The Syntax and Semantics of ATB *Wh*-Constructions in Chinese

Haoming Li

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Contents

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Abstract

This paper introduces asymmetrical, and therefore *non-canonical*, Across-the-Board (hereinafter, ATB) *wh*-constructions in Mandarin Chinese, which are unreported in previous literature. It is argued that such constructions are essentially object-drop constructions, which are ubiquitous in Chinese. Assuming unselective binding and choice function quantification for *wh*-dependencies, the asymmetrical placement of the *wh*-operator in conjunct 1 alone, an ellipsis approach to object-drop, and dynamic semantic mechanisms, the analysis makes the correct predictions for a wide range of empirical behavior for such constructions, including the lack of island effects, the availability of sloppy readings, and asymmetry in Weak Crossover effects and focus intervention effects. This paper also discusses the inadequacy of other approaches to ATB constructions in the face of non-canonical ATB *wh*-constructions in Chinese.

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1 Introduction

Across-the-Board (ATB) constructions are interesting phenomena with a long history in the linguistic literature. Ever since Ross (1967), they have sparked numerous syntactic and semantic explorations into their nature throughout the recent decades in linguistic theory. Classic examples include the following:

(1)   Which paper did John file __ and Mary read __?

Essentially, ATB constructions involve parallel gaps in all coordinates that are usually co-construed in an supposedly coordination structure, constituting an *identity reading*; with ATB *wh*-questions, the construction involved is usually asking about a single individual that satisfies both conjuncts: it is the same paper that John filed and Mary read. In this paper, however, I will use the term *Across-the-Board* (ATB) in a more general sense, where the identity reading property is considered the defining criterion: ATB constructions are coordinate constructions where an identity reading is obtained across the coordinates with respect to a certain argument position. I will refer to constructions with both parallel gaps and identity readings as *canonical* ATB constructions, and those without parallel gaps but with identity readings as non-canonical ATB constructions. It is clear that (1) is a canonical ATB construction.

There are various accounts of canonical ATB constructions of different flavors compatible with the Minimalist framework that the work has brought into existence. There are broadly two main camps of analyses, based on whether the extraction is symmetrical, i.e., from both conjuncts, or asymmetrical, i.e., from only one conjunct. The first camp includes *Sideward Movement* represented by Nunes (2001) and *Parallel Merge* (multidominance) of Citko (2005); the second camp include the null operator parasitic gap analysis of Munn (1992), the "extraction in one conjunct, *wh*-ellipsis in the other" in Salzmann (2012) and Ha (2008), and the pro-ϕP empty pronoun approach in Zhang (2009).

Chinese ATB facts have featured in many of such accounts. However, the considered evidence is usually limited to the following contrast between the canonical ATB construction in (2-b) and the construction in (2-a), with *wh*-phrases in situ in both conjuncts, as in Citko (2005):

(2)   a.   Zhangsan xihuan shenme ren,   Lisi taoyan shenme ren?
               Zhangsan like   what   person Lisi like   what   person
               i.   'What person does Zhangsan like and what person does Lisi hate?'
               ii.   *'What person does Zhangsan like and Lisi hate?'

b.   shenme ren   Zhangsan xihuan Lisi taoyan?
        what   person Zhangsan like   Lisi hate?
        'What person does Zhangsan like and Lisi hate?'

In this example, (2-a) features identical *wh*-phrases in situ in each coordinate, while (2-b) has a single *wh*-phrase at the left edge of the coordinate structure. The unavailability of the identity reading (ii) for (2-a) has been variously interpreted in the accounts. For example, Citko (2005) considers (2-a) an illicit linearization of the multidominated *Parallel Merge* structure, which she believes underlies all ATB constructions with an identity reading. Salzmann (2012) argues that since there is only one Spec, CP position available, the two *wh*-phrases cannot both undergo covert movement, resulting in the unavailability of the identity reading. (2-b), on the other hand, involves for Citko an instance of movement that makes linearization possible and for Salzmann asymmetrical extraction of the *wh*-phrase from conjunct 1 combined with ellipsis of the *wh*-phrase in conjunct 2, so only one *wh*-phrase occupies the matrix Spec, CP position. In either case, the desired structure is properly licensed, and the corresponding interpretation is one of identity reading.

In this paper, I report additional kinds of ATB *wh*-constructions in Chinese that have seldom been explored in the literature, starting with the non-canonical ATB example below:

(3)   Zhangsan xihuan shei danshi Lisi taoyan?   base configuration
     Zhangsan like   who but   Lisi hate
     'Who does Zhangsan like and Lisi hate?'

This newly reported ATB construction immediately raises interesting questions for the general investigation of ATB constructions. First, the construction is explicitly asymmetrical: the *wh*-phrase is overtly present in only one conjunct, occupying a position that cannot dominate both conjuncts; it is a non-canonical in that there are no parallel gaps in the two conjuncts, but only identity reading. This property poses significant challenges for any symmetrical approach to ATB constructions, such as Citko's and Nunes's. Second, the *wh*-phrase is in situ in conjunct 1, while most Minimalist accounts of *wh*-in-situ in Chinese have already opted for unselective binding for all *wh*-phrases (with perhaps the exception for causal *wh*-phrases such as *weishenme* 'why' and *zenme* 'how come') introduced in (Aoun and Li, 1993), such as Huang et al. (2009); Murphy (2017); Tsai (1999, 2008). This means that for such *wh*-questions as in conjunct 1, there is no movement of any kind. However, all previous approaches either rely on the assumption that there is independently

necessitated *wh*-movement, i.e., Salzmann (2012); Ha (2008),[1] or forces the *wh*-phrase to move by means of the approach itself, in an attempt to derive the contrast in (2), i.e., Citko (2005); Nunes (2001); Zhang (2009). Then, it is imperative that a new analysis of ATB constructions be developed, with explicit asymmetrical and movement-free properties in mind. In this paper, I set out to accomplish this aim.

I believe that this newly reported construction is the base configuration for the more frequently seen construction (2-b), which is derived from the base configuration through *wh*-topicalization. I aim to provide an analysis that captures the whole range of peculiar properties that these two types of constructions demonstrate. I argue that there is only one base-generated *wh*-phrase, which is located entirely in conjunct 1, i.e., there is no Sideward Movement or Parallel Merge. Additionally, the gap in conjunct 2 is produced in exactly the same manner as in Chinese object-drop constructions: ATB *wh*-questions in Chinese involve no special mechanisms dedicated to ATB constructions, but only whatever is necessary for the derivation of null objects. In this sense, my analysis of Chinese ATB *wh*-questions is a de-mystifying one that unites it with a ubiquitous phenomenon in Chinese, i.e., object-drop. There is no need for special Across-the-Board mechanisms such as multidominance or Sideward Movement. Notice that I do not wish to claim that this analysis is cross-linguistically valid; I merely propose that it is the one that suits the Chinese data. I entertain the possibility that ATB constructions might employ different derivational mechanisms in different languages. However, it might be the task of future research to explore the cross-linguistic generalizability of the proposal and the possibility of a revised architecture of ATB constructions in general, inspired by this new proposal for Chinese.

The analysis will receive detailed breakdown and separate expositions for each of its components, which I will carry out in § 2. Here, I will be giving a broad overview of the proposal below, and the following bracketed structure can be used as a reference.

(4) $[_{\text{ForceP}}$ Force $[_{\text{FocP}}$ Qu 1 Foc $[_{\text{CP}}$ C ... $[f_1, \text{NP}]]]$ & $[_{\text{FocP}}$ Foc $[_{\text{CP}}$ C ... TEC=$[f_1,$ NP$]]]]$

The *wh*-phrase base-generated in conjunct 1, as mentioned above, is a variable over choice functions, and is unselectively bound by a Qu *wh*-operator (see § 2.1), which essentially performs existential closure over free choice function variables (see § 2.3), also base-generated in Spec, FocP in the conjunct 1. The gap in con-

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1. I mean that it is the assumption of such authors that *wh*-movement is involved in ATB *wh*-questions.

junct 2 is fundamentally just a regular case of object-drop that is ubiquitous in Chinese utterances; I only need a version of argument ellipsis which applies to DPs (see 2.4). In my proposal, I assume that the ellipsis mechanism is true-empty-category-mediated LF-copying, as in Li (2014). I also assume the Split-CP hypothesis advanced by Rizzi (1997) and believe the two conjuncts to be conjoined at or above the Spec, FocP position, crucially below the merger of Force^0, which triggers λ-binding of the propositional variable introduced by C^0 in conjunct 1, making propositional conjunction no longer possible (see § 2.2). Additionally, my analysis depends on the assumption of the semantics of dynamic predicate logic (Groenendijk and Stokhof, 1991, hereinafter, DPL) for the interpretation of the logical metalanguage for semantic interpretation of syntactic objects Transferred to the LF interface, which is after all necessary for DPL to be compatible with the semantic framework of generative grammar in the style of Heim and Kratzer (1998). In order to achieve this compatibility, I also need to reorient Heim and Kratzer (1998) so that semantic interpretation targets intermediate logical representations instead of directly producing truth conditions or truth values. On top of this reorientation, I also need an algorithmic implementation of the interpretation procedures to guarantee that the *wh*-operator in conjunct 1 alone is able to bind into both conjuncts ultimately. These semantic stipulations are discussed in § 2.5. § 2.6 summarizes § 2 and demonstrates how all of the components work together in my proposal.

