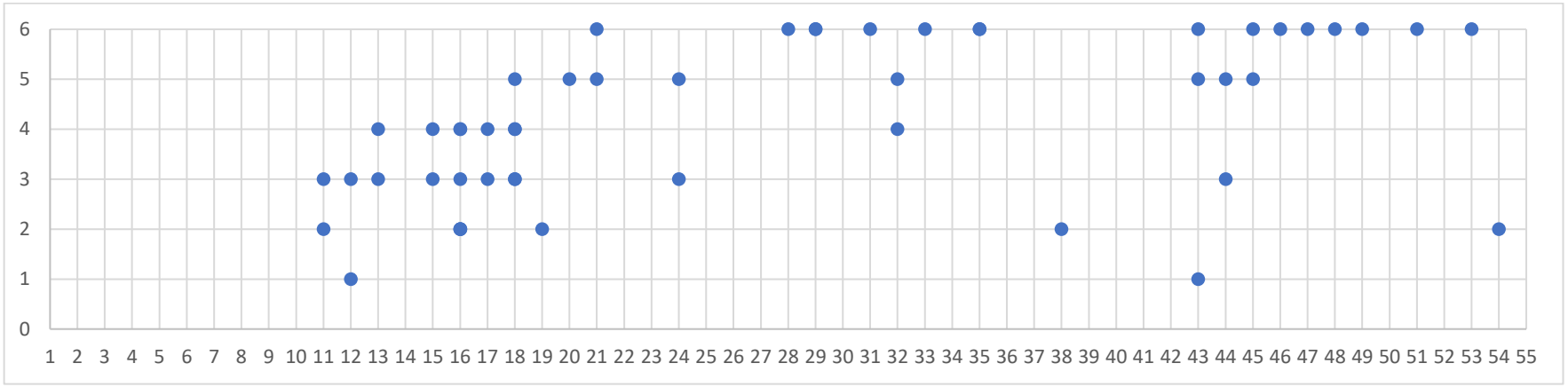


Figure 6.2. The acceptance in distributive condition by EC group

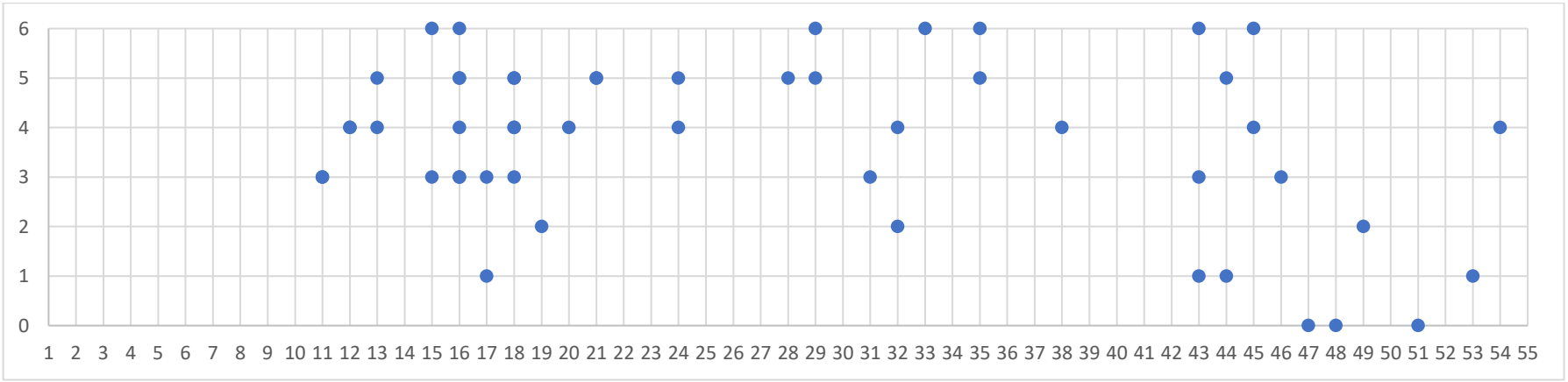


Figure 6.3. The acceptance in collective condition by EC group

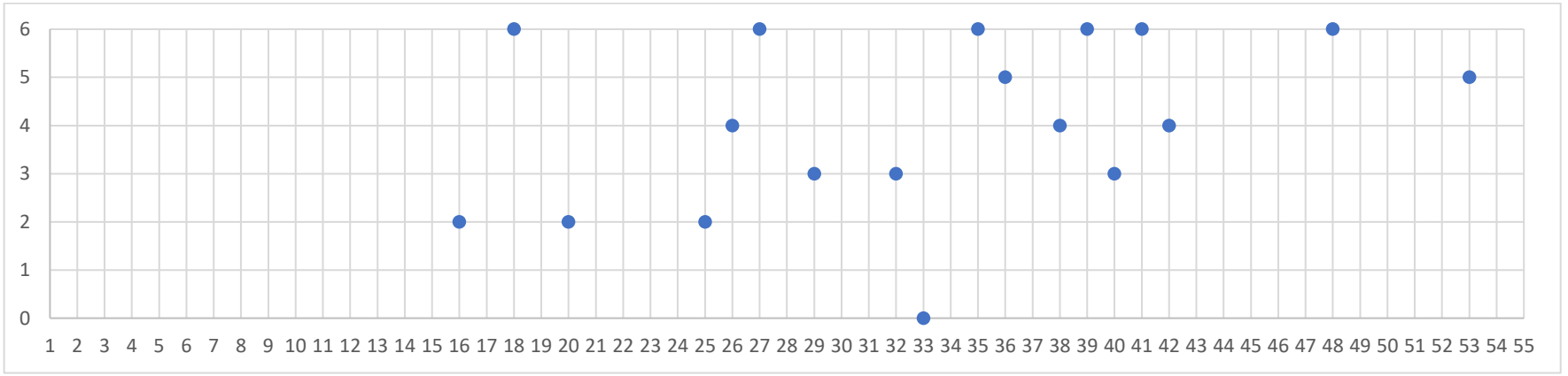


Figure 6.4. The acceptance in distributive condition by JC group

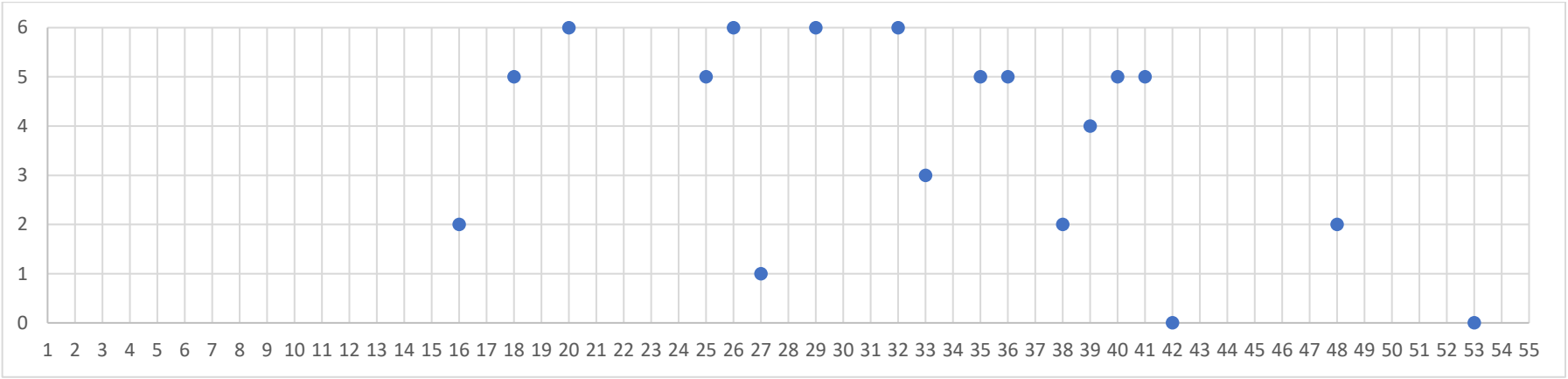
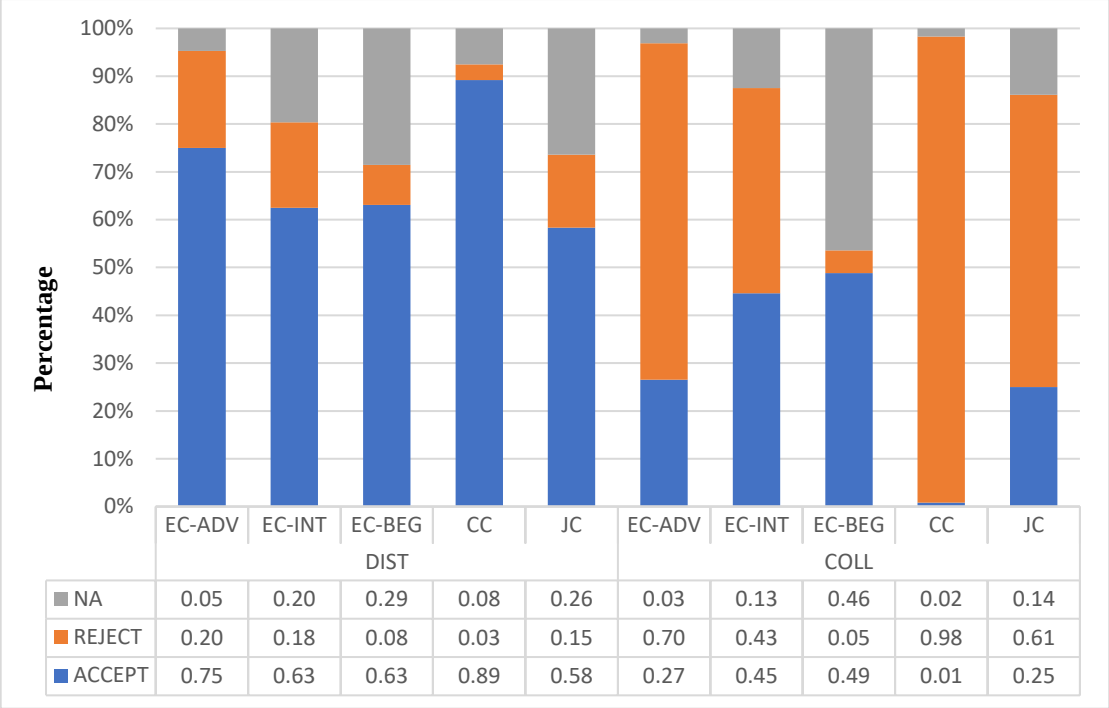


