

TO EXHAUST, OR NOT TO EXHAUST: AN EXPERIMENTAL STUDY ON MANDARIN *Shi*-CLEFTS

YING LIU

YU'AN YANG

City University of Hong Kong

The Chinese University of Hong Kong

1 Introduction

Mandarin *shi*-clefts (henceforth SC) have long been recognised as the Mandarin counterpart of English *it*-clefts (e.g. Teng, 1979; Huang, 1982; Shi, 1994). Similar to English *it*-clefts, SCs also encode three meaning components: the existential presupposition, the identificational assertion, and the exhaustivity, as illustrated in (1).

- (1) Shi [Xiaogao he Xiaopang]_{CLEFT FOCUS} [chidao le.]_{CLEFT CLAUSE}
SHI Xiaogao and Xiaopang late ASP
'It is Xiaogao and Xiaopang who were late.'¹

Existential presupposition: There is someone who was late.

Identificational assertion: Xiaogao and Xiaopang were late.

Exhaustivity: Besides Xiaogao and Xiaopang, no one else was late.

It is generally agreed that the first two meaning components should be placed in presupposition and assertion respectively (e.g. É Kiss, 1998), but the status of exhaustivity triggers much debate. Two camps have been formed on this issue: the semantic and the pragmatic camp. Early proposals from the semantic camp analogizes clefts to restrictive particle *only*, and places the exhaustivity in assertion (e.g. É Kiss, 1998). However, noticing the differences between the two structures, some researchers propose the pragmatic account, which argues that exhaustivity is computed as a conversational implicature (e.g. Xue and Onea, 2011; DeVaugh-Geiss et al., 2015). Arguing against the pragmatic camp, scholars from the semantic camp assimilates exhaustivity to maximality, and identifies the exhaustivity as part of the presupposition of clefts (e.g. Percus, 1997; Velleman et al., 2012; and Križ, 2015). Back to Mandarin, although many have discussed the first

¹Glosses: ASP: aspectual marker, LOC: localizer, CL: classifier, DE: relative clause marker (when used with *shi*, it marks the cleft clause), SHI: focus marker (*shi* can also be used as a copula, in which case the lexicon is glossed as *be*), [_F: focused constituent

two meaning components of *shi*-clefts (e.g. Teng, 1979; Lee, 2005; Cheng, 2008; Hole, 2011), the status of exhaustivity is less examined; some have even argued that *shi*-clefts are not exhaustive at all (Paul and Whitman, 2008).

This study, therefore, sets out to investigate the exhaustivity of *shi*-clefts with experimental methods. In what follows, we will first review the debate on the exhaustivity of clefts that motivate this study. Section 3 to 5 present three experiments targeting at the assertion, conversational implicature and presupposition hypothesis respectively. Finally, we conclude in Section 6.

2 Three Hypotheses on the Exhaustivity of Clefts

2.1 Assertion Hypothesis

Based on the similarities between clefts and exclusive particle *only*, É Kiss (1998) among others proposes that the exhaustivity of clefts is part of its assertion. Lee (2005) applies this analysis to Chinese:

- (2) Shi [Zhangsan]_F da Lisi de.
 SHI Zhangsan beat Lisi DE
 “It was Zhangsan that beat Lisi.”

Presupposition: ‘Someone beat Lisi.’

Assertion: The ‘someone’ equals Zhangsan; Except Zhangsan, there are no other people who beat Lisi.’ Lee (2005:p.95)

2.2 Conversational Implicature Hypothesis

Observing the disparity between the exhaustivity of *it*-clefts and that of *only*, Horn (1981) proposes that this meaning component is a generalized conversational implicature, calculated from the Maxim of Quantity. This proposal found support in recent experimental studies (e.g. Byram-Washburn et al., 2013; Destruel et al., 2015; DeVeugh-Geiss et al., 2015). These studies show that (i) under certain contexts, cleft sentences accept non-exhaustive interpretation (Byram-Washburn et al., 2013; Onea and Beaver, 2009; DeVeugh-Geiss et al., 2017 among others); (ii) contradicting clefts’ exhaustivity is processed differently from contradicting the assertion or the presupposition of *only* (DeVeugh-Geiss et al., 2015).

2.3 Presupposition Hypothesis

Drawing on the close relationship between definiteness and exhaustivity, the referential account (Percus, 1997; Hedberg, 1990) proposes that the exhaustivity of clefts is derived from the maximality of a definite DP formed by the cleft pronoun *it* and the cleft clause. Following this line, Büring and Križ (2013) analyze clefts as having a homogeneity presupposition similar to definite plurals, and thus violating exhaustivity leads to the same consequence as violating the homogeneity of definite plurals. For example, (??) presupposes that the plural entity [Peter and Tom] is not a proper part of the sum of all the individuals being late; i.e. either Peter and Tom are the only individuals being late or they are not late at all. Combined with the assertion *Peter and Tom are late*, the second conjunct is falsified, deriving the exhaustivity: Peter and Tom are the only people who were late.