§ 3 is a brief section showing how my proposal is able to account for the classic contrast in (2). In § 4, I will examine the predictions of unifying Chinese ATB *wh*-questions with object-drop. In § 5, I will discuss the consequences of adopting asymmetrical *wh*-operator placement and choice function quantification: Weak Crossover and focus intervention asymmetry. In § 6, I introduce a construction whose existence my approach to Chinese ATB *wh*-question naturally predicts, i.e., the Right-Node-Raising (RNR) version ATB *wh*-question, as in the following example:

(5)   Zhangsan xihuan, danshi Lisi taoyan, shei?
        Zhangsan like   but   Lisi hate   who
        'Who does Zhangsan like and Lisi hate?'

The prediction is natural since the same kind of Right-Node-Raising is observed in regular object-drop without *wh*-elements. The properties of RNR ATB *wh*-questions provide further evidence, conversely, for unifying ATB *wh*-questions with object-drop.

2   The components of the proposal

In this section, I will describe the components of my proposal in detail, including unselective binding, choice function quantification for in-situ $\overline{\text{A}}$-dependencies, the true empty category analysis of object-drop in Chinese, the syntax and semantics of *wh*-questions, and slightly modified procedures of semantic interpretation.

2.1   Unselective binding

In this subsection, I will first discuss the theoretical and empirical arguments for adopting unselective binding as an analysis for *wh*-in-situ phenomena. Then, I will propose a simple Agree-based mechanism for constraining the distribution of unselective binders and bindees, which will prove useful for deriving the contrast in (2), § 1.

2.1.1   Arguments for unselective binding

Unselective binding has seen support for its use in Chinese *wh*-questions in studies as early as Aoun and Li (1993) and Tsai (1994). This approach essentially treats *wh*-phrases in situ as variables with no inherent quantificational force, which are then bound by operators at the appropriate scope positions, as in the following example in Aoun and Li (1993):

(6) $[_{CP}$ Qu$_i$ $[_{IP}$ Zhang shuo $[_{CP}$ Li maile   shenme$_i$]]]?
              Zhang say   Li bought what
        'What did Zhang say Li bought?'

Here, as one can observe, the *wh*-phrase stays where it is base-generated throughout the derivation, and no island effects are expected. This was developed before Minimalism, and there were empirical reasons against LF movement in the GB framework itself. The crux of the empirical argument has to do with the interactions between *wh*-in-situ elements and the focus element *zhi*, 'only.' Aoun and Li first discuss the fact that elements such as *only* can only be associated with elements in their c-command domain, as in the following example:

(7)   *Mali$_i$, ta zhi   xihuan x_i
         Mali   he only like
         'He only likes Mary.'

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(8)   *ta zhi xihuan x_i de na-ge ren$_i$
        he only like   DE that-CL person
        'the man that he only likes'

This generalization is encapsulated in the following:

(9)   *Principle of Lexical Association* (PLA)
        An operator like *only* must be associated with a lexical constituent in its c-command domain.

It is then argued that the PLA holds at LF, since Chinese displays the following:

(10)   a.   meigeren dou bei yi-ge ren   ma   guo.   ambiguous
            everyone all   by one-CL person scold ASP
            'Everyone has been scolded by a man.'
        b.   meigeren dou zhi bei yi-ge ren ma   guo.   unambiguous
            everyone all   only by one-CL man scold ASP
            'Everyone has only been scolded by a man.'

Since (10-b) does not allow the wide scope interpretation of *yi-ge ren* over *meigeren*, it means that the for the word *zhi* to be associated with *yi-ge ren*, the latter must not even undergo the LF movement of Quantifier Raising. This is therefore evidence that the PLA is a constraint on LF. Another piece of related evidence comes from antecedent-contained deletion, which I will not repeat here.

    Then, it is observed that when the QPs in (10-a) and (10-b) are replaced with *wh*-in-situ, the same patterns persist.

(11)   a.   ta shou meigeren maile shenme?   ambiguous
            he say everyone bought what
            'What did he say everyone bought?'
        b.   ta zhi shuo meigeren maile shenme?   unambiguous
            he only say   everyone bought what
            'He only said everyone bought what?'

Again, the *wh*-in-situ in (11-b) cannot scope above the QP *meigeren*, indicating the unavailability of LF movement that can have scope effects when it is associated with *zhi*.

    Aoun and Li conclude that *wh*-in-situ in Chinese should not involve LF movement as in the original proposal of Huang (1982) (or movement of any sort), and that therefore, unselective binding with a Qu-operator is the better approach to Chinese *wh*-in-situ.

There are also theoretical arguments against LF movement within Minimalism, for example, the one advanced by Reinhart (1998).

In summary, we have reason to abandon the LF movement approach in favor of the unselective binding approach.

2.1.2 Constraining *wh*-distribution with Agree

However, there are implicit conditions for unselective binding to apply that must be made explicit, which will be crucial for my analysis. We see that with every occurrence of a *wh*-phrase in Chinese, a quantificational element must be provided. Otherwise, the construction becomes ungrammatical. That is to say, if a sentence contains a *wh*-phrase, it must involve some form of quantification, either interrogative, universal, or existential. In syntactically explicit terms, every sentence containing a *wh*-phrase must have its Spec, FocP filled with a quantificational operator. A non-quantificational reading of the following example is ungrammatical:

(12)   Zhangsan xihuan shenme ren
        Zhangsan like   what   person
        i.   'Who does Zhangsan like?'
        ii.   'Zhangsan like someone.'
        iii. *'Zhangsan like that person/him.'

To reflect this correspondence between overt *wh*-phrases and quantificational operators, we can utilize the mechanism Agree. Below, I will utilize the notation from Heck and Müller (2007) and posit structure-building features, [●ꜰ●], and probe features, [∗ꜰ∗]. The former, when on a syntactic object $α$, enables a syntactic object $β$ whose label is F to be Merged with $α$. The latter, when on $α$, enables the Agreement between $α$ and $β$, which is m-commanded by $α$ and can evaluate $α$ with respect to $β$. These features are stored in a feature stack, and the feature at the top of the stack must be satisfied first; after a feature has been satisfied, the one immediately below becomes the top of the feature stack. I propose that the Foc head will probe its c-command domain for a *wh*-phrase, through a [∗ᴡʜ∗] feature. If a *wh*-phrase is located, then a [●ᴏᴘ●] feature will be activated. This mechanism can be more precisely implemented if we allow for the existence of many types of Foc heads, each with different featural specifications in terms of the feature stack. In particular, Foc heads of the following form exist:

(13)   Foc   Foc   Foc   ...

$$\begin{bmatrix} [\ast\textsc{wh}\ast] \\ [\bullet\textsc{op}\bullet] \end{bmatrix} \quad \begin{bmatrix} [\ast\textsc{wh}\ast] \\ [\bullet\textsc{op}\bullet] \\ [\ast\textsc{wh}\ast] \\ [\bullet\textsc{op}\bullet] \end{bmatrix} \quad \begin{bmatrix} [\ast\textsc{wh}\ast] \\ [\bullet\textsc{op}\bullet] \\ [\ast\textsc{wh}\ast] \\ [\bullet\textsc{op}\bullet] \\ [\ast\textsc{wh}\ast] \\ [\bullet\textsc{op}\bullet] \end{bmatrix}$$

The idea is that Foc heads must bear alternating features of $[\ast\textsc{wh}\ast]$ and $[\bullet\textsc{op}\bullet]$, and each $[\ast\textsc{wh}\ast]$ must be followed by exactly an $[\bullet\textsc{op}\bullet]$. Then, Foc will obligatorily attract an operator to its specifier for each *wh*-phrase that its probing locates. In the absence of a matching quantificational operator, the derivation will crash at the interface due to the uninterpretability of the unsatisfied $[\bullet\textsc{op}\bullet]$ feature on Foc.

(14)   a.   Agree between Foc and *wh*:
          $\text{Foc}_{[\ast\textsc{wh}\ast],[\bullet\textsc{op}\bullet]}$ ... *wh*
     b. $[\bullet\textsc{op}\bullet]$ becomes the top of the feature stack on Foc:
          $\text{Foc}_{[\bullet\textsc{op}\bullet]}$ ... *wh*
     c.   Op is obligatorily merged:
          Op $\text{Foc}_{[\bullet\textsc{op}\bullet]}$ ... *wh*

In the case of multiple *wh*-phrases in a single clause, multiple cycles of $[\ast\textsc{wh}\ast]$ and $[\bullet\textsc{op}\bullet]$ features are necessary on Foc (below, $[\ast\textsc{wh}\ast]$ features are omitted.)