Figure 6.5. The acceptance in collective condition by JC group



	EC-ADV	EC-INT	EC-BEG	CC	JC	EC-ADV	EC-INT	EC-BEG	CC	JC
	DIST					COLL				
NA	0.05	0.20	0.29	0.08	0.26	0.03	0.13	0.46	0.02	0.14
REJECT	0.20	0.18	0.08	0.03	0.15	0.70	0.43	0.05	0.98	0.61
ACCEPT	0.75	0.63	0.63	0.89	0.58	0.27	0.45	0.49	0.01	0.25

Figure 6.6. The rates (percentage) of participants' responses on distractor items (*ge*), by group

To interpret the data further, a linear mixed-effects model was run on the L2 learners' accuracy (*Right* versus *Wrong*) of the critical items (with *dou*) using the *glmer* function in the *lme4* package. As claimed by Baayen et al (2008), "mixed-effect models have been developed to capture individual differences in a principled way, while at the same time allowing generalisations across populations. Instead of discarding individual differences across subjects and items as an uninteresting and disappointing nuisance, we should embrace them. It is not to the advantage of scientific progress if systematic variation is systematically ignored" (p. 407). Therefore, in this statistical analysis process, all available data were included, and the proficiency score was treated as a variable, replacing the proficiency level (beginning, intermediate and advanced). The model was maximal: the fixed effects were *condition* (collective, distributive), *group* (EC, JC) and *proficiency score*, as well as their interactions. Random intercepts were included for both participants and items. Furthermore, the random slope of *condition* by participants was also included in the model. The binary variables were sum-coded: *condition* (collective = -1, distributive = 1); *group* (EC = -1, JC = 1), and proficiency scores were centred around the means (Cunning, 2012). The results of the linear mixed-effects model on the critical items are presented in Table 6.1.

Table 6.1. Fixed effects for the effects of group, condition and proficiency score on L2 participants' accuracy on critical items *dou* (828 observations)

	Estimate	SE	z value	Pr (>|z|)
condition	-1.458	0.246	-5.936	< .001
group	-0.092	0.197	-0.466	.641
centre proficiency	-0.092	0.019	-4.974	< .001
condition × group	0.363	0.192	1.893	.058
condition × centre proficiency	0.026	0.018	1.445	.149
group × centre proficiency	0.009	0.018	0.508	.612
condition × group × centre proficiency	-0.010	0.017	-0.554	.580

Note. Formula: accuracy ~ condition * group * centreprof + (1 +condition | ID) + (1 | item); ** p < .01, * p < .05.

Table 6.1 reveals the main effects of *condition* and *proficiency score*. The main effect of *condition* indicates that the participants generally displayed higher accuracy for one condition compared with the other condition. As illustrated in Figure 6.1, this interaction arises from the higher acceptance of the distributive condition and the lower rejection of the collective condition. The main effect of *proficiency score* shows that the participants' accuracy in their responses varied based on their proficiency. However, there is no significant three-way interaction, suggesting that the EC group is not different from the JC group significantly in terms of the relationship between *condition* and *proficiency score*. Additionally, no significant interactions were found between *condition* and *group, condition* and *proficiency score* , as well as *group* and *proficiency score*.

Furthermore, a linear mixed-effects model was employed to examine the L2 learners' accuracy of the distractor items. In this model, the fixed effects included *condition*, *group* and *proficiency score*, and their interactions, and participants and items were considered as random intercepts. No other random slopes or intercepts were included in the model, since the random effects would be too complex for the model to support. The binary variables: *condition* (collective = -1, distributive = 1); *group* (EC = -1, JC = 1), were sum-coded for the analysis. The results of the linear mixed-effects model on the distractor items are demonstrated in Table 6.2.

Table 6.2. Fixed effects for the effect of group, condition and proficiency score on L2 participants' accuracy on distractors *ge* (552 observations)

	Estimate	SE	z value	Pr (>|z|)
condition	-0.372	0.185	-2.013	.044*
group	-0.133	0.150	-0.889	.374
centre proficiency	-0.061	0.014	-4.406	< .001
condition × group	0.429	0.118	3.652	< .001
condition × centre proficiency	0.029	0.011	2.716	.007**
group × centre proficiency	0.025	0.014	1.808	.071
condition × group × centre proficiency	-0.026	0.011	-2.445	.014*

Note. Formula: accuracy ~ condition * group * centreprof + (1 +condition | ID) + (1 | item); ** p < .01, * p < .05.

In Table 6.2, significant main effects can be observed for *group* and *proficiency score*. Moreover, two significant two-way interactions are identified. The first interaction, *condition* and *group*, represents that the performance of one group differs from the other group in relation to the conditions. The second interaction, *condition* and *proficiency score*, indicates that the participants' proficiency influenced their accuracy in responses when encountering different conditions. Most importantly, there is a significant three-way interaction among *condition*, *group* and *proficiency score*. This reveals that the participants' performance on both conditions is dependent on their first language group and their proficiency. However, there is no significant two-way interaction of *group* and *proficiency score*. To investigate the significant two-way interaction of *condition* and *group* further, a follow-up model was run, nesting *group* within *condition* as fixed effects, and participants and items as random intercepts. The results of the nested model are given in Table 6.3.

As shown in Table 6.3, the model indicates that the accuracy for one condition was significantly higher than for the other condition in the L1 English-L2 Mandarin group, but not in the L1 Japanese-L2 Mandarin group. This finding aligns with the patterns observed in Figure 6.6. Specifically, the participants in the L1 English group made more mistakes by regarding the collective condition as acceptable, while the participants in the L1 Japanese group accepted the items with the distributive condition as well as rejected the ones with the collective condition. It is worth mentioning that the absence

of a significant effect of *condition* on the accuracy of participants' responses in the L1 Japanese group may be attributed to the small sample size. With only 18 L1 Japanese-L2 Mandarin learners participating in this study, their proficiency levels were relatively concentrated in intermediate and advanced. As a consequence, the variations in their performance based on proficiency were difficult to observe conclusively due to the limited amount of data.

Table 6.3. Results of nested linear mixed-effects model for group within condition

	Estimate	SE	z value	Pr (>|z|)
group	-0.200	0.184	-1.086	.278
group EC / condition	0.821	0183	-4.484	< .001
group JC / condition	-0.070	0.230	0.303	.762

Note. Formula: accuracy ~ group/condition + (1 | ID) + (1 | item); ** p < .01, * p < .05.

To summarise the findings thus far, the advanced EC and native groups display similar behaviour when matching sentences including *dou*/*ge* to pictures expressing distributive readings. Both groups revealed a high acceptance rate for the distributive condition when sentences including a distributive quantifier. However, while the native group unequivocally rejected the matching between sentences including *dou/ge* and pictures expressing collective readings, the advanced EC group maintained a certain level of acceptance, especially when encountering the quantifier *dou*. In other words, although the advanced EC group had basically acquired the knowledge of the distributive force of *dou* in the specific sentence structure noun-*men* (subject) + *dou* + verb-LE + one-CL + noun (object) with mixed predicates, there remains a gap between the advanced EC group and the native group. Notably, the intermediate EC and beginning EC groups exhibited more varied performance. Their response patterns suggest that they interpreted the sentences with either *dou* or *ge* in the same way as sentences with the universal quantifier *all* in English. Both the distributive and the collective interpretations were considered acceptable. Thus, it is challenging for the pre-advanced learners to understand *dou*'s properties as a distributive quantifier and acquire knowledge of its distributive force. As for the JC group, one the one hand, it failed to distinguish the distributive quantifier *dou* from the universal quantifiers *subete/minna/zen'in/dono-mo* in terms of semantic properties and functions, leading to the acceptance of both the distributive and the collective conditions. On the other hand,

the JC group was able to build a similar contrast between *ge* and *sorezore* and identify the distributive force of *ge*, allowing them to clearly reject cases where *ge* occurs in a non-distributive context.

6.1.2 The Picture-Based Acceptability Judgment Task

For the AJT task, the participants' responses of -3, -2 and -1 were considered as rejections of the answers to the questions and pictures, while +3, +2 and +1 stood for acceptance. Group mean acceptability ratings were calculated first for each condition, as illustrated in Table 6.4. Recall that with the insertion of *dou* into an interrogative sentence with a *wh*-object, the sentence is more likely to receive a pair-list answer rather than an individual answer. At the same time, the non-maximal answer becomes incompatible. Looking at Table 6.4, starting with the native control group, it is apparent that native Mandarin controls highly accepted the pair-list reading (mean = 2.65), but they did not virtually reject the individual reading (mean = 0.35). A similar pattern is observed in the advanced EC group. On the one hand, the participants showed a preference for the pair-list reading in the interrogative sentence with *dou* (mean = 1.65). On the other hand, they did not thoroughly regard the individual reading as inappropriate (mean = 0.56). In the intermediate EC group, the participants presented the highest acceptance of both the pair-list reading (mean = 1.81) and the individual reading (mean = 0.76) among the three proficiency levels of the EC group. In the beginning EC group, the participants did not make clear judgements on accepting or rejecting either condition, as the means of both conditions were close to zero. Furthermore, regarding the JC group, the participants recognised that an interrogative sentence with a *dou*-quantified subject and a *wh*-object is more compatible with a pair-list reading (mean = 2.00). Additionally, they outperformed the native control group in rejecting the individual reading (mean = 0.21).