- (3) The one who was late were Peter and Tom.

From another perspective, the question-based account also agrees that exhaustivity is presupposed, but what is presupposed is the same as definite descriptions (Velleman et al., 2012). In their account, clefts are an inquiry terminating construction that have two focus-sensitive operators MAX, *no true answer is strictly stronger than p* and MIN, *there is a true answer at least as strong as p*. Different from *only*, clefts assert MIN and presuppose MAX.

In summary, the assertion proposal draws an analogy between *zhiyou* and SC, which predicts that exhaustivity affects the truth-condition of these two structures in the same way. As for the conversational analysis hypothesis, it would predict that exhaustivity of SC is comparable to that of PF regarding the diagnostics of conversational implicatures. If the exhaustivity of SC is presupposed, it should pattern in the same way as the maximality presupposition of definite expressions, which will be represented by definite pseudo-clefts in this study.

3 Experiment 1

Experiment 1 aims at comparing Mandarin speakers' acceptance to exhaustive inference in *shi*-clefts (SC) with restrictive particles *zhiyou* (ZY) and plain focus sentences (PF).

It has been acknowledged that ZY (4) asserts while PF (5) conversationally implicates exhaustivity.

- (4) Only [Mary]_F was late.
 ~→ *Besides Mary, no one else was late.*
- (5) A: (Among Mary, Peter, and Susan,) who was late?
 B: [Mary]_F was late.
 ~→ *Besides Mary, no one else was late.*

In a neutral context, speakers should assign a higher degree of acceptance to asserted exhaustivity than to exhaustivity encoded in other layers of meaning, while conversationally implied exhaustivity may not even arise and thus should receive a relatively low score.

Taking advantage of this common interpretation of ZY, PF and SC, Experiment 1 aims at addressing three questions: (i) to draw a general picture of how exhaustivity is perceived among these three constructions in Chinese; (ii) to evaluate whether Mandarin SC encodes exhaustivity, and if the answer is yes then (iii) to evaluate the above hypotheses (assertion, conversational implicature, and presupposition hypothesis) on the exhaustivity of clefts.

3.1 Methods

This experiment employs an inference judgment task presented as a web-based questionnaire. Sixty-one speakers of Mandarin (age: 23 to 58, mean 31) were recruited.

In each trial, participants are first asked to read a short background description (6), and listen to a conversation between two people, a elicitation utterance (7) and a testing sentence (8). After the audio ends, an inference on the conversation led by *Oh, I think I know what she/he meant...* appears on the screen, illustrated by (9). The task is to judge whether this inference is acceptable in the given scenario on a scale of 1 to 5, with 1 being the least acceptable. In order to justify potential unacceptable inferences, a fictional character David, who have learned Mandarin for

some years, is set up. The testing sentences are presented as audio stimuli with the corresponding phonological prominence given to the focused constituent to avoid ambiguities caused by different focus assignments.

- (6) *Scenario*: David is consulting his colleague Bai Lili on the regulations about annual leave.
- (7) David: Wo ting-shuo zhezhou women xiaoshoubu de yuangong keyi qing nianjia.
I hear-ASP this week us sales DE employee can apply annual leave
'I heard that we employees from sales can apply for annual leave'
- (8) *Testing Sentence*
Bai Lili: Zhezhou, shi [shichangbu de yuangong]_F keyi qing nianjia.
this week SHI marketing DE employee can apply annual leave
'This week, it is employees from marketing who can apply for annual leave.'
- (9) *Inference*
David thinks: Oh, I think I know what she meant. The other people cannot apply for annual leave this week.

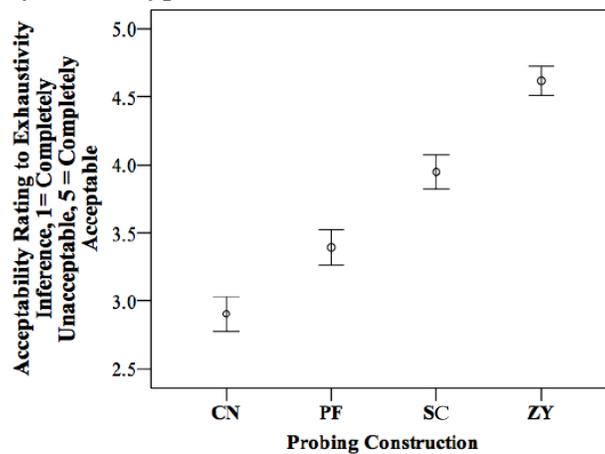
Twelve sets of scenarios were created. Each testing sentence underwent four permutations, as illustrated by (10): *zhiyou* "only" sentences (ZY), *shi*-clefts (SC), plain focus sentences (PF), and simple SVO sentences (referred to as canonical sentence, CN). Before the experiment begins, the participants were given three practice trials to familiarize with the procedure. Four types of filler sentences were used: *cai* "even", double negation, universal quantifier, propositional attitude verb *yiwei* "falsely believe". Together the 96 items were assigned to six lists in a Latin square fashion. The sixteen items in each list was pseudo-randomized with thirty-six filler items. All audio stimuli and inference sentences were verified as grammatical by two native Mandarin speakers, so participants' judgment would not be interfered by grammaticality.