(15) Op_i Op_j $\text{Foc}_{[\bullet\textsc{op}\bullet],[\bullet\textsc{op}\bullet]}$ Zhangsan xiang zhidao shei$_i$ xihuan shenme$_j$?
                                    Zhangsan want know who like   what
     'Who does Zhangsan wonder likes what?'

Every $[\ast\textsc{wh}\ast]$ and $[\bullet\textsc{op}\bullet]$ features must in the end be satisfied; otherwise, the derivation will crash. It is in this way that the bijection between overt *wh*-phrases and operators is encoded.

In essence, I have encoded this bijection between overt *wh*-phrases and quantificational operators syntactically, via the specified featural makeup of Foc heads.

The reader might object that there are cases in Chinese in the *bare conditional* construction where a single universal quantifier is able to bind two *wh*-variables, one in the conditional adjunct and one in the matrix, as in the following example:

(16) shei xian lai, shei xian chi.
      who first come who first eat
      'Whoever comes first, eats first.'

According to Huang et al. (2009), this should be best accounted for by the following structure, both *wh*-phrases being variables, unselectively bound by a single universal quantifier:

(17) $\forall x.\ x$ comes first $\rightarrow x$ eats first

However, we must recognize that this is a very idiosyncratic construction with no generalizability, not even to other kinds of quantifiers, such as the existential or the interrogative: (16) cannot have existential or interrogative interpretations. We might better consider the ability of the universal quantifier to be able to bind multiple *wh*-variables as an exception to the general rule of bijection.

2.2 Syntax and semantics of *wh*-questions

In this subsection, I discuss the different aspects of the syntax and semantics of *wh*-questions that my analysis utilizes. I adopt the standard semantics of *wh*-questions so that their denotation is a set of propositions (Hamblin, 1958, 1973; Karttunen, 1977; Groenendijk and Stokhof, 1984). In order to facilitate proper compositional semantic derivation and interpretation, I subscribe to the Split-CP hypothesis of Rizzi (1997) and a specific semantic implementation thereof in Sauerland (1998). To accommodate the fact that answers to *wh*-questions can often be more specific and provide more information than is asked for, I revise the standard semantics of *wh*-questions such that implication replaces propositional equality.

2.2.1 Semantics of *wh*-questions and the Split-CP hypothesis

In this paper, I adopt the standardly assumed semantics (except for the replacement of propositional equality with implication) for *wh*-questions, i.e., that *wh*-questions are essentially functions from propositions to truth values, and this can be further thought of as the characteristic function for a set of propositions which can serve as a true answer to the question. This semantic analysis has a long history in the literature, and we can see similar proposals in Hamblin (1958, 1973); Karttunen (1977); Groenendijk and Stokhof (1984). A recent investigation of Chinese *wh*-in-situ by Murphy (2017) also relies on the same underlying semantics. Then, a typical *wh*-question would have the following denotation:

(18) $[\![$What did John read?$]\!] = \lambda p \exists x.\, p = \lambda w.\, \text{John read } x \text{ in } w$

Now, a question arises as to how to derive this denotation through compositional means.[2]

Since Murphy does not want to get into the compositional details which after all have rather little to do with the crux of his analysis of *wh*-phenomena, he is content with a derivation that requires syncategorematic rules to arrive at the desired denotation. The relevant denotations for the constituents are as labeled in the following tree:[3]

(19)   Zhangsan xihuan shenme?
        Zhangsan like   what
        'What does Zhangsan like?'

(20)

$$\text{CP} \quad \lambda p \exists x.\, p = \lambda w.\, \textbf{like}(\textbf{z}, x) \text{ in } w$$

Op_i $\text{C}' \quad \lambda x \lambda p.\, p = \lambda w.\, \textbf{like}(\textbf{z}, x) \text{ in } w$

$\lambda P \exists x.\, P(x)$

    i $\text{C}' \quad \lambda p.\, p = \lambda w.\, \textbf{like}(\textbf{z}, g(i)) \text{ in } w$

    λx

      C $\text{TP} \quad \lambda w.\, \textbf{like}(\textbf{z}, g(i)) \text{ in } w$

      $\lambda q \lambda p.\, p = q$

         Zhangsan like what$_i$
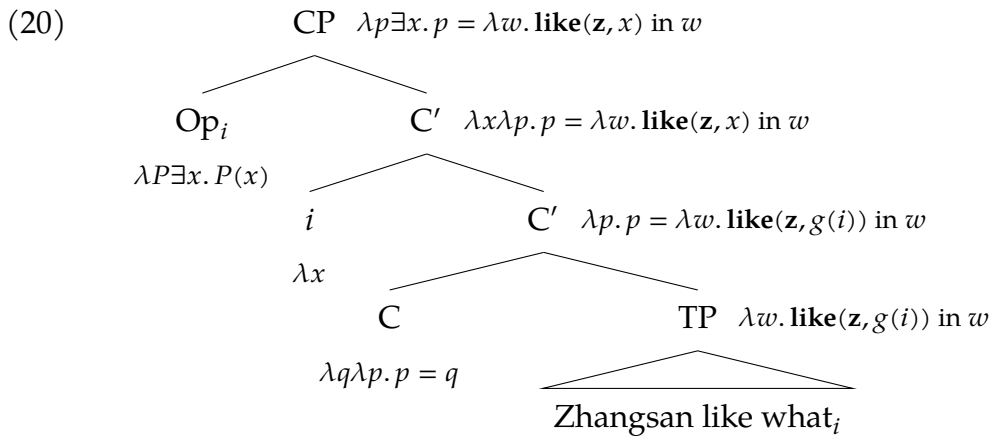
As Murphy acknowledges, this derivation does not reflect the true compositional result in the final step: first, there is a type mismatch between the denotations of Op_i and the highest C', with the former of type $\langle\langle e, t\rangle, t\rangle$, and the latter of type $\langle e, \langle\langle s, t\rangle, t\rangle\rangle$; second, even if we were to adjust the type of the operator, so that the variable P ranges over denotations of type $\langle e, \langle\langle s, t\rangle, t\rangle\rangle$, we would not be able to get the λp to scope over the $\exists x$.

He recommends either imposing a certain syncategorematic rule to handle the mismatch, or looking to the Split-CP proposals of Rizzi (1997); Cable (2010) where

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2. By *compositional* I mean that we are allowed to use at least Functional Application and Predicate Abstraction as semantic rules.

3. Notice that for the indices, forms such as λx do not represent denotations, but rather a shorthand to indicate that Predication is triggered at their level, resulting in the binding of the variable in the representation.

the crucial step that turns the sentence's denotation into a function from propositions to truth values is not the C at its lowest position, but one of the high Split C's, i.e., Force^0. *Wh*-movement and merger of *wh*-operators, responsible for existential closure, on the other hand, should target Spec, FocP, which is lower than Force^0. In this fashion, the interrogative nature and the *wh*-property of *wh*-questions are decoupled and handled by separate elements. In this way, it is straightforward to give a compositionally sound derivation for the semantics of *wh*-question, as Sauerland (1998) has already done for us. Here, I adapt the approach that Sauerland takes to the same Chinese in situ examples that Murphy uses to better illustrate:[4]

(21)　　　　　　ForceP　$\lambda p \exists x.\, p = \lambda w.\, \textbf{like}(\textbf{z}, x)$ in w

Force　　　　FocP　$\exists x.\, p = \lambda w.\, \textbf{like}(\textbf{z}, x)$ in w
λp