Figure 6.7 shows a bar chart of mean acceptability ratings between the two L2 groups by answer types. It is observable that compared with the L1 English group, the L1 Japanese group performed more target-likely. The L1 Japanese group revealed a stronger preference for accepting the pair-list reading as well as rejecting the individual reading. By contrast, the L1 English group demonstrated an understanding that the pair-list reading is more compatible, while still considering the individual reading as a potential answer to *dou*-quantified subject/*wh*-object questions.

Table 6.4. Mean rating of two types of answer among five groups

Group	Condition	Mean	SD	SE
beginning EC	individual	0.23	1.51	0.13
	pair-list	0.38	1.43	0.13
intermediate EC	individual	0.76	1.61	0.18
	pair-list	1.81	1.56	0.17
advanced EC	individual	0.56	1.67	0.17
	pair-list	1.65	1.57	0.16
JC	individual	0.21	1.83	0.18
	pair-list	2.00	1.58	0.15
native	individual	0.35	1.56	0.29
	pair-list	2.65	0.52	0.10

For further analysis, an ordinal mixed-effects model was employed on the raw ratings of the two L2 groups using the *clmm* function in *ordinal* package (Christensen, 2022), in the R statistical environment. Here, the application of the ordinal regression method enables a direct analysis of the rating scale data without the need to transform the data into a ratio scale. The maximal model included the fixed effects of *condition* (pair-list, individual), *group* (EC, JC) and *proficiency score*, along with their interactions. Participants and items were treated as random intercepts. The sum-coding was applied to the binary variables: *condition* (collective = -1, distributive = 1); *group* (EC = -1, JC = 1). In addition, proficiency scores were centred around the means during the data analysis process. The results of the omnibus ordinal model for acceptability ratings are illustrated in Table 6.5.

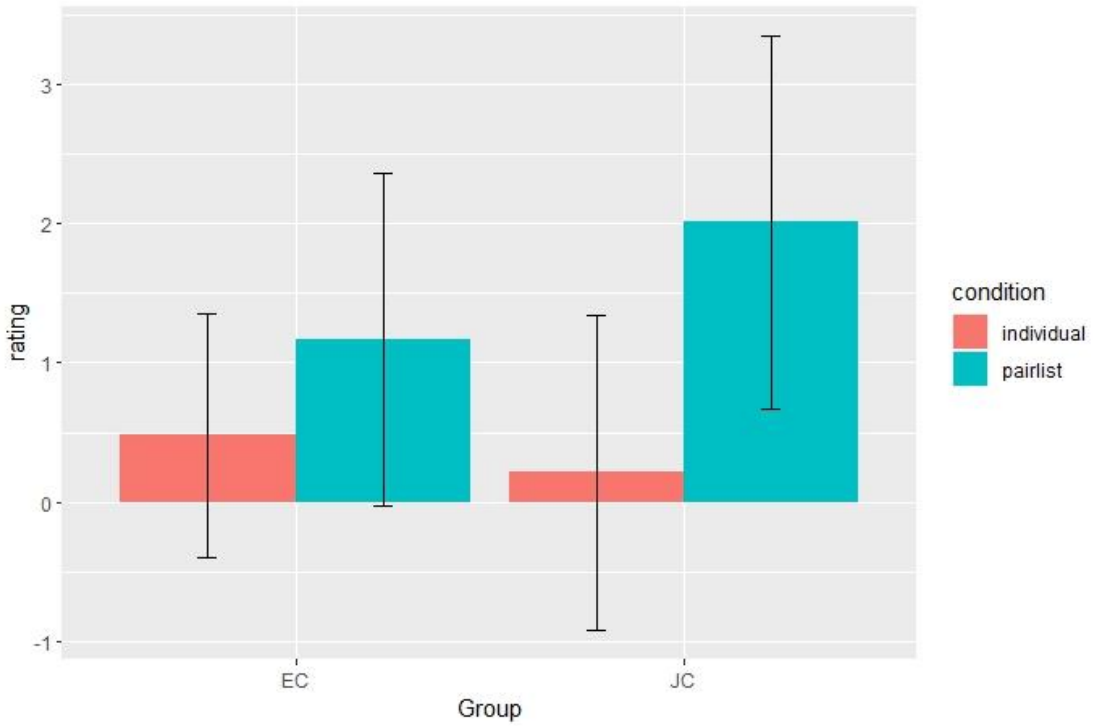


Figure 6.7. Mean acceptability ratings of two types of answers between the two L2 groups (error bars = SE).

Table 6.5. Results of main ordinal models for acceptability ratings

	Estimate	SE	z value	Pr (>|z|)
condition	0.833	0.087	9.617	< .001
group	0.149	0.155	0.959	.338
centre proficiency	0.058	0.015	3.873	0.712
condition × group	0.315	0.081	3.886	< .001
condition × centre proficiency	0.051	0.009	5.878	< .001
group × centre proficiency	0.024	0.015	1.583	.113
condition × group× centre proficiency	0.029	0.009	3.322	< .001

Note. Formula: response ~ condition * group * centreprof + (1 | ID) + (1 | item), ** p < .01, * p < .05.

In Table 6.5, the model reveals a significant main effect of *condition*, two significant two-way interactions, and one significant three-way interaction. The main effect of *condition* indicates that the participants overall gave higher ratings to one reading than

the other reading. Referring to the patterns in Figure 6.7, it becomes evident that the participants in both L2 groups assigned higher ratings to the pair-list reading than the individual reading. The significant interaction of *condition* and *group* suggests that the effect of *condition* differed between the two groups. In other words, one group responded differently to the conditions in comparison with the other group. Furthermore, the significant interaction of *condition* and *proficiency score* implies that the participants' proficiency influenced their judgements on different conditions to a considerable extent. As given in Table 6.4, with increasing proficiency, learners in the EC group became more likely to accept the pair-list reading and reject the individual reading. Of particular interest is the significant three-way interaction among *condition*, *group* and *proficiency score*. This interaction highlights that the participants' performance was influenced by both their first language group and their language proficiency when encountering different conditions. Then, a nested model was carried out to pinpoint the significant interaction of *condition* and *proficiency*. The model nested *group* within *condition* as fixed effect, and participants and items as random effects. The sum-coding was applied to the binary variables as well. The results of the nested model are presented in Table 6.6.

Table 6.6. Results of nested models for acceptability ratings

	Estimate	SE	z value	Pr (>|z|)
group	0.268	0.154	1.741	.082
group EC / condition	0.451	0.079	5.712	< .001
group JC/ condition	1.260	0.141	8.908	< .001

Note. Formula: response ~ group /condition + (1| ID) + (1 | item), ** $p < .01$, * $p < .05$.

As shown in Table 6.6, the main effect of *condition* is evident in both L2 groups. According to the data presented in Table 6.4 and Figure 6.7, a distinct trend emerges wherein both groups showed sensitivity to the different conditions, generally preferring the pair-list reading over the individual reading. However, the EC group displayed a notable frequency of acceptances or uncertainties regarding the individual reading, despite its incompatibility with the *dou*-quantified subject/*wh*-object question. By contrast, the JC group was more likely to deem the individual reading as inappropriate,

revealing the lowest mean rating among all the groups. This difference in response patterns could explain the observed significant interaction of *condition* and *group* in the analysis.

So far, the results indicate that the two L2 groups and the native control group behaved diversely with respect to the different types of readings. Both the advanced EC group and the JC group demonstrated a higher acceptance of the pair-list reading, a pattern akin to the performance of the native control group. None of these groups outrightly rejected the individual reading, as reflected in their mean ratings all being above zero. The intermediate EC group outperformed the advanced EC group in terms of accepting the pair-list reading, while also presenting the highest acceptance for the individual reading. The beginning EC group struggled to differentiate between the two types of readings, as they regarded both types as acceptable, with lower mean ratings hovering around zero.

6.2 Discussions

6.2.1 The Sentence-Picture Matching Task

The sentence-picture matching task was conducted to investigate L2 learners' knowledge of the distributivity of *dou* on the interpretation of declarative sentences with mixed predicates. As explained in Chapter 3 and Chapter 4, unlike the universal quantifiers *all* in English and *subete/zen'in/minna/dono-mo* in Japanese, which allow for both distributive and collective interpretations, *dou* in Mandarin Chinese is a distributive quantifier that makes the distributive interpretation the only possibility of the sentence. The experiment aims to test the predictions mentioned earlier (in Section 5.5.1.2), which are repeated below as (1) and (2).

(1) **Sentence-Picture Matching Task Prediction A:**
***dou–each/sorezore* mappings**
If L2 Mandarin learners map *dou* onto the [+distributive] form *each/sorezore*, both lower and higher proficiency learners will accept the distributive interpretation and reject the collective interpretation in the sentence-picture matching task (i.e., their behaviour will be target-like), due to L1 transfer.

(2) **Sentence-Picture Matching Task Prediction B:**

***dou–all/ subete/minna/zen'in* and *dou-dono-mo* mappings**

If L2 Mandarin learners map *dou* onto the [+universal] form *al/subete/minna/zen'in* or the [+universal, ∨] form *dono-mo*, lower proficiency learners will demonstrate a non-target-like acceptance of both distributive and collective interpretations, due to L1 transfer. Higher proficiency learners, who undergo the reassembly process (abandon the feature [+universal] or the features [+universal, ∨] and add the feature [+distributive]), will accept the distributive interpretation and reject the collective interpretation, due to Universal Grammar access.