- (10) a. Zhezhou, zhiyou [shichangbu de yuangong]_F keyi qing nianjia.
this week only marketing DE employee can apply annual leave
'This week, only employees from marketing can apply for annual leave.' **ZY**
- b. Zhezhou, shi [shichangbu de yuangong]_F keyi qing nianjia.
this week SHI marketing DE employee can apply annual leave
'This week, it is employees from marketing who can apply for annual leave.' **SC**
- c. Zhezhou, [shichangbu de yuangong]_F keyi qing nianjia.
This week Marketing DE employee can apply annual leave
'This week, employees from marketing can apply for annual leave.' **PF**
- d. Zhezhou, shichangbu de yuangong keyi qing nianjia.
this week marketing DE employee can apply annual leave
'This week, employees from marketing can apply for annual leave.' **CN**

3.2 Predictions

- (i) If *shi*-clefts are exhaustive, it is expected that the acceptability of exhaustivity inference is significantly higher than that to the baseline, canonical sentences;
- (ii) Following the assertion analysis, the acceptability of SC's exhaustivity should pattern with ZY;

Figure 1: Exhaustivity in four types of sentences (means with confidence intervals 95%)



(iii) Following the conversational implicature analysis, the acceptability of SC's exhaustivity should pattern with PF;

(iv) If exhaustivity of SC is encoded otherwise, its acceptability should pattern with neither constructions.

3.3 Results

Results from sixty complete questionnaires were analyzed. The mean acceptability ratings of exhaustive inference of the four types of probing constructions are presented in Fig. 1. One-way ANOVA reveals that the difference among the four probing constructions is statistically significant ($F = 137.9, p < 0.001$). A post-hoc Bonferroni test suggests that the mean acceptability to exhaustive inference of SC ($mean = 3.95$) was significantly lower than that of ZY ($mean = 4.62, p < 0.001$), while higher than that of PF ($mean = 3.39, p < 0.001$). These three constructions all received a higher acceptability to exhaustivity than CN ($mean = 2.90, p < 0.001$).

3.4 Interim Discussion

This experiment helps paint a general picture of how well exhaustivity inference of various constructions is received among Mandarin speakers. While PF, SC, and ZY sentences all elicit an exhaustive interpretation, the levels of acceptance vary, suggesting that the status of exhaustivity of these three types of sentences differs from each other. Results from our experiment then fail to support the assertion and conversational implicature analysis of SC's exhaustivity, as SC patterned with neither ZY nor PF regarding the acceptability of exhaustive inference.

4 Experiment 2

Results from Experiment 1 suggest that exhaustivity of *shi*-clefts does not seem to be a conversational implicature based on the fact that it is perceived differently from that of *in-situ* PF, a prototypical conversational implicature. However, some have argued that this difference between SC and PF could be explained by independent reasons. One proposed possibility is

that the two constructions have different presuppositions (Zimmermann and Onea, 2011; Horn, 2016). A cleft has an existential presupposition, but *in situ* PF does not, and thus the former is associated with a stronger exhaustive effect. Another possible reason is the availability of focus projection. DeVeugh-Geiss et al. (2015) suggest that, since clefts provide an ideal environment for information-enrichment, namely it triggers a clearly designated QUD and a well-defined alternative set, cleft focus does not further project to other constituents. Lacking such conditions, focus in PF could project. The possibility of focus projection structurally allows for an ambiguous domain of alternatives and results in a suboptimal environment for pragmatic enrichment.

Taking these two explanations into account, this experiment sets out to further verify the pragmatic account. To this end, we make use of one of the hallmarks of conversational implicatures: cancelability, i.e. an implicature may be suspended in certain contexts (Grice, 1989). One such canceling context for conversational implicatures is a follow-up utterance that asserts the negation of the implicature (Grice, 1989). For example, in (11), the first utterance has an implicature *not all students came*, which is canceled by the second utterance which asserts that *all students came*.

(11) Some of my students came to the party. In fact, all of them came.

Following this logic, if the exhaustivity *no one else did p* can be canceled, an SC or PF utterance followed by *In fact, someone else did p too* would still be acceptable. As PF exhaustivity is recognised as being conversationally implicated, this experiment compares SC against PF. To avoid the aforementioned independent reasons, Experiment 2 adopts a different plain focus construction: answer to a *wh*-question. Similar to clefts, it carries an existential presupposition and also has a clearly designated that does not allow focus projection. As these independent reasons are controlled, if the results of SC still differ from PF, then the pragmatic account is not supported.