　　Qu$_i$　　　　Foc'　$\lambda x.\, p = \lambda w.\, \textbf{like}(\textbf{z}, x)$ in w
$\lambda P \exists x.\, P(x)$

　　　　　　i　　　　　Foc'　$p = \lambda w.\, \textbf{like}(\textbf{z}, g(i))$ in w
　　　　　λx

　　　　　　　　Foc　　　　CP　$p = \lambda w.\, \textbf{like}(\textbf{z}, g(i))$ in w

　　　　　　　　　　　　C　　　　　TP　$\lambda w.\, \textbf{like}(\textbf{z}, g(i))$ in w
　　　　　　　　　　$\lambda q.\, p = q$
　　　　　　　　　　　　　　Zhangsan like what$_i$
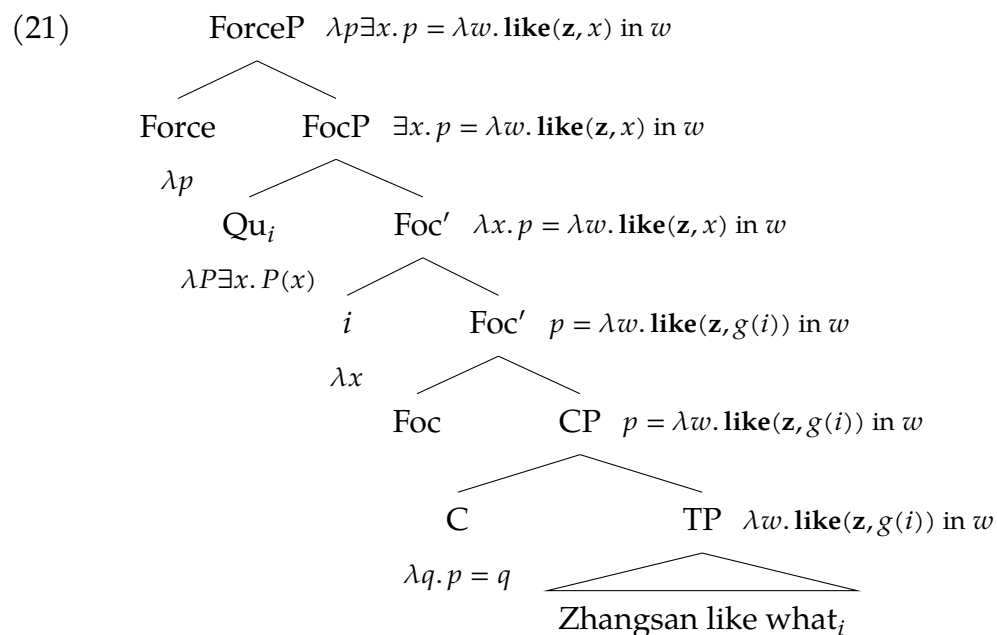
This revised semantic derivation is not only preferable because it is compositionally neat (again assuming Functional Application and Predicate Abstraction as the fundamental semantic rules) from a theoretical point of view, but it also has a significant prediction relevant to my proposal to make. FocP in this derivation is a type $\langle s, t \rangle$ element that already contains the existential closure of the individual variable. This means that it is a viable position for the conjunction with another clause of type $\langle s, t \rangle$. This is the conjunction site that I am proposing, between conjunct 1 and conjunct 2 of an ATB *wh*-question in Chinese.

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4. Again, forms such as λp and $\lambda q.\, p = q$ are not actually denotations, but shorthand for indicating the position and result of Predicate Abstraction over propositions.

2.2.2 Implication instead of propositional equality

Additionally, I would now introduce a slight change to such semantics. Notice that it is often allowable that we supply more information than needed in a response to a question:

(22) Q: What did John read?
     A: John read *War and Peace*, and he liked it.

This means that we do not need the answer proposition, to be substituted into p, to have exactly the same truth conditions as an instantiation of the right-hand side of the propositional equality. More explicitly, the following is the denotation for the question in (22).

(23) $\lambda p \exists x. p = \lambda w. \textbf{read}(\textbf{j}, x)$ in w.

A correction answer according to this denotation should correspond only to sentences of the form

(24) John read ___.

where the gap can contain the name of a book. However, we have already seen that the answer in (22) is also correct and acceptable. In light of this, we can allow propositions which are stronger than the right-hand side in the given denotation; in other words, we allow the answer proposition to imply the right-hand side in the given denotation. Therefore, I can safely revise the semantics of *wh*-questions such that we have

(25) $[\![\text{What did John read?}]\!] = \lambda p \exists x. p \rightarrow \lambda w. \text{John read } x \text{ in } w$.

This amounts to revising the denotation of C from $\lambda q. p = q$ into $\lambda q. p \rightarrow q$, and then carrying propagating the change upwards through the derivation. The ultimate denotation of (21) would become

(26) $\lambda p \exists x. p \rightarrow \lambda w. \textbf{like}(\textbf{z}, x)$ in w

instead. With this denotation, the answer in (22) can be judged correct.

Again, this revision is not only grounded in independent semantic observations, as in (22), but as we will see, it will have a crucial consequence in the semantic composition of the two conjuncts, essentially making possible the derivation of the desired denotation of ATB *wh*-questions in Chinese given the other parts of my analysis.

2.3 Choice function quantification

While unselective binding involving quantification, by default, over individuals has taken care of the syntactic aspects of *wh*-in-situ questions, it leaves much to improve in terms of its semantics. There is a famous argument by Reinhart (1998), cited by Murphy (2017) and adapted here, demonstrating the deficiency:

(27)   Who will be offended if we invite which philosopher?
        $\lambda p \exists x \exists y. p = y$ is a philosopher $\wedge$ we invite $y \to x$ will be offended

Here, I still assume that the denotation of a *wh*-question is the set of true answers to the questions, as discussed in the previous section. Then, we see that (27) predicts that the sentence

(28)   Max will be offended if we invite Donald Duck.

is a true answer to the question, since by falsifying the antecedent condition with an individual that does not satisfy the restriction on the individual asked for (*Donald Duck* is not a philosopher), a conditional statement like (28) trivially evaluates to true.

One straightforward way out is to introduce choice function quantification. A choice function, of type $\langle \langle e, t \rangle, e \rangle$, when applied to a set, returns an individual from a non-empty set. Therefore, suppose we have three choice functions f_1, f_2, f_3. If we apply them to the set of philosophers, we might get the following results:

(29)   a. $f_1(\textbf{philosopher}) = $ Wittgenstein
        b. $f_2(\textbf{philosopher}) = $ Russel
        c. $f_3(\textbf{philosopher}) = $ Carnap

By rewriting the semantics of (27) in the following way, we see how the *Donald Duck* answer can be prevented:

(30) $\lambda p \exists x \exists f. p = $ we invite $f(\textbf{philosopher}) \to x$ will be offended

Now, since no choice function can possibly return *Donald Duck* when applied to **philosopher**, the answer in (28) is clearly ruled out as being true.

Not only does choice function quantification solve the *Donald Duck* problem of *wh*-in-situ, but it has also been successfully applied to ex situ and in situ *wh*-questions in general repeatedly, solving puzzles impenetrable to an individual-based approach, as in Reinhart (1998); Sauerland (1998); von Stechow (2000); Ruys (2000); Lin (2004); Sauerland (2004); Thuan and Bruening (2013); Urk (2015);

[Murphy](#) ([2017](#)). Therefore, I feel justified in my adoption of choice function quantification as the mechanism of unselective binding for Chinese *wh*-in-situ questions.

Then, I can revise the semantic derivation tree given in § [2.2](#) to reflect the choice function re-orientation:

(31)   ForceP $\lambda p \exists f . p = \lambda w . \mathbf{like}(\mathbf{z}, f(\mathbf{book}))$ in w

     Force   FocP $\exists f . p = \lambda w . \mathbf{like}(\mathbf{z}, f(\mathbf{book}))$ in w

     λp

      Qu$_i$ Foc$'$ $\lambda f . p = \lambda w . \mathbf{like}(\mathbf{z}, f(\mathbf{book}))$ in w

     $\lambda P \exists f . P(f)$

         i Foc$'$ $p = \lambda w . \mathbf{like}(\mathbf{z}, g(i)(\mathbf{book}))$ in w

         λf

           Foc CP $p = \lambda w . \mathbf{like}(\mathbf{z}, g(i)(\mathbf{book}))$ in w

             C   TP $\lambda w . \mathbf{like}(\mathbf{z}, g(i)(\mathbf{book}))$ in w

            $\lambda q . p = q$

              Zhangsan like which$_i$ book
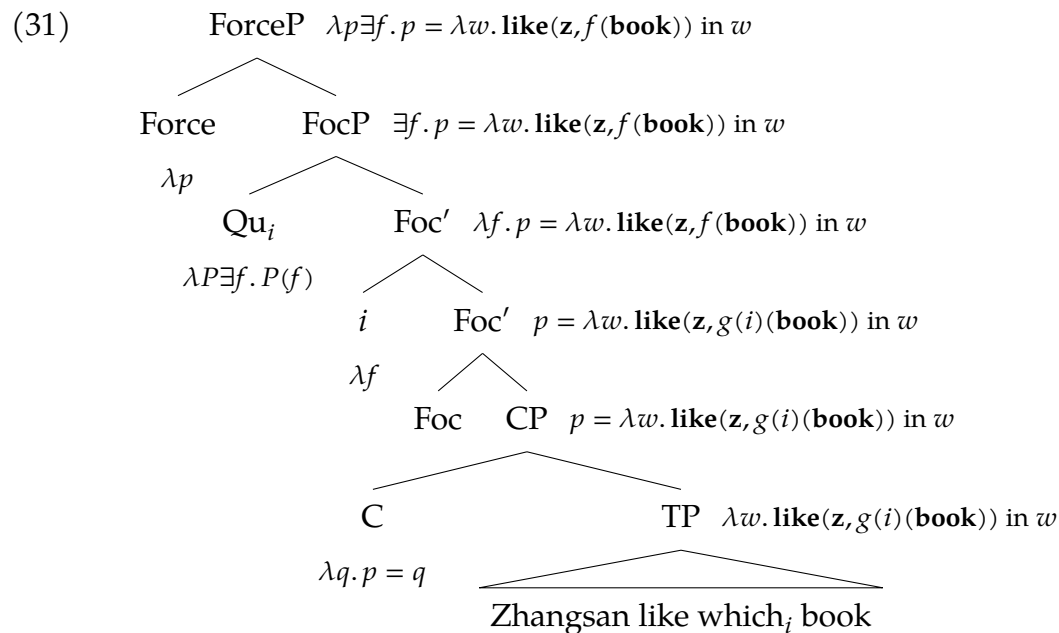
Notice the crucial differences where *i* is now an index of the choice function type and Qu now requires a predicate from choice functions to truth values.