These predictions were proposed based on the Feature Reassembly Hypothesis, taking into account the challenges L2 learners might encounter at the two different stages: mapping and reassembly, as well as the poverty of the stimulus situation at the syntax-semantics interface. This section discusses what the results represent in the context of these predictions.

Firstly, consider the individual consistency among the L2 participants, as presented in Table 6.7. The most prominent feature of the distributive data is that across all the groups, there is only one participant who consistently rejected the distributive interpretation. Additionally, as the proficiency level increased, the participants showed a higher likelihood of making consistent judgements of acceptance for the distributive interpretation. As for the collective data, the most noteworthy observation is that in all the groups, a certain proportion of participants consistently accepted the collective interpretation. However, with increasing proficiency, some of the advanced participants demonstrated the ability to consistently reject the collective interpretation. Furthermore, the number of participants who consistently accepted the distributive interpretation, as well as consistently rejected the collective interpretation, was calculated, with 5 from the advanced EC group and 2 from the JC group. The successful acquisition of the distributivity of *dou* in this context means that L2 learners could make consistent judgments of acceptance for the distributive and rejection for the collective.

Table 6.7. Consistency data for L2 groups on distributive and collective interpretations of the critical items

Group	Distributive interpretation: number (percentage) of participants who demonstrate:			Collective interpretation: number (percentage) of participants who demonstrate:		
	consistent acceptance	consistent rejection	inconsis tency	consistent acceptance	consistent rejection	inconsis tency
EC adv (n=16)	12 (75.00%)	1 (6.25%)	3 (18.75%)	4 (25.00%)	5 (32.25%)	7 (43.75%)
EC int (n=14)	10 (71.43%)	0 (0.00%)	4 (28.57%)	8 (57.14%)	0 (0.00%)	6 (42.86%)
EC beg (n=21)	1 (4.76%)	0 (0.00%)	20 (95.24%)	7 (33.33%)	0 (0.00%)	14 (66.67%)
JC adv (n=7)	4 (57.14%)	0 (0.00%)	3 (42.86%)	2 (28.57%)	2 (28.57%)	3 (42.86%)
JC int (n=9)	3 (33.33%)	0 (0.00%)	6 (66.67%)	7 (77.78%)	1 (11.11%)	1 (11.11%)
JC beg (n=2)	1 (50.00%)	0 (0.00%)	1 (50.00%)	1 (50.00%)	0 (0.00%)	1 (50.00%)

Notes: 'consistent acceptance' = selection of *Yes* on at least 5 out of 6 relevant test items; 'consistent rejection' = selection of *NO* on at least 5 out of 6 relevant test items; 'inconsistency' = neither consistent acceptance nor consistent rejection

Recall that with the predictions of the FRH, L2 learners will initially build a similar contrast between the lexical item they perceived in the target language input and the morpholexical equivalent in their L1, based on semantic meaning or grammatical function. They will transfer the feature bundles encoded by the equivalent in L1 onto the L2 item. Subsequently, as they are exposed to the L2 input, L2 learners are expected to identify the situation in which the direct mapping is inappropriate, leading to a reassembly of the feature set. The acquisition task in this stage involves remapping or reconfiguring features from the way they are assembled in the L1 into a new target combination appropriate for the L2. During the process of reconfiguration, new features may be acquired and added to the feature bundle, while some features that are not present in the L2 may be deleted. The findings of this task suggest that the feature set of the distributive quantifier *dou* in the interlanguage of L2 learners with lower

proficiency in Mandarin Chinese appeared to include the [+universal] feature. That is to say, due to L1 transfer, lower proficiency learners tended to regarded *dou* as a universal quantifier, on par with *all* in English and *subete/zen'in/minna/dono-mo* in Japanese. As a result, they strongly accepted both the distributive and collective interpretations. On the other hand, the two-way and three-way interactions revealed that the feature set of *dou* in the interlanguage of L2 learners with higher proficiency did not seem to include the [+universal] feature. Higher proficiency learners exhibited a higher acceptance of the distributive interpretation and rejected the incompatible collective interpretation. In addition, although it is not feasible to determine how L2 learners mapped *dou* onto the equivalent in their L1s, some evidence of mapping can be observed in their performance. The consistency data shows that no lower proficiency learners consistently rejected the collective interpretation, which indicates that they might not map *dou* onto the distributive form in their L1s, such as *each* in English and *sorezore* in Japanese. Otherwise, they would make consistent judgements of both acceptance for the distributive interpretation and rejection for the collective interpretation. Furthermore, the presence of higher proficiency learners who made consistent judgments of both interpretations reveals that the problem of POS can be overcome. In summary, the experimental predictions based on the FRH were partially supported by the results of this task. It was found that lower proficiency learners might adopt the L1-based feature sets of universals, while higher proficiency learners had reconfigured the feature set of *dou* by deleting the [+universal] feature and adding the [+distributive] feature.

Moreover, consider the predictions in regard to *ge*, which are repeated in (3) and (4). According to the consistency data for the L2 groups presented in Table 6.8, it is observable that, compared with *dou*, with increasing proficiency, the participants tended to consistently accept the distributive interpretation as well as reject the collective interpretation. Only one participant from the beginning EC group consistently rejected the distributive interpretation. In addition, 14 participants from the EC group and 5 from the JC group made consistent judgements correctly for both conditions, indicating that they had acquire the knowledge that *ge* in Mandarin Chinese is a distributive quantifier that is only compatible with the distributive interpretation in the context of this task.

(3) **Sentence-Picture Matching Task Prediction C:**

***ge-each/sorezore* mappings**

If L2 Mandarin learners map *ge* onto the [+distributive] form *each/sorezore*, both lower and higher proficiency learners will accept the distributive interpretation and reject the collective interpretation (i.e., their behaviour will be target-like), due to L1 transfer.

(4) **Sentence-Picture Matching Task Prediction D:**

***ge-all/ subete/minna/zen'in* and *ge-dono-mo* mappings**

If L2 Mandarin learners map *ge* onto the [+universal] form *all/subete/minna/zen'in* or the[+universal, ∨] form *dono-mo*, lower proficiency learners will demonstrate a non-target-like acceptance of both distributive and collective interpretations, due to L1 transfer. Higher proficiency learners, who undergo the reassembly process (abandon the feature [+universal] or the features [+universal, ∨] and add the feature [+distributive]), will accept the distributive interpretation and reject the collective interpretation, due to Universal Grammar access.

The findings of this task illustrate that, similar to *dou* in Mandarin Chinese, the feature set of *ge* in the interlanguage of L2 learners with lower proficiency seemed to include the [+universal] feature. However, as the proficiency level increased, the [+universal] feature appeared to be excluded, and instead, the [+distributive] feature was added. The higher the proficiency was, the more consistent judgements of both acceptance for the distributive interpretation and rejection for the collective interpretation were made. The participants' performance provided evidence of their comprehension of the distributive nature of *ge*, which could be attributed to either L1 transfer, such as *each* in English and *sorezore* in Japanese, or feature reassembly involving the omission of the [+universal] feature and the acquisition of the [+distributive] feature.

Table 6.8. Consistency data for L2 groups on distributive and collective interpretations of the distractor items

Group	Distributive interpretation: number (percentage) of participants who demonstrate:			Collective interpretation: number (percentage) of participants who demonstrate:		
	consistent acceptance	consistent rejection	inconsis tency	consistent acceptance	consistent rejection	inconsis tency
EC adv (n=16)	14 (87.50%)	0 (6.25%)	2 (12.50%)	0 (0.00%)	12 (75.00%)	4 (25.00%)
EC int (n=14)	6 (42.86%)	0 (0.00%)	8 (57.14%)	4 (28.57%)	4 (28.57%)	6 (42.86%)
EC beg (n=21)	13 (61.90%)	1 (4.76%)	7 (33.33%)	7 (33.33%)	0 (0.00%)	14 (66.67%)
JC adv (n=7)	4 (57.14%)	0 (0.00%)	3 (42.86%)	0 (0.00%)	5 (71.43%)	2 (28.57%)
JC int (n=9)	3 (33.33%)	0 (0.00%)	6 (66.67%)	2 (22.22%)	3 (33.33%)	4 (44.44%)
JC beg (n=2)	0 (0.00%)	0 (0.00%)	2 (100.00%)	0 (0.00%)	1 (50.00%)	1 (50.00%)

Notes: 'consistent acceptance' = selection of *Yes* on at least 3 out of 4 relevant test items; 'consistent rejection' = selection of *NO* on at least 3 out of 4 relevant test items; 'inconsistency' = neither consistent acceptance nor consistent rejection

In conclusion, in regard to the critical items with *dou*, higher proficiency learners exhibited a target-like pattern in accepting the distributive interpretation, but they did not unequivocally reject the collective interpretation as predicted. A considerable proportion of consistent acceptance was observed among higher proficiency learners distinguishing them from native Mandarin speakers. This suggests that higher proficiency learners may encounter difficulties in fully capturing the distributive nature of *dou* in the context of this task. Nonetheless, it is worth noting that a number of higher proficiency learners were able to judge both interpretations correctly, indicating that the acquisition of the distributivity of *dou* is indeed possible. With regard to the predictions, it appears that learners from all L2 groups preferred to map *dou* onto the universal forms in their L1s. As a consequence, the L1-based [+universal] feature was initially transferred to the L2. Under the influence of L1 transfer, lower proficiency learners accepted sentences with *dou* to be interpreted either distributively or collectively. As for higher proficiency learners, they had undergone a reassembly process by omitting

the [+universal] feature and adding the [+distributive] feature. This allowed them to reconfigure the feature set of *dou* and acquire its distributive force, leading to the rejection of the non-target-like collective interpretation. However, only a limited number of L2 learners could get rid of the influence of their L1 transfer and reject the collective interpretation consistently. This presents that the acquisition of the distributivity of *dou* remains challenging, possibly due to the lack of evidence to motivate the reassembly or poverty of the stimulus.