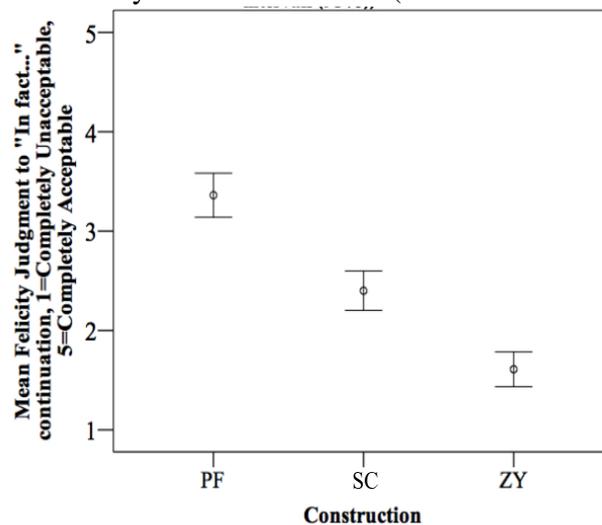
4.1 Method

This experiment adopts a felicity judgment task presented as a web-based questionnaire. Thirty-six Mandarin speakers (age: 21-36, mean: 25.7) were recruited.

In each trial, participants are asked to first read a short description of a scenario, and then listen to a short conversation consisting of a *wh*-question and its answer. To assist understanding, after the audio ends the written form of the answer part of the conversation appears on screen and the participants judge how acceptable the answer is on a scale from 1 to 5, with 1 being least acceptable. Before the experiment starts, the participants are given two practice trials to familiarize with the procedure.

The task consists of 9 sets of testing scenarios, each with three permutations on the target sentence: ZY, SC, and PF. Each target sentence was composed of two conjuncts: the first varies with constructions, and the other is the follow-up in the form *In fact, someone else did it too*. The *wh* elicitation also contains two conjuncts: the first identifies all the alternatives *among A, B, and C*. This conjunct is followed by a *wh*-question about the status of each alternative. An example is given in (12). All items were evaluated by two native speakers to make sure that the first conjunct of each target sentence is a felicitous answer to the *wh*-question. The testing and filler scenarios are then assigned to three lists in a Latin square fashion, such that each list displays nine testing scenarios and nine filler scenarios in a pseudo-randomized order.

Figure 2: Canceling exhaustivity in three structures (means with confidence intervals 95%)



- (12) a. Bai Lili: Between Mo Yan and Yu Hua, who has published a new book? **Wh-question lead-in**
- b. David: Shi Mo Yan chu-le xinshu; shishishang, Yu Hua ye chu-le
 SHI Mo Yan publish-ASP new book; in fact, Yu Hua also publish-ASP
 xinshu.
 new book
 ‘It is Mo Yan who has published a new book; in fact, Yu Hua also has published a new book.’ **SC, testing utterance**

4.2 Results

Thirty-five complete questionnaires were included in the analysis. The mean acceptability ratings of the three types of sentences are presented in Fig. 2. There was a statistically significant difference among constructions as determined by one-way ANOVA ($F = 76.345, p < 0.01$); a Bonferroni test revealed that the acceptability to cancelation continuation of PF ($mean = 3.4$) was significantly higher than that of SC ($mean = 2.4, p < 0.001$) and ZY ($mean = 1.6, p < 0.001$); SC and ZY also differ ($p < 0.001$).

4.3 Interim Discussion

This experiment shows that SC differs from ZY and PF regarding the cancelability of exhaustivity, which challenges the pragmatic account. As the current experiment uses PF elicited by *wh*-questions, which has existential presupposition in Horn’s and Zimmerman and Onea’s analyses, the difference between the two constructions cannot be explained by the presence/absence existential presupposition. The second explanation from the pragmatic account, namely that SC differs from PF because the former is less optimal for pragmatic enrichment due to its clearly designated QUD, is also challenged. In this current experiment, all testing sentences are paired with *wh*-questions, so the domain of alternatives is clearly designated for both PF and SC.

Therefore, we can conclude that our results challenges the conversational implicature hypothesis. Next, we move on to the presupposition hypothesis.

5 Experiment 3

In the previous experiments, we have entertained the assertion and conversational implicature hypothesis regarding the exhaustivity of SC; both hypotheses are rejected. Next, we will turn to the presupposition hypothesis: exhaustivity is part of the presuppositional content of SC. To this end, a variant of the *Covered Box* paradigm (c.f. Huang et al., 2013) is conducted.