If I also apply the revision to the denotation of C^0 discussed in the last subsection, then we get the denotation of

(32) $\lambda p \exists f . p \rightarrow \lambda w . \mathbf{like}(\mathbf{z}, f(\mathbf{book}))$ in w.

2.4 Ellipsis approach to null objects

An important component of my analysis hinges on the ellipsis approach to object-drop in Chinese. This approach is best represented by [Li](#) ([2014](#)). Li first argues against the traditional view in [Huang](#) ([1982](#)) where empty objects are variables bound by an empty topic. However, while a topic in Chinese cannot be indefinite, an empty object can be:

(33) *yi-ge nanhai, wo hen xihuan/kandao-le __.
      one-CL boy   I   very like/see-LE
      Intended: 'A boy, I like/saw __.'

(34) a. ta song yi-ge nanhai yi-ben shu; wo song yi-ge nuhai (yi-ben
          he give one-CL boy   one-CL book I   give one-CL girl   one-CL
          shu).
          book
          'He gave a boy a book; I gave a girl (a book).'
      b. ta song yi-ge nanhai yi-ben shu; wo song (yi-ge nanhai) yi-zhi
          he give one-CL boy   one-CL book I   give one-CL boy   one-CL
          bi.
          pen
          'He gave a boy a book; I gave (a boy) a pen.'

Additionally, the topic is unable to be co-indexed with a gap in an object position contained in an island, but it is possible for a null object to be contained in an island:

(35) na-ge   ren$_i$,   wo [yinwei *(ta)$_i$ renshi ni] hen gaoxing.
      that-CL person I   because he   know you very happy
      'That person, I am happy because *(he) knows you.'

(36) a. zhe-ge laoshi$_i$ hen hao, wo mei kandao-guo [[e_j bu xihuan e_i de]
          this-CL teacher very good I   not see-ASP   not like   DE
          xuesheng$_j$]
          student
          'This teacher$_1$ is very good. I have not seen students$_2$ who e_2 do not like (him$_1$).'
      b. zhe-zhi bi$_i$ hen gui,   wo tebie   [yinwei ta yuanyi mai e_i
          this-CL pen very expensive I   especially because he willing buy
          gei wo] gandao gaoxing.
          to me feel   happy
          'This pen$_1$ is very expensive. I am especially happy because he was willing to buy it$_1$ for me.'

These problems show that null objects are not variables bound by an empty topic. Further, dropped objects in Chinese can contain within them elements that receive sloppy readings.

(37) a. Zhangsan$_i$ [yinwei wo jiao-guo ta$_i$de erzi] hen gaoxing; Lisi$_j$
Zhangsan because I   teach-ASP his   son very happy   Lisi
[yinwei wo mei jiao-guo (ta$_j$de erzi)] hen bu gaoxing
because I   not teach-ASP his   son   very not happy
'Zhangsan$_i$ is happy because I have taught his$_i$ son; Lisi$_j$ is not happy
because I have not taught [his$_j$ son].'
b. Zhangsan$_i$ xihuan [renshi ziji$_i$/ta$_i$ erzi de ren]; Lisi$_j$ xihuan [bu
Zhangsan like   know self/he son DE people Lisi like   not
renshi (ziji$_j$/ta$_j$ erzi) de ren]
know self/he son DE people
'Zhangsan$_i$ likes the people that know self's$_i$/his$_i$ son; Lisi$_j$ likes the
people that do not know (self's$_j$/his$_j$ son).'

In the example above, the object in the adjunct of conjunct 1 contains an anaphor *ta*
that is bound by the conjunct 1 subject *Zhangsan*. In conjunct 2, the missing object
can be understood as also containing the anaphor, but instead of being bound by
Zhangsan, it is bound by the conjunct 2 subject *Lisi*.

The availability of such sloppy readings is a classic property of ellipsis and
is difficult to derive with a bound-variable or pronominal analysis of the missing
object. This is because for sloppy readings to be attained, the gap must still contain
indices that can be bound by elements c-commanding it in conjunct 2, which means
that the gap contains complex structure rather than being atomic, as in the case of
pronouns and bound variables.

Li follows up with a counterargument against the VP ellipsis approach, exem-
plified by Huang (1991); Otani and Whitman (1991); Goldberg (2005), where an
entire VP is deleted after the verb has evacuated the VP, giving the impression of
only missing the object. First, she tries to establish the fact that the first object in
a double object construction asymmetrically c-commands the second object. We
can verify this fact in terms of Binding conditions:

(38) a. ni yao song na-ge   ren$_i$ taziji$_i$ de zhaopian?
you want give which-CL person himself DE picture
'Which person(x_i) you want to give x_i pictures of himself$_i$?'
b. *wo yao song ta$_i$ Lisi$_i$ de zhaopian.
I   want give him Lisi DE picture.
'I want to give him$_i$ Lisi$_i$'s pictures.'

These two examples, pertaining to Condition A and Condition C respectively, will
follow from the fact that the first object asymmetrically c-commands the second.

Additionally, quantificational elements in the first object obligatorily scope over such elements in the second object:

(39)　a.　wo gei　mei-ge　ta yao　de ren　　yi-ben shu.　　　　　∀ > ∃
　　　　　　I　give every-cl he want de person one-cl book
　　　　　　'I gave everyone he wants a book.'
　　　b.　wo gei　yi-ge　ren　　mei-ben ta mai de shu.　　　　∃ > ∀
　　　　　　I　give one-cl person every-cl he buy de book
　　　　　　'I gave a person every book that he bought.'

This is another piece of evidence for the asymmetrical c-command relationship between the two objects. Then, this means that there is no contiguous constituent that contains just the trace of the verb and the first object, to the exclusion to the second object:

(40)　　　V ... [VP obj$_1$ [$_{V'}$ t_V obj$_2$]]

However, the first object alone can be dropped:

(41)　a.　ta song yi-ge　nanhai yi-ben shu; we song yi-ge　nühai (yi-ben
　　　　　　he give one-cl boy　　one-cl book I　give one-cl girl　　one-cl
　　　　　　shu).
　　　　　　book
　　　　　　'He gave a boy a book; I gave a girl (a book).'
　　　b.　ta song yi-ge　nanhai yi-ben shu; wo song (yi-ge nanhai) yi-zhi
　　　　　　he give one-cl boy　　one-cl book I　give one-cl boy　　one-cl
　　　　　　bi.
　　　　　　pen
　　　　　　'He gave a boy a book; I gave (a boy) a pen.'

This means that the VP ellipsis approach cannot be used for deriving null objects in Chinese.

The only option left is to adopt a kind of argument ellipsis, where only the object is elided. Li presents arguments that the PF deletion is undesirable to LF-copying, and that a specific implementation of LF-copying, i.e., via *true empty categories* (TEC), actual syntactic objects with empty phonetic features base-generated in the null object position, is superior to Late Insertion, where there is no syntactic object at all at the ellipsis site in the Narrow Syntax. The arguments for the TEC analysis is not relevant to my own analysis of ATB *wh*-questions, so I merely adopt Li's formulation of argument ellipsis out of convenience. Therefore, I will write

TEC in the place of a null object where relevant in my analysis.

2.5 An algorithmic perspective on semantic interpretation

The final piece I need in fleshing out the proposal is an effect of λ-operator binding when viewed from an algorithmic perspective, i.e., that once an index is bound by a certain operator through *Predicate Abstraction*, every instance of the same index in the same LF, regardless of whether it is in the syntactic scope of the application of *Predicate Abstraction*, will all be bound by the same operator if we assume the semantics of dynamic predicate logic (Groenendijk and Stokhof, 1991) for the target logical language of semantic interpretation. I thus clarify that the semantic interpretation mechanism that I am working with is a map from syntactic objects to logical representations, rather than directly to truth values or truth conditions. Variables, such as x, y, z, etc., are in the domain of individuals D_e, along with constants standing for individuals in the actual world, such as **j** for John, **m** for Mary, etc. Denotations of predicates, such as *book*, will be written in boldface, such as **book**, which is naturally a function from individual-typed entities to truth values.