6.2.2 The Picture-Based Acceptability Judgment Task

The picture-based acceptability judgment task aims to investigate L2 learners' knowledge of the distributivity of *dou* on the interpretation of interrogative sentences that involve a *dou*-quantified subject and a *wh*-object. As discussed in Chapter 3, when *dou* is inserted into an interrogative sentence and quantifies over the subject NP, the response is more likely to be in the form of a pair-list answer rather than an individual answer. At the same time, the non-maximal answer is eliminated because *dou* requires the answer to provide the maximal and exhaustive information to the best of the respondent's knowledge. The predictions of the AJT as mentioned in Section 5.5.2.2, are reiterated as follows:

(5) **Acceptability Judgment Task Prediction A:**

***dou-each/sorezore* mappings**

If L2 Mandarin learners map *dou* onto the distributive quantifier *each* or *sorezore*, which hosts a [+distributive] feature, both lower proficiency and higher proficiency learners will accept the pair-list answer and reject individual answer, due to L1 transfer.

(6) **Acceptability Judgment Task Prediction B:**

***dou-all/subete/minna/zen'in* and *dou-dono-mo* mappings**

If L2 Mandarin learners map *dou* onto the universal quantifier *all/subete/minna/zen'in*, which hosts a [+universal] feature, or the universal *wh*-indeterminate *dono-mo,* which hosts [+universal, ∨] features, lower proficiency learners will accept both the pair-list and individual answers due to L1 transfer. Higher proficiency learners, who undergo

the reassembly process (abandon the feature [+universal] or the features [+universal, ∨] and add the feature [+distributive]) will accept the pair-list answer and reject the individual answer, due to Universal Grammar access.

The predictions were aligned with the Feature Reassembly Hypothesis, considering the different possibilities in the mapping stage and the potential reassembled features in the reassembly stage. In addition, the predictions took into account the problem of poverty of the stimulus at the syntax-semantics interface. This section discusses what the results of the AJT imply in relation to these predictions.

Table 6.9. Consistency data for L2 groups on pair-list and individual answers

Group	Pair-list answer: number (percentage) of participants who demonstrate:			Individual answer: number (percentage) of participants who demonstrate:		
	consistent acceptance	consistent rejection	inconsis tency	consistent acceptance	consistent rejection	inconsis tency
EC adv (n=16)	10 (62.50%)	0 (0.25%)	6 (37.50%)	5 (31.25%)	3 (18.75%)	8 (50.00%)
EC int (n=14)	10 (71.43%)	0 (0.00%)	4 (28.57%)	5 (35.71%)	0 (0.00%)	9 (64.29%)
EC beg (n=21)	1 (4.76%)	0 (0.00%)	20 (95.24%)	1 (4.76%)	0 (0.00%)	20 (95.24%)
JC adv (n=7)	7 (100.00%)	0 (0.00%)	0 (0.00%)	2 (28.57%)	2 (28.57%)	3 (42.86%)
JC int (n=9)	6 (66.67%)	1 (11.11%)	2 (22.22%)	4 (44.44%)	0 (0.00%)	5 (55.56%)
JC beg (n=2)	1 (50.00%)	0 (0.00%)	1 (50.00%)	0 (0.00%)	0 (0.00%)	2 (100.00%)

Notes: 'consistent acceptance' = selection of +1 to +3 on at least 5 out of 6 relevant test items; 'consistent rejection' = selection of -1 to -3 on at least 5 out of 4 relevant test items; 'inconsistency' = neither consistent acceptance nor consistent rejection

Table 6.9 illustrates the consistency data for the L2 groups on the two types of answers: the pair-list answer and the individual answer. Considering the former one, the individual consistency data show that there were nearly no participants who consistently rejected this type of answer. As the proficiency level increased, the

majority of participants in each group exhibited a preference for accepting the pair-list answer consistently. For instance, in the advanced JC group, all participants made consistent judgments of acceptance on the target-like pair-list answer. As for the latter one, consistent rejection was only observed in the two advanced groups. Among the participants with lower proficiency, consistent rejection was not prevalent, and a considerable number of them made consistent acceptance judgements for the non-target-like individual answer. Across all the groups, the proportions of consistent acceptance for the individual answer were consistently higher than the proportions of consistent rejection. That is to say, even the participants with higher proficiency did not essentially reject the individual answer. In addition, the number of participants who could perform target-likely by consistently accepting the pair-list answer as well as rejecting the individual answer, was calculated, with 3 from the advanced EC group and 2 from the advanced JC group.

Consider the predictions of this task. The results suggest that lower proficiency learners appeared to include the [+universal] feature rather than the [+distributive] feature in the feature set of *dou*, due to L1 transfer. The lack of consistent rejection for the non-target-like answer can be regarded as an indication that they mapped *dou* onto the universal forms in their L1s. As a consequence, they did not show sensitivity to the different answer types and tended to accept both the pair-list and the individual answers as appropriate responses to the question that includes a *dou*-quantified subject and a *wh*-object. On the other hand, the two-way and three-way interactions further revealed that with increasing proficiency, the acceptability of L2 learners varied based on the different answer types. Higher proficiency learners presented a higher likelihood of rejecting the individual answer and a stronger preference for accepting the pair-list answer. Due to the presence of cases in which higher proficiency learners could consistently judge both types of answers correctly, it is reasonable to assume that higher proficiency learners are capable of acquiring the knowledge of the distributivity of *dou* in the context of this task. They had undergone the reassembly process, no longer including the L1-based [+universal] feature but instead adding the [+distributive] feature to the feature set of *dou*. An alternative account for their target-like performance is that higher proficiency learners mapped *dou* onto the distributive forms in their L1s. In this case, the feature reassembly may not take place. Overall, the acquisition of the distributive nature of *dou* in the interrogative sentence remains challenging for L2

learners, with only some very advanced learners being able to overcome the difficulties in both mapping and reassembly stages, as well as the problem of POS.

Importantly, as demonstrated in Table 6.4, the native control group did not intrinsically reject the non-target-like individual answer, as indicated by the mean rating above zero. The focus-based account may provide a solution to this issue. As shown in (7), the interpretation of *dou*-quantified subject/*wh*-object question is affected by stress in Mandarin Chinese. When the distributive quantifier *dou* is stressed or emphasised by specific intonation, the individual answer becomes more easily attainable.

(7) xuesheng-men DOU mai-le shenme
student-PL DOU buy-ASP what
'What did each student buy?'

A similar situation can be observed in English *wh*-object/QP-subject question, as exemplified in (8). Here, with the focus on *all* and *every*, the individual answer is readily obtainable and even overwhelms the pair-list answer.

(8) a. What did ALL the students buy?
b. What did EVERY student buy?

According to Marsden (2008), in English, a stressed *wh*-object/QP-subject question differs from the unstressed one in terms of information structure. In the *wh*-interrogative sentence, the non-*wh*-element usually represents old information or the topic. With stress on the non-*wh*-element, it turns to denote new information or a focus instead. In the case of Mandarin Chinese, with stress on the distributive quantifier *dou*, special attention should be paid to the information that is not explicitly expressed in the context. If the pair-list answer can be seen as a way that offers the information maximally and straightforwardly, the individual answer is a way that asks for further extraction of the information. Therefore, the speaker intends to find some 'new' information that is not directly present in the discourse. Since participants may add potential stress on *dou* by themselves during the test, the individual answer becomes available in the AJT.

In conclusion, the results of the AJT indicate that as the proficiency level increased, L2 learners were more inclined to highly accept the target-like pair-list answer and reject the non-target-like individual answer to some extent. However, none of the

groups inherently identified that the individual answer is incompatible with the *dou*-quantified subject/*wh*-object question. A notable proportion of consistent acceptance was observed among higher proficiency learners. On the other hand, a limited number of higher proficiency learners demonstrated the ability to consistently judge both answer types correctly, which reveals that it is not unachievable for L2 learners to acquire the distributive force of *dou* on the interpretation of interrogatives. Moreover, the absence of consistent rejection of the individual answer in the lower proficiency groups shows that lower proficiency learners were more likely to build a similar contrast between *dou* and the universals in their L1s. Consequently, they transferred the L1-based feature [+universal] to the feature set of *dou*, resulting in the acceptance of both the pair-list and the individual answers. As for higher proficiency learners, their target-like performance may be derived from two ways: the accomplishment of feature reassembly by omitting the original [+universal] feature and including the [+distributive] feature, or the mapping between *dou* and the distributives in their L1s. In addition, a focus-based approach was introduced to explain why the individual answer is not genuinely ruled out. This suggests that the interpretation of *dou*-quantified subject/*wh*-object questions is influenced by stress in Mandarin Chinese, similar to the situation in English *wh*-object/QP-subject questions. When a stress is put on *dou*, the speaker's attention will be attracted to the new information which is not directly expressed in the utterance. Therefore, the individual answer becomes acceptable.

6.3 Conclusion

This chapter provides the results of the two experimental tasks and their discussions in terms of the predictions. At the end of this chapter, I would like to return to the main research questions of the current study mentioned in Section 1.2 and interpret the results in relation to these questions.