The Covered Box paradigm was first introduced to test participants' understanding of scalar implicatures (Huang et al., 2013). In this paradigm, participants are given two boxes or pictures and asked to choose the one that matches the testing sentence. Different from the prototypical forced-choice sentence-picture evaluation task, in this paradigm, one of the boxes is covered. By using such a decoy, if subjects assign a richer interpretation to a construction than its asserted content (e.g. the meaning *not all* to the scalar item *some*), they will be compelled to choose the covered box. This paradigm has since been used in testing non-asserted meanings of different constructions such as the presupposed content of different triggers (Bill et al., 2016; Schwarz et al., 2016; Zehr et al., 2016; Schwarz, 2015). Studies have also shown that this paradigm is sensitive to the difference between presuppositions and implicatures, since people choose the covered box more often when the overt box violates a presupposition than when the overt box violates an implicature (Bill et al., 2016).

As the exhaustivity of clefts is narrowed down to the presupposition hypothesis and the conversational implicature hypothesis, the Covered Box paradigm suits perfectly with our current purposes. Previously, Boell and Devesh-Geiss (Boell and Devesh-Geiss., 2015) employ a modified Covered Box design to verify the presupposition hypothesis of cleft exhaustivity. They took up the assumption that to interpret a sentence with exhaustivity, we need to gather information about the status of all members of the alternative set. For example, to assign the correct interpretation to the sentence *only Tom put on a pullover*, we need to know whether the alternatives to Tom in the context, i.e. Max, Ben, and Jens, put on a pullover. In their experiment, subjects are asked to judge whether they need more information than "Tom put on a pullover" to verify a cleft sentence *It is Tom who put on a pullover*. They find that half of time people decide to ask for more information to judge the truthfulness of cleft sentences and definite descriptions like *He who put on a pullover is Tom*, whereas for *only*, they always seek more information to make a judgment. From these results, they conclude that exhaustivity of clefts are perceived in the same way as the uniqueness presupposition of definite descriptions.

Boell and Devesh-Geiss's experimental design addresses the question: "When the information entailed by the presupposition is absent, do speakers seek the information?" However, their results are ambiguous with regard to whether speakers assign exhaustive interpretation: when speakers stop seeking information, it is equally likely that they have already accommodated exhaustivity or they do not interpret the construction with exhaustivity at all. In the latter case, we cannot assume that speakers presuppose exhaustivity, because for them, clefts are simply not exhaustive. Therefore, it will be interesting to test the presupposition hypothesis in another setting: whether it will be accommodated when the meaning is apparently violated. If speakers accommodate the violation of exhaustivity the same way as they accommodate

for the uniqueness presupposition of definite description, then we can add more weight to the presupposition hypothesis.

In this study, then, we adopt the Covered Box paradigm in a different form, with a covered box and an overt picture of a scenario where exhaustivity is violated. If speakers accommodate exhaustive presupposition, they would choose the covered box. If they do not assign exhaustivity to clefts, they would go for the overt picture. Since they do not have to judge the non-exhaustive scenario as a clear-cut “False,” we bypass the issue that violating presupposition is sometimes assigned a third value. Also, since Covered box is sensitive to the distinction between presupposition and conversational implicature, we could pinpoint the status of exhaustivity by pitching it against PF.

Besides SC, ZY and PF, this experiment uses another construction as a comparison: pseudo-clefts (PC), as in (13). The structure of PC can be decomposed into two parts: the cleft clause in the form of a headless relative clause, and the cleft focus. *Shi*, interpreted as a copula here, connects these two parts. According to (Dikken, 2006), PC with a copula and a referring cleft focus in (13) denotes a specificational relation, with the cleft clause interpreted as a definite DP (see also Hedberg, 2000). Thus, the headless relative clause in PC is definite, and share the same maximality presupposition of definite expression. When paired with a scenario where there are more than one people being late, the maximality presupposition is violated, rendering (13) less acceptable. If the exhaustivity of SC is a presupposition, speakers should treat this meaning component in the same way as the maximality of PC. Therefore, by comparing the two constructions, we would be able to test the presupposition hypothesis of exhaustivity.

- (13) [chidao le de]_{CLEFT CLAUSE} shi [Zhangsan]_{CLEFT FOCUS}.
 late ASP DE SHI Zhangsan
 “(The person) who was late is Zhangsan.”
 ~> Maximality: There exists a maximal entity that satisfies the predicate “being late”.

5.1 Method

This experiment adopts a variant of Covered Box paradigm. The task is designed as a guessing game between two fictional children, Xiaoxiao and Taoqi, and the participants. The participants are given two pictures and asked to guess which picture is described by Xiaoxiao and Taoqi. Different from forced-choice tasks, one of the two pictures is not visible to the participants, so their judgment is based on information from only one picture.