Semantic interpretation can be thought of as a program, which when run on a syntactic object, imports several things from the context:

(42)   a.   the assignment function g
         b.   the mapping d from semantically atomic syntactic objects to their denotations

Both are stored in the memory that is available to the program, as global variables which can be accessed repeatedly in the course of the interpretation. g, in particular, is not only accessible but also mutable so that the interpretation function can make changes to the version of g that is stored in memory and the effect of the change will apply to future invocations of g.

The body of the program contains the interpretation function $I(\cdot)$, which takes three arguments, a syntactic object σ, and g.

$I(\cdot)$ should be simple to implement. It performs structural recursion on σ, calling itself on the sub-parts of σ. The base case is when σ is a semantically atomic syntactic object, where $I(\cdot)$ applied to σ would simply return the fixed denotation $d(\sigma)$ of σ. $I(\cdot)$ should also take care of the syncategorematic rules, especially those related to binding, making proper modifications to g when passed as arguments to the sub-calls of itself in structural recursion. For example, to capture the *Predicate Abstraction* rule described in Heim and Kratzer (1998):

(43)   *Predicate Abstraction*
         $[\![i\ \alpha]\!]^g = \lambda x.\, [\![\alpha]\!]^{g[x/i]}$,

$I(\cdot)$ should execute the following when it patterns matches the condition for *Predicate Abstraction* application:

$$I([i\ \alpha], g) = I(\alpha, g[x/i]).$$

I also need to mention that when $I(\cdot)$ is applied to an index, it applies g to the index, which is the standard behavior:

$$I(i, g) = g(i).$$

However, the crucial that I am proposing here is that instead of feeding the sub-call of $I(\cdot)$ with $g[x/i]$, I ask $I(\cdot)$ to modify g in the memory when passing it down. That is to say, I define the following function U, for **update**:

$$U(g, x, i) = (g = g[x/i]; g).$$

This means that g, as a global variable, is modified in place before being returned by U. Then, I refine the action performed by $I(\cdot)$ upon a structure where *Predicate Abstraction* is applicable:

$$I([i\ \alpha], g) = I(\alpha, U(g, x, i)).$$

Now, not only is the sub-call of $I(\cdot)$ in the branch handling *Predicate Abstraction* going to reflect the effect of binding the index i to the variable x, but every call of $I(\cdot)$ on the global variable g will all bear the effect of such index binding.

Additionally, I assume that the function performs *Call-by-Value* semantic evaluation to the syntactic objects. That means, when a syntactic object is a function application, all of the arguments are fully evaluated before the function itself is evaluated and then applied to the arguments. [5]

Take the following syntactic object, where α, β, γ are atomic syntactic objects:

(44) β''
         α β'
             β   γ

---

5. The Call-by-Value evaluation is not the only choice that would work for my analysis; any order in which the specifier of &P is evaluated before the complement of & is sufficient. The choice of Call-by-Value is merely due to the fact it is a commonly adopted evaluation order in actual programming languages that happens to coincide with my purposes.

I also assume that we have backward application with α and β and forward application with β and γ. Then, we have the following interpretation procedure:

$$
\begin{aligned}
[\![\beta'']\!] &= [\![\beta']\!]([\![\alpha]\!]) && (\alpha \text{ is now evaluated to } d(\alpha)) \\
&= ([\![\beta]\!]([\![\gamma]\!]))(d(\alpha)) && (\gamma \text{ is now evaluated to } d(\gamma)) \\
&= ([\![\beta]\!](d(\gamma)))(d(\alpha)) && (\beta \text{ is now evaluated to } d(\beta)) \\
&= (d(\beta)(d(\gamma)))\, d(\alpha).
\end{aligned}
$$

Then, suppose that during the interpretation of α, *Predicate Abstraction* is needed, and the corresponding branch in $I(\cdot)$ is triggered. Then, suppose that index 1 is bound as the variable x. Then, g is modified in the memory. If there are occurrences of the index 1 in β and γ, then when $I(\cdot)$ is called on them, the g will have been modified, and any such index 1 will all be converted to x.

Then, we can easily get the denotation of the following sentence correct:

(45)   John read something, and it was good.

Suppose that *something* is just a variable semantically, and it is base generated as an index to be bound unselectively through existential closure. It should have the following structure:

(46)

```
                    &P
            _____|_____
           |                 |
           CP               &'
        ___|___           ___|___
       |       |         |       |
  ∃ 1 John read 1        &       CP
                        and    ___|___
                              |       |
                           1 was good
```
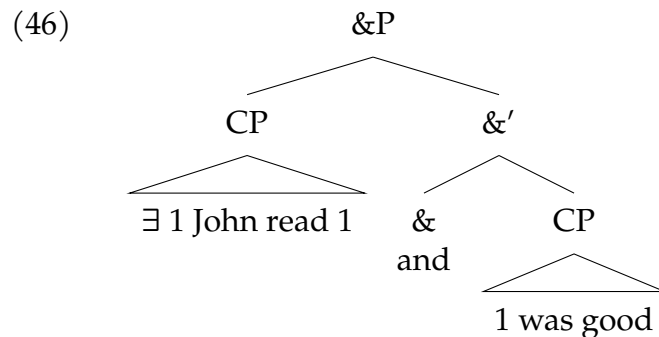
Suppose we interpret the entire structure with respect to the empty g, defined on

23

no indices or variables at all. Then we have the following interpretation steps:

$$I(\text{John read something, and it was good}, g)$$
$$= I(\text{and it was good}, g)(I(\text{John read something}, g))$$
$$= I(\text{and it was good}, g)(I(\exists, g)(I(1 \text{ John read } 1, g)))$$
$$\qquad\qquad\qquad\qquad (g \text{ is modified, and maps 1 to } x)$$
$$= I(\text{and it was good}, g)(I(\exists, g)(\lambda x. \mathbf{read}(\mathbf{j}, x)))$$
$$= I(\text{and it was good}, g)((\lambda P \exists x. P(x))(\lambda x. \mathbf{read}(\mathbf{j}, x)))$$
$$= I(\text{and it was good}, g)(\exists x. \mathbf{read}(\mathbf{j}, x))$$
$$= (I(\text{and}, g)(I(1 \text{ was good}, g)))(\exists x. \mathbf{read}(\mathbf{j}, x))$$
$$= (I(\text{and}, g)(\mathbf{good}(g(1))))(\exists x. \mathbf{read}(\mathbf{j}, x))$$
$$\qquad\qquad\qquad (g, \text{ now mapping 1 to } x, \text{ is applied to 1})$$
$$= (I(\text{and}, g)(\mathbf{good}(x)))(\exists x. \mathbf{read}(\mathbf{j}, x))$$
$$= ((\lambda p \lambda q. q \wedge p)(\mathbf{good}(x)))(\exists x. \mathbf{read}(\mathbf{j}, x))$$
$$= \exists x. \{\mathbf{read}(\mathbf{j}, x)\} \wedge \mathbf{good}(x).$$

Then, this final denotation will be semantically equivalent to

$$\exists x. \{\mathbf{read}(\mathbf{j}, x) \wedge \mathbf{good}(x)\}$$

via the mechanisms of DPL.

Notice that my approach bridges the gap between Groenendijk and Stokhof (1991) DPL and the semantic framework in Generative Grammar in the style of Heim and Kratzer (1998) since DPL works with the semantics of propositions of first-order logic; I need to adapt the Heim and Kratzer (1998) framework so that it outputs logical representations rather than truth conditions or truth values. As syntactic objects, variables should enter the syntax as indices in the Heim and Kratzer (1998) framework. We need to map the out-of-scope indices to matching variables in order for DPL to properly enable operators to bind outside their syntactic scopes. This particular implementation of the interpretation procedure, therefore, ensures that indices outside the syntactic scope of its binder can also be properly converted to the same variable that the same index has been converted into inside the syntactic scope of the binder, which makes gives DPL the chance to take effect. As we will see, my analysis crucially depends on this step, to properly bind the index of the *wh*-variable in conjunct 2 which is outside the scope of the *wh*-operator in conjunct 1.