The main research questions are restated in (9) to (12). For the first question, higher proficiency learners in both L2 groups exhibited their ability to recognise the semantic difference between the distributive quantifier *dou* in Mandarin Chinese and the universal quantifiers in their first languages. Specifically, according to the results of the two experimental tasks, a number of higher proficiency learners were able to consistently reject the non-target-like conditions (i.e., the collective interpretation in the sentence-picture matching task and the individual answer in the AJT), which are

appropriate in the contexts with universal quantifiers. However, lower proficiency learners seemed to struggle in identifying this contrast and tended to accept the non-target-like conditions in both tasks. This suggests that lower proficiency learners may have difficulties in fully capturing the semantic functions of *dou* and distinguishing the distributive *dou* from the universals. Regarding the second research question, it is not directly testable since it is impossible to determine precisely how L2 learners associate the lexical items they encounter in the L2 input with the already-fully-assembled feature bundles from their L1s. Instead, the predictions of the two tasks were based on assumptions about the mapping possibilities, considering semantic and syntactic similarities between the L1 and L2. While these possibilities exist only hypothetically and are challenging to empirically prove, the consistent acceptance of non-target-like conditions by lower proficiency learners provides evidence that they were more inclined to map *dou* onto universal forms, rather than distributive forms. As for the third research question, in accordance with the hypothetical mapping possibilities, potential reassembly paths can be assumed as well. On the one hand, the reassembly process may not take place, if learners map *dou* onto distributive forms. On the other hand, the reassembly process may indeed occur, involving the omission of the original [+universal] feature and the accession of the [+distributive] feature, if learners map *dou* onto universal forms. A notable proportion of higher proficiency learners were capable of rejecting the non-target-like conditions, indicating that they may have undergone the feature reassembly process. In regard to the fourth research question, the issue of poverty of the stimulus can be observed in the contexts of both experimental tasks. If there is a mapping between *dou* and universal forms, the unavailability of the non-target-like conditions will result in the POS situations. A limited number of higher proficiency learners performed native-likely, which represents that they may have overcome the problem of POS. The overgeneralisation and overinfluence of L1 transfer can be found among lower proficiency learners, especially those in the intermediate groups. In particular, they outperformed the learners in the advanced groups in accepting the target-like conditions in both tasks, while underperforming the learners in the beginning groups in rejecting the non-target-like ones. L1 transfer revealed a great impact on the behaviour of lower proficiency learners, which is firmly rooted and hard to get rid of.

(9) Research Question 1: Do English-speaking and Japanese-speaking learners of Mandarin have the basic semantic knowledge of the contrast between *dou* and the universals in their first languages?

(10) Research Question 2: In the mapping stage, how do English-speaking and Japanese-speaking learners of Mandarin map the feature sets on their L1 lexical items onto the target item *dou*?

(11) Research Question 3: In the reassembly stage, how do English-speaking and Japanese-speaking learners of Mandarin reconfigure the feature sets to better match the target item *dou*?

(12) Research Question 4: Does the poverty of the stimulus problem occur in the acquisition process? If yes, do English-speaking and Japanese – speaking learners of Mandarin get rid of the overgeneralisation or overinfluence of their L1 transfer and acquire the knowledge of the target item *dou* successfully?

Chapter 7

Contributions, Limitations and Conclusion of the Current Study

7.1 Introduction

In the preceding chapters, two experiments tasks, namely the sentence-picture matching task and the picture-based acceptability judgment task, were employed to investigate L2 learners' knowledge of the distributivity of *dou* in the current study. The experimental design, participants' information, hypotheses, procedure, statistical analysis, results and discussions were introduced. In this final chapter, I will move on to the contributions of this study, starting with a review of the key results of the two experimental tasks, followed by a discussion of the limitations and a conclusion of the current study.

7.2 Contributions

Two experimental tasks were conducted in this thesis: a sentence-picture matching task and a picture-based acceptability judgement task. The former aimed to examine the performance of L2 learners on the interpretation of declarative sentences including *dou* with mixed predicates. In particular, this task adopted a specific sentence structure and offered a series of pictures depicting scenarios of either collective interpretation (e.g., the kids built a snow man together) or distributive interpretation (e.g., the kids individually build a snowman). L2 learners were required to judge whether the sentences matched the pictures. Through their judgements, L2 learners' attitudes towards each interpretation were observed, which can be regarded as an indication of their understanding of the semantic function of *dou*. As a distributive quantifier, *dou* is not compatible with the collective interpretation. The results of this tasks showed that neither higher proficiency learners nor lower proficiency learners successfully rejected the non-target-like collective interpretation, as observed in the native controls. However, as their proficiency level developed, learners tended to exhibit a preference for the distributive interpretation over the collective one. A limited number of native-like representations can be found among higher proficiency learners. Based on the predictions of the Features Reassembly Hypothesis, this task adds evidence that L1 transfer had a significant influence on even higher proficiency learners and was difficult

to get rid of. When they built a mapping between *dou* and the universals in their L1s, it became more likely for them to accept both interpretations, regardless of their proficiency level. This also testified to the existence of poverty of the stimulus problem. The lack of effective data in the L2 input regarding the unacceptability of the collective interpretation delayed the development of native-like representations. On the other hand, the POS problem is possible to be overcome, with the UG access.

The latter attempted to explore the performance of L2 learners on the interpretation of interrogative sentences including *dou*-quantified subjects and *wh*-objects. In this task, each pair of questions and answers was accompanied by a picture depicting a scenario of either pair-list answer or individual answer. L2 learners were asked to observe the picture, listen to the audio recording of the question and answer, and then judge to what extent they could accept the answer in the context of the question and the picture using a 7-point scale. With the insertion of *dou* into the interrogative sentence, the question was more likely to be responded by a pair-list answer, rather than an individual answer. The results of this task revealed that neither higher proficiency learners nor lower proficiency learners unequivocally rejected the non-target-like individual answer. Instead, their acceptance rates of the individual answer were much lower than the pair-list answer, as indicated by the mean ratings just above zero. With increasing proficiency, the pair-list answer was much more preferred by L2 learners. However, very few higher proficiency learners demonstrated target-like performance. In line with the FRH, the results confirm the influence of L1 transfer as well as the problem of POS. Mapping *dou* onto the universal forms and transferring the L1-based feature [+universal] to the feature set of *dou* led to the non-target-like acceptability of the individual answer. Moreover, it is still challenging for higher proficiency learners to identify the unacceptability, which can be attributed to the overinfluence of L1 transfer and the scarcity of positive evidence in the L2 input.

The first contribution of the current study lies in enhancing our knowledge of *dou*, specifically, its distributivity, in the field of second language acquisition. Although in the theoretical literature, the semantic properties as well as the syntactic derivations of *dou* have been extensively discussed, there has been limited research on the learning task of *dou* in the L2 acquisition study. This study addresses this gap by investigating the learnability problem of the distributivity of *dou* by L1 English and L1 Japanese speakers at the syntax-semantics interface and by providing empirical data to support the L2 theories. Additionally, this study explores how native Japanese speakers

interpret universal quantifiers, including *subete*, *zen'in*, *minna* and *dono-mo*. The empirical evidence gathered sheds light on the semantic function of these universals, which has not been clearly elucidated in the existing literature.

The second contribution of this study is to verify the Features Reassembly Hypothesis. The lower proficiency learners' data of both tasks confirm the influence of L1 transfer, where learners associated the target lexical item in the L2 with the feature bundles from their L1s. On the other hand, the higher proficiency learners' data suggest that it is indeed possible for L2 learners to acquire target-like knowledge and develop native-like representations, although it is extremely challenging in practice and may be impeded by various difficulties, particularly in the two stages: mapping and reassembly. The findings of this study are in line with the predictions of the FRH, providing support for its validity in the context of L2 acquisition at the interpretive interface.

The third contribution of this study is to testify to the issue of poverty of the stimulus at the syntax-semantics interface. The findings that at least some higher proficiency learners were able to acquire the unacceptability of the non-target-like conditions in both tasks can be seen as an indication of successful acquisition in the POS situation. Following Dekydtspotter and Sprouse (2001) and Marsden (2009), it is reasonable to assume that this interpretation constraint does not need to be learned from evidence in the input, but rather, it may be given by UG. Particularly, the unavailability of collective interpretation and individual answer appears to stem from the distributive force of *dou*. If this is the case, the interpretation constraint will be automatically activated in the L2 grammar, once learners acquire the semantic properties of *dou*, namely that it serves as a quantifier and a distributor.

7.3 Limitations

The first limitation of this study is that the feature set of *dou* remains unspecified. As mentioned in Chapter 3, apart from the feature of distributivity, other features, such as maximality, exhaustivity and plurality could be observed as well. The study's specific focus restricts the investigation of these additional features, even though they could have been examined in the experimental tasks. Second, the predictions of mapping and reassembly are not formulated in a comprehensive way. Since the complete feature set of *dou* is not determined, the assumptions of feature reassembly only consider the feature of distributivity, while other features are excluded from consideration. Third,

the sample size of the L1 Japanese group is relatively small, and the learners are not grouped according to their proficiency levels. As a consequence, this study does not identify potential variations in task performance between different proficiency levels in the L1 Japanese group and it lacks a thorough discussion of the effect of proficiency level and its interactions with conditions and L1 groups. Fourth, in the sentence-picture matching task, the use of a Likert scale would have been more appropriate for learners to make their judgments, as opposed to the four options: *Yes*, *No*, *Not Sure* and *I don't know*. Additionally, although the task attempts to provide an environment with time pressure, learners may still rely on their explicit knowledge to organise their responses. Last, the presentation of results in both experimental tasks should be more concise and informative. For instance, in the bar chart shown in Figure 6.1, the same group appears twice under different conditions, which makes it more difficult to read the data visually. A clearer and more organised representation of the results would be beneficial.