Each testing trial decomposes into two screens: a context screen (Figure 3) and a testing screen (Figure 4). In the context screen, the boy Taoqi introduces the characters common to the two testing pictures, as in (14). After finishing reading the context sentence, the participant is asked to press a button to continue to the testing screen (Figure 4). In this screen, the boy Taoqi utters a sentence like (a) to introduce the existential presupposition of the following testing sentence (b). The purpose of Taoqi’s lead-in utterance is to meet the felicitous condition and existential presupposition of cleft sentences. The testing sentence is presented as an audio file.² As the audio

²Audio stimuli were used to present the testing sentence in order to control the placement of focus in these sentences. Since the placement of focus is not crucial for our purposes in the context sentences, they are presented in written form. Similar to the previous two experiments, the audio stimuli were recorded and sliced by a native speaker of Mandarin.

finishes, a booklet containing a picture and a black box representing a covered picture appears on screen, as in (Figure 4). Taoqi then asks the participant a question of the form “Which of the two pictures are we describing?” For the testing items, the overt pictures always depict a non-exhaustive scenario, such as two out of three cats caught a fish. If subjects associate a richer interpretation “no one else did x” to the clefts, they should not choose the overt picture.

50 subjects participated in the experiments (34 female and 16 male). Two of which were excluded due to low accuracy of filler sentences. The mean participant age is 28.1, ranging from 23 to 52. All participants speak Mandarin from birth.

- (14) Taoqi: Xiaohuimao, Xiaobaimao, he Xiaohuangmao qu diaoyu, tamen dou hen kaixin.
 Grey Kitty, White Kitty, and Yellow Kitty go fishing they DOU very happy
 “Grey Kitty, White Kitty and Yellow kitty went fishing; they were all very happy.”
- (15) a. Taoqi: Xiaohuimao, Xiaobaimao, he Xiaohuangmao li, youren diao-dao le
 Grey Kitty, White Kitty, and Yellow Kitty among someone fish-get ASP
 yu.
 fish
 “Among Grey Kitty, White Kitty and Yellow Kitty, someone caught a fish.”
- b. Xiaoxiao: Shi Xiaohuimao diao-dao le yu.
 SHI Grey Kitty fish-get ASP fish
 “It is Grey Kitty who caught a fish.”

5.2 Material

This experiment contains 12 sets of testing sentences, each with four permutations: *zhiyou* “only” sentences (ZY), *shi*-clefts (SC), definite pseudo-clefts (PC)³ and *wh*-elicited plain focus sentences (PF). Examples of the testing stimuli are presented in (16). As discussed above, each testing sentence is presented as an audio file preceded by a short lead-in satisfying the felicitous conditions of the two types of clefts. Five types of filler items are added to keep the four permutations of testing sentences separated and to counterbalance for the choice of covered box. They are: 1) sentences with the scalar item *youxie* “some” paired with “all” overt pictures; 2) sentences with the scalar item *youxie* “some” paired with “some but not all” overt pictures; 3) sentences with *suoyou* “all” paired with “all” overt pictures; 4) “A and B did x” sentences paired with “only A did x” overt pictures; 5) SC clefts paired with exhaustive overt picture. All items were assigned to 4 lists, each of which contained 12 testing and 24 filler items, which was presented in a pseudo-randomised manner. Before the testing phase, each participant is given one example and five practice trials.

³Note that different from Deveaugh-Geiss et al. (2016), this experiment tested Chinese pseudo-cleft rather than definite specificational sentences in the form of *i*. This is in consideration of the naturalness and felicity. Chinese pseudo-clefts share the same interpretation with Chinese definite specificational sentences.

- (i) Diaodao le yu de na-ge ren shi Xiaohuimao.
 fish-get ASP fish POSS that-CLS person is Grey Kitty
 “The person who caught a fish is Grey Kitty.”

Figure 3: Context screen for an SC trial



Figure 4: Test screen for an SC trial



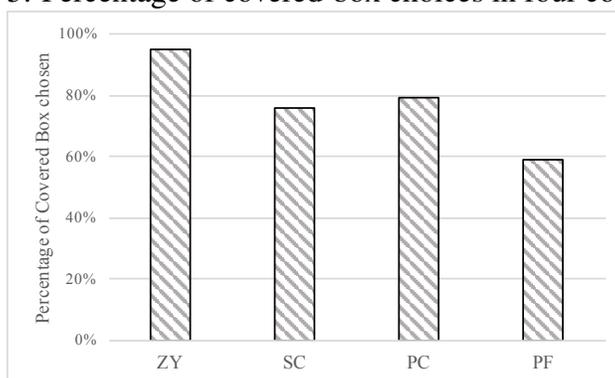
- (16) a. Zhiyou [Xiaohuimao]_F diaodao le yu.
Only Grey Kitty fish-get ASP fish
“Only Grey Kitty caught a fish.” **ZY**
- b. Shi [Xiaohuimao]_F diaodao le yu.
SHI Grey Kitty fish-get ASP fish
“It Grey Kitty who caught a fish.” **SC**
- c. Diaodao le yu de shi [Xiaohuimao]_F.
Fish-get ASP DE SHI Grey Kitty fish
“(The one) who caught a fish is Grey Kitty.” **PC**
- d. (Who caught a fish?)
[Xiaohuimao]_F diaodao le yu.
Grey Kitty fish-get ASP fish
“[Grey Kitty]_F caught a fish.” **PF**

5.3 Predictions

(i) If exhaustivity of *shi*-clefts is presupposed, participants should perceive this meaning component in the same way as the maximality presupposition of definite pseudo-clefts. (ii) If *shi*-clefts is not presupposed, it should not be perceived in the same way as perceived differently from definite pseudo-clefts.