2.6 Putting it all together

After detailing all of the components of my analysis, it is time for synthesis. First, my analysis essentially unites ATB *wh*-questions in Chinese with object-drop in conjunct 2, so I use TEC to represent this fact, and use the equal sign = to indicate syntactic identity after LF-copying:

(47)

```
                    &P
          _____/ \
         /_____    &′
        … obj_=       / \
                     &   /____
                        … TEC_=
```
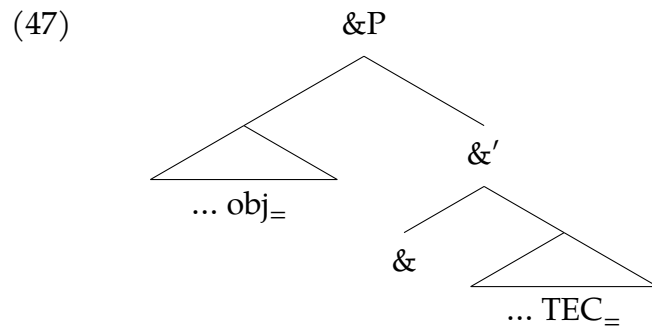
Next, I require that whatever the nature of the interrogative quantifier is, it is present only in conjunct 1:

(48)

```
                    &P
          _____/ \
         /_____    &′
       Qu … obj_=     / \
                     &   /____
                        … TEC_=
```
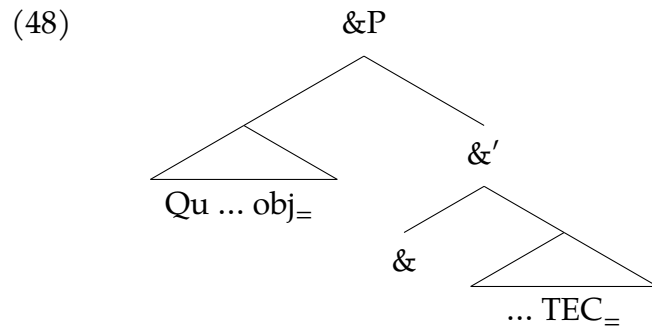
Then, I assume unselective binding as the quantificational mechanism, and choice function is the type of variable quantified over:

(49)

```
                    &P
          _____/ _____
         /                   \
    Qu 1 ... [f₁, NP]₌         &'
                           ___/ \___
                          /         \
                         &       ... TEC₌
```

$$(49)\quad \text{\&P} \rightarrow [\text{Qu 1 ... } [f_1, \text{NP}]_=]\ \text{\&}'\ [\text{\& ... TEC}_=]$$
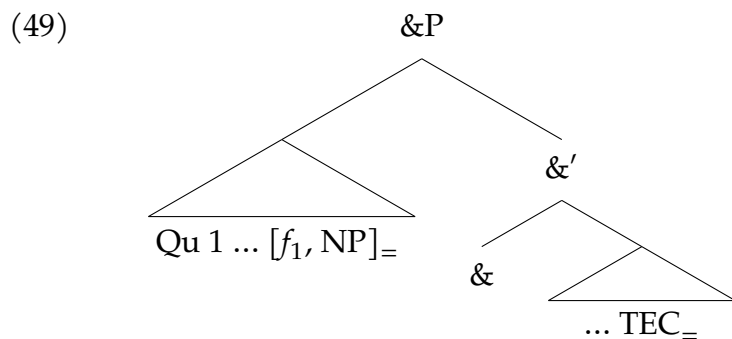
Then, I adopt the Split CP hypothesis, deriving for us a type $\langle s, t \rangle$ FocP in both conjuncts, which is used for the conjunction:

(50)

```
                        ForceP
                     ___/   \___
                    /           \
                 Force          &P
                          _____/  \_____
                         /              \
                      FocP              &'
                    __/  \__         __/  \__
                   /        \       /        \
                 Qu       Foc'     &        FocP
                 1      __/  \__           __/  \__
                       /        \         /        \
                     Foc        CP      Foc        CP
                              /  \                /  \
                          ... [f₁, NP]₌       ... TEC₌
```
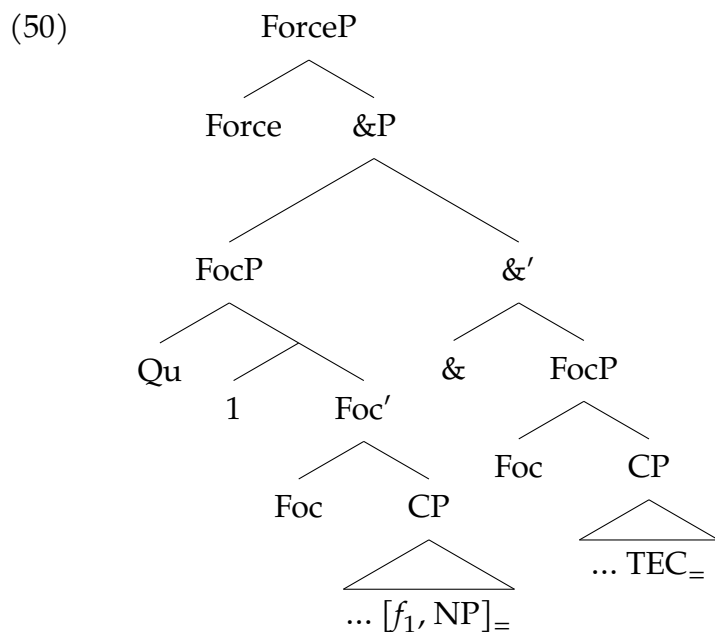
This is the underlying syntactic representation of the base configuration of the ATB *wh*-question in Chinese. Then at LF, copying of the antecedent into the TEC will result in

(51)

```
                    ForceP
                   /      \
               Force      &P
                        /     \
                    FocP₁      &'
                   /    \      /   \
                 Qu    Foc'   &    FocP₂
                  1   /    \        /    \
                   Foc    CP      Foc    CP
                        /  \            /   \
                     ... [f₁, NP]    ... [f₁, NP]
```
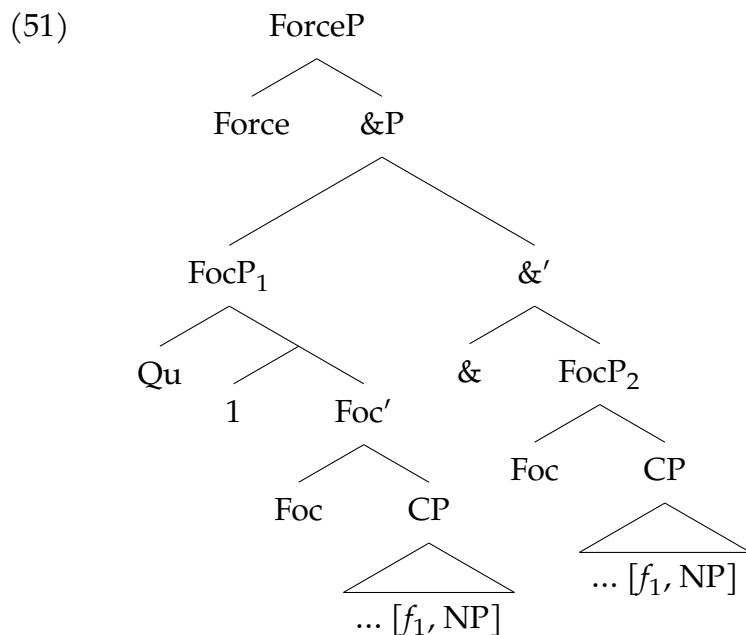
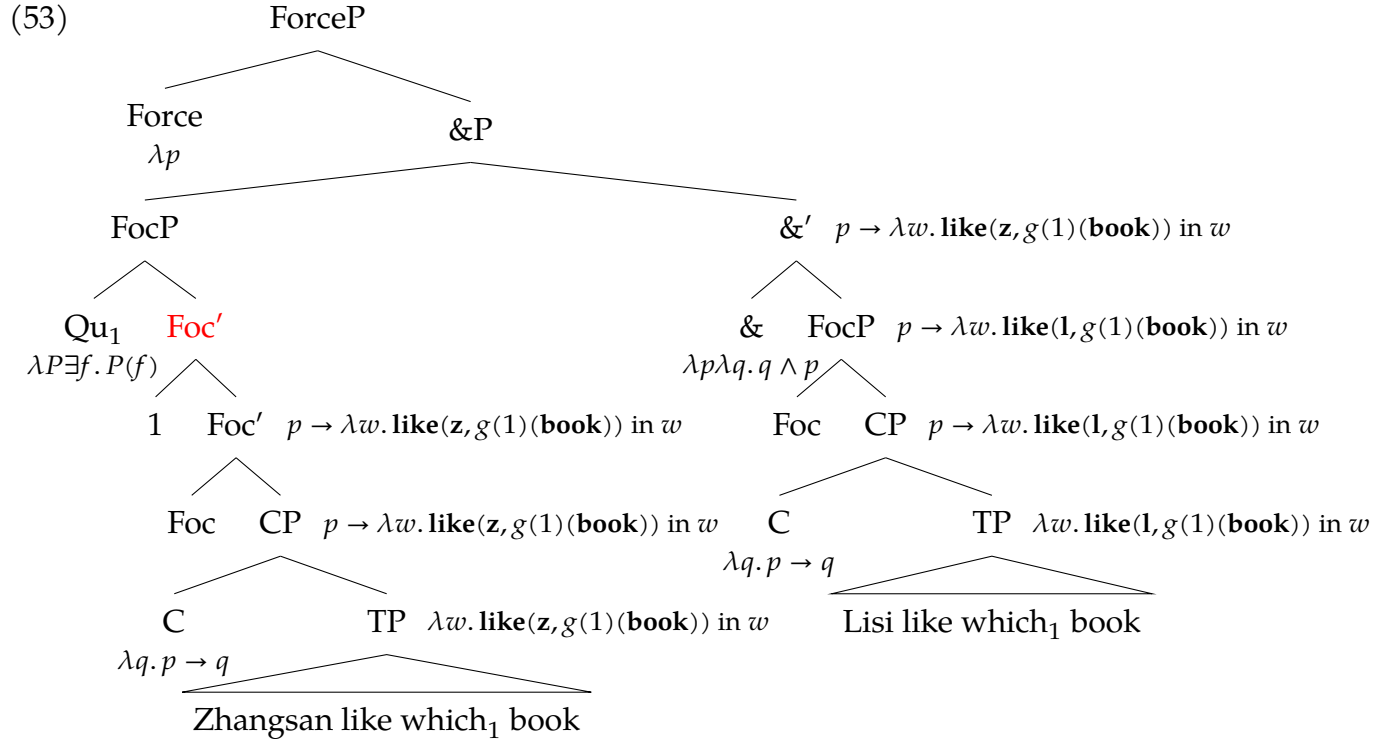At this point, we are ready to introduce the semantic side of the analysis into the structure. We are also going to illustrate it with a tree annotated with denotations and semantic shorthand for the syntactic nodes, based on an actual example Chinese ATB *wh*-question.