7.4 Conclusion

This thesis reports on an experimental study on the acquisition of the distributivity of *dou* at the interpretive surface by L1 English and L1 Japanese speakers. A sentence-picture matching task and a picture-based acceptability judgment task were adopted in this study to investigate how Mandarin learners interpret the declarative sentences including *dou* with mixed predicates and the interrogative sentences including *dou*-quantified subjects and *wh*-objects. A total of 51 L1 English-L2 Mandarin speakers, 18 L1 Japanese-L2 Mandarin speakers and 30 native Mandarin speakers were recruited. The L1 English speakers were divided into three proficiency groups: beginning (n=21), intermediate (n=14) and advanced (n=16), while the L1 Japanese speakers were considered as a whole due to the limited number of participants. The two tasks were conducted using the online questionnaire system Qualtrics. Participants' responses as well as their reaction time were recorded automatically by the system. The experimental data of both tasks were analysed using Excel and R. The results indicated that lower proficiency learners tended to map *dou* onto the universal forms in their L1s and transfer the L1-based [+universal] feature to the feature set of *dou*. As a result, they accepted the non-target-like conditions as well as the target-like conditions. However, higher proficiency learners appeared to undergo the feature reassembly process, wherein they omitted the [+universal] feature and added the [+distributive] feature. This allowed

them to gradually reject the non-target-like conditions and strongly accept the target-like conditions. These findings align with the predictions of the Features Reassembly Hypothesis and provide evidence of the influence of L1 transfer. In addition, the study addressed the problem of poverty of the stimulus. Some higher proficiency learners demonstrated target-like performance in both tasks, indicating that it is possible for L2 learners to overcome the POS and achieve native-like representations, with the accessibility of Universal Grammar, even though it may be challenging in practice. In conclusion, this study contributes to our understanding of the semantic property of *dou*, specifically its distributivity, in the context of second language acquisition and sheds light on learnability problem related to L1 transfer and the issue of POS at the interpretive surface that may arise during the learning process.

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Appendix A1 The Information Sheet (Japanese Version)

中国語の文章理解に関する考察

研究者：ユシ・ゴン

研究の目的

本研究は日本語のネイティブスピーカーである中国語学習者がどのように中国語で文章を解釈しているのか調査することを目的としています。同時に、中国語のネイティブスピーカーのデータが比較群として収集されています。

研究対象者

１８歳以上、日本生まれ日本育ち、中国語を勉強した、または勉強している、母国語が日本語の場合、この実験に参加することができます。

調査方法

本実験はオンラインで実施されます。解答時間は最大３０分です。実験は３つの部分で構成されています。①記事に記入する正しい単語を選択してください。②スクリーンに絵付きの文章がいくつか表示されますので、文章が絵と一致するかどうかを選んでください。③スクリーンに絵付きのビデオがいくつか表示されますので、文章がビデオと一致するかどうかを選んでください。

調査へのご協力に関して

本調査への参加はすべて任意です。一度始めた後でも、終了前に途中でやめることもできます。その場合データはすべて破棄され、本調査の分析対象から除外されます。すべての実験を完了すると、お礼として、３０００円が提供されます。

調査に関わるリスク

この実験の潜在的なリスクはありません。

回答の取り扱い

貴方が提供するデータは他の参加者のデータと共に、博士論文に使用されます。このデータはヨーク大学の言語・言語学研究科にて厳重に保管されます。

守秘や個人情報の取り扱い

調査回答は匿名で収集されますので、回答内容により個人を特定されることはございません。回答者の個人情報は本研究に関わるいかなる調査報告や分析においても使用されることはございません。

研究結果の通知

本研究における個人またはグループの調査結果に関する概要をご希望の場合は、下記のメールアドレスまでご連絡ください。メールにて概要をお送りいたします。

Yuxi Gong 公　雨溪

Department of Language and Linguistic Science

University of York, Heslington, York, YO10 5DD

Appendix A2 The Information Sheet (Mandarin Version)

关于汉语表述与理解的研究

研究员：公雨溪

关于实验目的

此项实验旨在研究日语为母语的汉语习得者针对句子的不同表达方式产生的相应理解，并根据其阐释，与汉语母语者进行对比，探索汉语习得者与母语者间的相同与不同之处。

关于研究员

公雨溪，博士生候选人，现就读于英国约克大学，语言与语言科学学院。

关于参加者

如果您的年龄超过 18 岁，母语为日语或英语且学习或者正在学习汉语，便可以参加此项实验。

关于实验内容

实验分为三个部分。第一个实验中，您将会读到一些小短文，并根据短文上下文的内容选择最合适的词填入短文的空白处。第二个实验中，您将会看到一些句子与一些图片，请您根据个人的理解与感觉等判断：句子与图片所画的内容是否匹配。第三个实验中，您将会看到一些短视频，视频中会出现一张图片，然后听到一个问句与一个答句。播放结束后，问句与答句的文字内容将会出现。请您根据个人的理解、感觉等判断：参照图片所画内容，答句是否与问句匹配。

关于强制性

此次实验并非强制性参加。若您决定参加，请在同意书的相关问题上勾选“是”。如果您同意参加此次实验，您依然可以在实验中途无任何条件选择退出，同时您所提供的数据将即刻销毁。

关于风险

此项实验不存在任何潜在风。

关于福利

您将会得到 100 人民币或等值 Amazon 礼品卡作为参加此次实验的答谢。

关于您提供的数据

您提供的数据将会与其他数据一起呈现在我的博士毕业论文之中。您提供的数据将会安全地存放于约克大学语言与语言科学学院的数据库中。

关于保密

您的个人信息将被严格保密，并不会出现在任何展示、发表与论文当中。

关于最终实验结果

如果您对最终的实验结果感兴趣，请在此处留下您的联系方式。研究员会于实验结束后将实验结果汇总并发送给您。

如果您对此项实验有更多疑问，欢迎您随时联系以下人员：

Yuxi Gong

Department of Language and Linguistic Science

University of York, Heslington, York, YO10 5DD

Appendix B The Sample of Consent Form (English Version)

UNIVERSITY of York
DEPARTMENT OF LANGUAGE & LINGUISTIC SCIENCE
Heslington, York, YO10 5DD
www.york.ac.uk/language

Consent form

Title of study: reading comprehension of Japanese sentence by native speakers and learners of Japanese

This form is for you to state whether or not you agree to take part in the study. Once you have read and checked every item below, please sign your name along with the date and hand the form in to the researcher. If there is anything you do not understand, or if you want more information, please ask the researcher.

I have read and understood the information sheet about the study.	Yes ☐ No ☐
I have had an opportunity to ask questions about the study.	Yes ☐ No ☐
I understand that the information you provide will be held in confidence by the researcher.	Yes ☐ No ☐
I understand that I may withdraw from the study at any time before I leave the venue without giving any reason.	Yes ☐ No ☐
I understand that the information I provide may be used in future research on language.	Yes ☐ No ☐
Do you agree to take part in the study?	Yes ☐ No ☐

Your signature: _____

Researcher's name: Keisuke Kume

Date: _____

Appendix C The Background Questionnaire

1. Your age:
   a. 18-15
   b. 26-35
   c. above 35
2. Your gender:
   a. male
   b. female
   c. other
3. Where are you from? (Which province in Japan are you from?)
4. How long have you learnt Mandarin Chinese?
5. How long do you spend learning Mandarin Chinese every week?
6. Have you ever taken any HSK test? If yes, on which level?
7. Have you ever studied or lived in any Chinese-speaking countries? If yes, which country(s) and how long?
8. Have you learnt any other foreign languages? If yes, which language(s) and how long?

Appendix D The Proficiency Test

1. 昨天我在整理书桌的时候，发现了一本很久没__1__到的书。那本书是几年__2__我父亲送给我的。我打开那本书，里面有一__3__卡片，那是父亲给我的。卡片里他__4__："爸爸想送你最特别的十八岁生日礼物，看了好几家店以后,__5__你买了这本书。希望这本书能__6__你明白一些道理。"看完卡片，我又把书读了一遍。

2. 整个冬天，小女生用她前所未有的沉重鼾声提醒我，她老了。小女生是我养的一只猫，以人的年龄换算，她早该是老太太 __1__的年纪。我诧异地发现，老猫打鼾的节奏和鼻息，乍听来 __2__ 是人熟睡时的呼吸声。吸进梦里的空气化成抽象的__3__，那些长长短短的轻声叹息，到底都说了些什么呢？我停下手边的工作，凝视__4__在垫子上的圆球体。我们的故事__5__是一箩筐，但认真回忆，那些细节却又稀松得很，不就是人猫之间的寻常日子嘛！小女生毕竟上了年纪，当鼾声再度响起，我不得不__6__，我们的感情，竟然有了九年的重量。

3. 小陈和小李是大学__1__的好朋友，大学毕业以后，他们已经__2__年没见面了。有一次小陈__3__想起和小李一起读书的事，他很想知道小李现在过得怎么样，所以他找出小李以前寄给他的信，__4__着信上的地址去找小李。可是小李的邻居说小李一家人早就搬家了，小陈很难过，因为他__5__以后都见不到小李了。

4. 我家附近有一家书店。这家书店的客人不多，__1__书很多。书店老板人很好，对客人总是很__2__。去那里不一定要买书，也__3__只是看看书。在那里看书，__4__看多久都行，没有人会来吵你。记得有一次，书店刚开门，我__5__进去看书，不知道看了多久，__6__头往外一看，才发现天都已经黑了。

5. 欧洲酿造啤酒的历史悠久，但最早酿造啤酒的记录却出现在中亚和古埃及__1__。这两个古文明农业发达，有剩余的大麦、小麦等谷物可作为酿酒原料，__2__成为啤酒的发源地。在当时，啤酒__3__可以和面包并列为主食，__3__一种理想的货币，不少官员便经常以啤酒来__4__建筑工人的工资。对现代人来说，啤酒虽然营养丰富，但是热量很高，饮用不宜__5__。要是有人认为啤酒很营养，多喝一点也__6__，要不了多久就会有个标准的啤酒肚了。

6. 每年春分这一天，日、夜时间一样长，世界__1__地都能照到阳光，有「平等」之意，因此，联合国将这天定为「世界地球日」，__2__平等的理想。事实上，每年的地球日本来日期都不 __3__，直到 1970 年，美国一名大学生在该年的地球日——4 月 22 日发起环境保护活动，__4__ 全美二千多万人的响应与支持。__5__ 该次活动非常成功，此后的地球日就定在 4 月 22 日，主题也转而趋向环保。