5.4 Results

Figure 5: Percentage of covered-box choices in four conditions



The percentage of covered box choices in the four conditions are presented in Fig 5. A logistic regression analysis shows that a model with the four construction types as fixed effect against a constant only model is statistically significant, indicating that participant’s choice of covered and overt picture differs among the four constructions ($\chi^2 = 44.06, p < 0.001$ with $df = 3$). Additional χ^2 test comparing participants’ choice in definite pseudo-cleft condition and SC cleft condition

found no difference ($\chi^2 = 0.17, p = 0.68$). While a statistically significant difference is found between ZY and SC conditions ($\chi^2 = 21.28, p < 0.001$), and between plain focus sentences and SC clefts ($\chi^2 = 8.11, p < 0.001$).

5.5 Interim Discussion

The above results from the Covered Box paradigm help us confirm the conclusions from previous experiments, namely the exhaustivity of SC is neither encoded as part of assertion nor as an implicature. Moreover, as SC patterns on a par with PC, the presupposition hypothesis is supported: the maximality of PC is perceived in the same way as the exhaustivity of SC. Since maximality is presupposed in PC, SC encodes exhaustivity as presupposition.

6 General Discussion

This study presents three experiments probing into the exhaustivity of *shi*-clefts (SC) in Mandarin. Through an inference judgment task, we first established that SC indeed encodes exhaustivity, but differs from restrictive particle *zhiyou* and plain focus sentences (PF). Then we tested the cancelability of the exhaustive inference, and found that the exhaustivity of SC is harder to cancel than that of PF, suggesting that this meaning component of SC is not conversationally implicated. Finally, with a Covered Box task, we compared the maximality presupposition of PC and the exhaustivity of SC, and discovered that speakers perceive these two meaning components in the same way, providing support for the presupposition hypothesis.

These three experiments touch upon a long-standing debate, i.e. what is the status of exhaustivity of cleft sentences. Previously, intuition data on the exhaustive interpretation of *shi*-clefts varies from study to study. For example, Paul and Whitman (2008) argue that only when combined with *de* does *shi*-sentences carry exhaustivity. By using experimental data, not only are we able to capture the exhaustive reading of *shi*-clefts, but also the subtle differences or similarities between the exhaustive interpretation of SC and other constructions.

Even though this study provides support for the presupposition hypothesis, we need more data to further discern between the referential account and the question-based account. As we have seen in Section 2, both accounts analogize exhaustivity to maximality. One feature of *shi*-clefts is that other constituents such as the predicate can also be clefted:

- (17) A: Did Zhangsan went out for food or went to the bathroom?
 B: Zhangsan shi [qu chi-fan]_F le, #ye qu cesuo le.
 Zhangsan SHI go eat-meal ASP #also go bathroom ASP
 Intended: ‘Zhangsan [went out for food]_F, not to the bathroom.’

If this type of *shi*-clefts is also exhaustive as illustrated above, the referential account which relies on maximality of the denotation of the cleft focus (Hedberg, 2000; Büring and Križ, 2013; Križ, 2015) cannot account for the exhaustivity of (17), since the cleft focus is not referential. As the next step, we wish to examine the exhaustivity of predicate-focused *shi*-clefts, to tease apart the referential and the question-based account.

References

- Bill, Cory, Jacopo Romoli, Florian Schwarz, and Stephen Crain. 2016. Presuppositions vs. scalar implicatures in acquisition. *TOPOI* Special issue “Presuppositions: Philosophy, Linguistics, and Psychology”:Online First (10.1007/s11245–014–9276–1).
- Boell, Anna-Christina., and Joseph P. Deveshau-Geiss. 2015. Empirical insights on the exhaustivity inference in *it*-clefts. Presentation at Experimental Approaches to Semantics Workshop.
- Büring, Daniel, and Manuel Križ. 2013. Exhaustivity and homogeneity presupposition in clefts (and definites). *Semantics and Pragmatics* 6(6):1–29.
- Byram-Washburn, Mary, Elsie Kaiser, and Maria Luisa Zubizarreta. 2013. The english *It*-cleft: No need to get exhausted. Doctoral Dissertation, University of Southern California.
- Cheng, Lisa. 2008. Deconstructing the *shi . . . de* construction. *The Linguistic Review* 25:235–266.
- Destruel, Emilie, Daniel Velleman, Edgar Onea, Dylan Bumford, Jingyang Xue, and David Beaver. 2015. A cross-linguistic study of the non-at-issueness of exhaustive inferences. In *Experimental perspectives on presuppositions experimental perspectives on presuppositions*, ed. Florian Schwarz, 135–156. Springer.
- DeVeaugh-Geiss, J. P., M. Zimmermann, E. Onea, and A. Boell. 2015. Contradicting (not-)at-issueness in exclusives and clefts: An empirical study. In *The 25th Semantics and Linguistic Theory Conference*, ed. Sarah D’Antonio, Mary Moroney, and Carol Rose Little.
- DeVeaugh-Geiss, Joseph P., Swantje Tönnis, Edgar Onea, and Malte Zimmermann. 2017. An experimental investigation of (non-)exhaustivity in clefts. In *Proceedings of Sinn und Bedeutung 21*.
- Dikken, den Marcel. 2006. *Relators and linkers: The syntax of predication, predicate inversion and copulas..* MIT Press.
- É Kiss, K. 1998. Identificational focus vs. information focus. *Language* 74(2):245–273.
- Grice, Paul. 1989. *Studies in the way of words*. Boston: Harvard University Press.
- Hedberg, Nancy. 1990. Discourse pragmatics and cleft sentences in english. Doctoral Dissertation, University of Minnesota.
- Hedberg, Nancy. 2000. The referential status of clefts. *Language* 76:891–920.
- Hole, Daniel. 2011. The deconstruction of Chinese *shi . . . de* clefts revisited. *Lingua* 121:1707–1733.
- Horn, Larry. 2016. Information structure and the landscape of (non-)atissue meaning. In *The oxford handbook of information structure*, ed. Caroline Féry and Shinichiro Ishihara. Oxford University Press.

- Horn, Laurence.R. 1981. Exhaustiveness and the semantics of clefts. In *Proceedings of the Eleventh Annual Meeting of the North Eastern Linguistics Society (NELS)*, ed. V. Burke and J. Pustejovsky.
- Huang, James C-T. 1982. Logical relations in Chinese and the theory of grammar. Doctoral Dissertation, MIT.
- Huang, Yi Ting, Elizabeth Spelke, and Jesse Snedeke. 2013. What exactly do numbers mean? *Language Learning and Development* 9:105–129.
- Križ, Manuel. 2015. Aspects of homogeneity in the semantics of natural language. Doctoral Dissertation, University of Vienna.
- Lee, Hui-chi. 2005. On chinese focus and cleft constructions. Doctoral Dissertation, National Tsing Hua University, Hsinchu.
- Onea, Edgar, and David Beaver. 2009. Hungarian focus is not exhausted. In *Proceedings of the 19th Semantics and Linguistic Theory (SALT)*, ed. Ed Cormany, Satoshi Ito, and David Lutz.
- Paul, Waltraud, and John Whitman. 2008. *shi ...de* focus clefts in Mandarin Chinese. *The Linguistic Review* 3/4:413–451.
- Percus, Orin. 1997. Prying open the cleft. In *the 27th Annual Meeting of the North-East Linguistics Society (NELS)*, ed. Kiyomi Kusumoto, 337–351.
- Schwarz, Florian, ed. 2015. *Experimental perspectives on presuppositions*. Springer International Publishing.
- Schwarz, Florian, Jacopo Romoli, and Cory Bill. 2016. Reluctant acceptance of the literal truth-eye tracking in the covered box paradigm. In *Proceedings of Sinn und Bedeutung 20*.
- Shi, Dingxu. 1994. The nature of chinese emphatic sentences. *Journal of East Asian Linguistics* 3:81–100.
- Teng, Shou-hsin. 1979. Remarks on cleft sentences in Chinese. *Journal of Chinese Linguistics* 7:101–113.
- Velleman, Dan Bridges, David Beaver, Emilie Destruel, Dylan Bumford, Edgar Onea, and Liz Coppock. 2012. *It*-clefts are it (inquiry terminating) constructions. In *Proceedings of the 22th Semantics and Linguistic Theory (SALT)*, ed. Anca Chereches, 441–420.
- Xue, Jingyang, and Edgar Onea. 2011. Correlation between presupposition projection and at-issueness: An empirical study. In *Proceedings of the ESSLLI 2011 Workshop on Projective Meaning*.
- Zehr, Jérémy, Cory Bill, Lyn Tieu, Jacopo Romoli, and Florian Schwarz. 2016. Presupposition projection from the scope of ‘none’: universal, existential, or both? sition projection from the scope of ‘none’: universal, existential, or both? In *Proceedings of SALT 26*.
- Zimmermann, Malte, and Edgar Onea. 2011. Focus marking and focus interpretation. *Lingua* 121:1651–1670.