7. 人之所以冒险，主要有两种动力：第一种是当追求基本的生存需求都倍感__1__，渐渐走向穷途末路，__2__冒险突破目前的困境时，这属于「对抗现实」的动力。__3__当年的祖先，离乡背井，横渡惊险的海峡到另一边陌生的土地上，那样的冒险无疑是__4__；第二种冒险则完全相反，当人在生活饱暖、安定时，便会有__5__去寻找人生不凡的价值，为实践自己的梦想而冒险，这属于「自我实现」的动力。

8. 我刚来这里工作的时候，我的老板帮我在这个大都市里租了一间小房间。他对这个地点非常满意，附近交通不但__1__，也有多家商店和超市，买什么都方便。不过我觉得大都市的生活__2__太小，休息的时候还是觉得有压力，住在这里一点也__3__轻松。听说这座城市西边的郊区有不少便宜的大房子，那里

__4__交通不方便，__4__有很多自然风景，我希望__5__工作稳定以后，再搬到那儿住。

9. 从 15 世纪开始，欧洲便出现了手抄报纸，报导有关政治、战争、市场、船期等消息，__1__它突破了传统私人信件的形式，但传播的范围还很小，__2__要等到印刷技术进步，报纸才__3__大量发行。报纸之所以普及，也跟近代商业的发展 __4__关系。经济快速地成长，使得不同地区、不同国家间的关系更为密切，人们需要互相了解，信息需要快速传播，人们对报纸的依赖也就__5__加深，报业因此蓬勃发展。

10. 有人认定，在生物死亡一瞬，灵魂会离开__1__。1907 年，美国麻州一名医生提出了「灵魂有其重量」的假设，为进一步给出有力的__2__，他自行秤量并观察了六位濒死病患，__3__得出人死后的重量确实比生前还要轻的结论。他__4__将实验结果发表于《纽约时报》、《美国医学》期刊中，但其理论也很快就被推翻了。__5__ 的类似实验均表明，人死时，重量并不会削减，21 公克的发现乃是测量误差所__6__。尽管学界判定该研究不足采信，不过可以确定的是，灵魂重量之说至今已然广为流传，甚至被拍成电影《21 公克》。

Appendix E The Items of the Sentence-Picture Matching Task

Critical Items

1. 工人们都粉刷了一面墙。

   The workers all painted a wall.

2. 小孩们都做了一盏南瓜灯。

   The kids all made a pumpkin lamp.

3. 工人们都建造了一艘木筏。

   The workers all built a raft.

4. 孩子们都堆了一个雪人。

   The children all built a snowman.

5. 教授们都发表了一篇论文。

   The professors all published an article.

6. 女孩们都拼了一副拼图。

   The girls all completed a puzzle

7. 小朋友们都买了一件玩具。

   The kids all bought a toy.

8. 设计师们都制作了一件女装。

   The designer all made a women’s wear.

9. 女孩们都画了一幅画。

   The girls all drew a picture.

10. 厨师们都做了一道菜。

    The chefs all cooked a dish.

11. 女孩们都烤了一个蛋糕。

    The girls all baked a cake.

12. 学生们都种了一棵树。

    The students all planted a tree.

Distractor Items

1. 记者们各采访了一位演员。

   The reporters each interviewed an actor(actress).

2. 旅客们各叫了一辆出租车。

   The travelers each called a taxi.

3. 学生们各写了一封信。

   The students each wrote a letter.

4. 男人们各搬了一张沙发。

   The men each carried a sofa.

5. 员工们各制定了一个方案。

   The staffs each made a plan.

6. 护士们各帮助了一位病人。

   The nurses each helped a patient.

7. 小伙子们各唱了一首歌。

   The guys each sang a song.

8. 留学生们各租了一栋房子。

   The international students each rent a house.

Fillers

1. 窗外在下雨。

   It is raining outside.

2. 书在椅子上面。

   The book is on the chair.

3. 树上有许多橘子。

   There are lots of oranges on the tree.

4. 今天是2016年1月4日。

   Today is 4th January 2016.

5. 这个学生的名字是林立。

   The student’s name is Linli.

6. 陈枫比李莉高。

   Chenfeng is taller than Lili.

7. 男人们在吹小号。

   The men are playing the trumpet.

8. 杯子里有液体。

   There is liquid in the glass.

9. 奥利芙举着一面旗子。

   Oliver is holding a flag.

10. 吉米在看电视。

    Jimmy is watching TV.

11. 四个人在吃火锅。

    Four people are eating hotpot.

12. 这栋楼房有四层。

    This building has four floors.

13. 公交车的票价是2元。

    The price of bus ticket is 2 yuan.

14. 王平早上9点吃早餐。

    Wangping has breakfast at 9 O’clock in the morning.

15. 贝拉在用笔记本电脑写论文。

    Bella is writing a thesis with her laptop.

16. 露西开车上班。

    Lucy drives to work.

17. 衣柜里挂着一件衬衫。

    There is a shirt hanging in the wardrobe.

18. 女孩们留着短发。

    The girls have short hairs.

Appendix F The Items of the Acceptability Judgment Task

Test Items

1. 问：农民们都种了什么？

   答：一些花。

   Q: What did the farmers all plant?

   A: Some flowers.

2. 问：小孩们都画了什么？

   答：一只猫。

   Q: What did the kids all draw?

   A: A cat.

3. 问：学生们都擦了什么？

   答：一扇窗户。

   Q: What did the students all clean?

   A: A window.

4. 问：服务员们都拿了什么？

   答：一个酒杯。

   Q: What did the waiters/waitresses take?

   A: A wine glass.

5. 问：男孩们都洗了什么？

   答：一件T恤。

   Q: What did the boys all wash?

   A: A T-shirt.

6. 问：男人们都看了什么？

   答：一场电影。

   Q: What did the men all watch?

   A: A film.

7. 问：孩子们都收到了什么？

   答：露西收到了一副手套和一双袜子，彼得收到了一副手套和一顶帽子，大卫收到了一副手套和一条围巾。

   Q: What did the kids all receive?

A: Lucy received a pair of gloves and a pair of socks, Peter received a pair of gloves and a hat, and David received a pair of gloves and a scarf.

8. 问：厨师们都烤了什么？

答：厨师A烤了一个面包和一个蛋糕，厨师B烤了一个面包和一个派，厨师C烤了一个面包和一些饼干。

Q: What did the chefs all baked?

A: Chef A baked a loaf of bread a cake, Chef B baked a loaf of bread and a pie, Chef C baked a loaf of bread and some cookies.

9. 问：女孩们都剪了什么？

答：李莉剪了一只兔子和一只青蛙，陈莹剪了一只兔子和一只鸭子，王芳剪了一只兔子和一只羊。

Q: What did the girls all cut?

A: Lili cut a rabbit and frog, Chenying cut a rabbit and a duck, Wangfang cut a rabbit and a sheep.

10. 问：学生们都带了什么？

答：小红带了一支铅笔盒一本书，小明带了一支铅笔盒一支钢笔，小华带了一支铅笔和一把剪刀。

Q: What did the students all bring?

A: Xiaohong brought a pencil and a book, Xiaoming brought a pencil and a pen, and Xiaohuang brought a pencil and a pair of scissors.

11. 问：裁缝们都做了什么？

答：裁缝A做了一件衬衫和一条短裙，裁缝B做了一件衬衫和一条连衣裙，裁缝C做了一件衬衫和一件大衣。

Q: What did the tailors all make?

A: Tailor A made a shirt and a skirt, Tailor B made a shirt and a dress, Tailor C made a shirt and a coat.

12. 问：家长们都买了什么？

答：家长A买了一条鱼和一把香蕉，家长B买了一条鱼和一些苹果，家长C买了一条鱼和一些洋葱。

Q: What did the parents all buy?

A: Parent A bought a fish and a bunch of bananas, Parent B bought a fish and some apples, Parent C bought a fish and some onions.

Distractor Items

1. (a) 问：男孩们喝了什么？

   答：乔治喝了啤酒。

   Q: What did the boys drink?

   A: George drank the beer.

   (b) 问：谁喝了橙汁？

   答：约翰。

   Q: Who drank the orange juice?

   A: John.

2. (a) 问：谁买了包？

   答：珍妮。

   Q: Who bought the bag?

   A: Jenny.

   (b) 问：辛迪买了什么？

   答：一双鞋。

   Q: What did Cindy buy?

   A: A pair of shoes.

3. (a) 问：谁搬了什么？

   答：詹姆斯搬了一个梯子，路易斯搬了一张桌子，简搬了一个箱子。

   Q: Who carried what?

   A: James carried a ladder; Louis carried a table and Jane carried a box.

   (b) 问：简搬了什么？

   答：一张桌子。

   Q: What did Jane carry?

   A: A table.

4. (a) 问：谁读了《麦克白》？

   答：宋明。

   Q: Who read *Macbeth*?

   A: Songming.

   (b) 问：谁读了什么？

   答：玛丽读了《哈姆勒特》，宋明读了《麦克白》，林立读了《李尔

王》。

Q: Who read what?

A: Mali read *Hamlet*, Songming read *Macbeth* and Linli read *King Lear*.

5. (a) 问：女孩吃了什么？

答：一个苹果。

Q: What did the girl eat?

A: An apple.

(b) 问：孩子们吃了什么？

答：男孩吃了香蕉和饼干。

Q：What did the kids eat?

A: The boy ate a banana and some cookies.

6. (a) 问：运动员们获得了什么？

答：张三获得了一块奖牌。

Q: What did the sportsmen receive?

A: Zhangsan received a medal.

(b) 问：谁获得了什么？

答：张三获得了一个奖杯，李四获得了一块奖牌，王五获得了一张证书。

Q: Who received what?

A: Zhangsan received a trophy, Lisi received a medal, Wangwu received a certificate.