(52)   Zhangsan xihuan shenme shu   danshi Lisi taoyan?
        Zhangsan like   what   book but   Lisi hate
        'What book does Zhangsan like but Lisi hate?'

Crucially, since &' supplies the function while Foc_1 supplies the argument in that step of semantic composition, by our *call-by-value* semantic interpretation order, the denotation of $FocP_1$ is computed before that of &'.[6]

---

6. Below, although I annotate nodes in &' with denotations, I by no means suggest that the interpretation procedure that generates these denotations is carried out simultaneously with the interpretation of conjunct 1; due again to *call-by-value*, the entirety of &' is interpreted after conjunct 1. The annotations in &P are provided merely to provide context for the illustration of the revised Predicate Abstraction.

(53)

ForceP
- Force λp
- &P
  - FocP
    - Qu$_1$ $\lambda P\exists f.\,P(f)$
    - Foc′
      - 1
      - Foc′ $p \to \lambda w.\,\textbf{like}(\textbf{z}, g(1)(\textbf{book}))$ in w
        - Foc
        - CP $p \to \lambda w.\,\textbf{like}(\textbf{z}, g(1)(\textbf{book}))$ in w
          - C $\lambda q.\,p \to q$
          - TP $\lambda w.\,\textbf{like}(\textbf{z}, g(1)(\textbf{book}))$ in w
            - Zhangsan like which$_1$ book
  - &′ $p \to \lambda w.\,\textbf{like}(\textbf{z}, g(1)(\textbf{book}))$ in w
    - & $\lambda p \lambda q.\, q \wedge p$
    - FocP $p \to \lambda w.\,\textbf{like}(\textbf{l}, g(1)(\textbf{book}))$ in w
      - Foc
      - CP $p \to \lambda w.\,\textbf{like}(\textbf{l}, g(1)(\textbf{book}))$ in w
        - C $\lambda q.\,p \to q$
        - TP $\lambda w.\,\textbf{like}(\textbf{l}, g(1)(\textbf{book}))$ in w
          - Lisi like which$_1$ book

The node in red above is the node just before the triggering of Predicate Abstraction in conjunct 1. Suppose that Predicate Abstraction here would like to map the index 1 to the variable f. By our revised Predication Abstraction definition, after its execution, the globally scoped assignment function g will map 1 to f, which it crucially does when &′ is being interpreted. In this way, we have the following annotated denotations:

(54)

ForceP $\lambda p. \{\exists f. [p \to \lambda w. \textbf{like}(\textbf{z}, f(\textbf{book})) \text{ in } w] \wedge p \to \lambda w. \textbf{like}(\textbf{l}, f(\textbf{book})) \text{ in } w\}$

Force λp

&P $\exists f. [p \to \lambda w. \textbf{like}(\textbf{z}, f(\textbf{book})) \text{ in } w] \wedge p \to \lambda w. \textbf{like}(\textbf{l}, f(\textbf{book})) \text{ in } w$

FocP $\exists f. p \to \lambda w. \textbf{like}(\textbf{z}, f(\textbf{book})) \text{ in } w$

&' $\lambda q. q \wedge p \to \lambda w. \textbf{like}(\textbf{l}, g(1)[=f](\textbf{book})) \text{ in } w$

Qu_1 $\lambda P \exists f. P(f)$

Foc' $\lambda f. p \to \lambda w. \textbf{like}(\textbf{z}, f(\textbf{book})) \text{ in } w$

& $\lambda p \lambda q. q \wedge p$

FocP $p \to \lambda w. \textbf{like}(\textbf{l}, g(1)(\textbf{book})) \text{ in } w$

1

Foc' $p \to \lambda w. \textbf{like}(\textbf{z}, g(1)[=f](\textbf{book})) \text{ in } w$

Foc

CP $p \to \lambda w. \textbf{like}(\textbf{l}, g(1)(\textbf{book})) \text{ in } w$

Foc

CP $p \to \lambda w. \textbf{like}(\textbf{z}, g(1)(\textbf{book})) \text{ in } w$

C $\lambda q. p \to q$

TP $\lambda w. \textbf{like}(\textbf{l}, g(1)(\textbf{book})) \text{ in } w$

Lisi like which$_1$ book

C $\lambda q. p \to q$

TP $\lambda w. \textbf{like}(\textbf{z}, g(1)(\textbf{book})) \text{ in } w$

Zhangsan like which$_1$ book

These ultimate denotation we get is therefore

(55) $\lambda p. \{\exists f. [p \to \lambda w. \textbf{like}(\textbf{z}, f(\textbf{book})) \text{ in } w] \wedge p \to \lambda w. \textbf{like}(\textbf{l}, f(\textbf{book})) \text{ in } w\}.$

This denotation is semantically equivalent to

(56) $\lambda p. \{\exists f. [p \to \lambda w. \textbf{like}(\textbf{z}, f(\textbf{book})) \text{ in } w \wedge p \to \lambda w. \textbf{like}(\textbf{l}, f(\textbf{book})) \text{ in } w]\}$

via the dynamic predicate logic of Groenendijk and Stokhof (1991). Notice that the only relevant change from (55) to (56) is the scope that the existential quantifier $\exists f$ takes; in the former, it scopes over only the part contributed by conjunct 1; in the latter, it scopes over both conjunct 1 and conjunct 2.

The resulting denotation is clearly one of identity-reading, with the same choice function variable, corresponding to the minimal *wh*-element, bound in both conjuncts. This would be the structural analysis of the newly presented kind of ATB *wh*-question, i.e., (3), which I consider to be the base configuration underlying all different kinds of ATB *wh*-question in Chinese. The classic Chinese ATB *wh*-question example, (2-b), repeated below, would be analyzed as the *wh*-topicalized version of the base configuration, with a semantically vacuous displacement of the

wh-phrase in conjunct 1.

(57)   shenme ren$_{1=}$ Zhangsan xihuan ___$_1$ Lisi taoyan TEC$_=$?
         what   person Zhangsan like   Lisi hate?
         'What person does Zhangsan like and Lisi hate?'

Notice that the without the change from $\lambda q. p = q$ into $\lambda q. p \rightarrow q$ in the denotation of C, we would not be able to properly conjoin the two conjuncts, because it is a contradiction that p is equivalent to both the $\langle s, t \rangle$ function represented by the proposition in conjunct 1 and the $\langle s, t \rangle$ function represented by the proposition in conjunct 2, as long as conjunct 1 and conjunct 2 differ semantically in the propositional part, which is a usual, if not necessary, condition for an ATB *wh*-question.

In the sections to come, we will examine the predictions made by the proposal detailed above and see if they are borne out.

3   Deriving Citko's contrast

The starting point of all claims of a working proposal for Chinese ATB *wh*-question would be to derive the important contrast of (2), reproduced here:

(58)   a.   Zhangsan xihuan shenme ren,   Lisi taoyan shenme ren?
               Zhangsan like   what   person Lisi like   what   person
               i.   'What person does Zhangsan like and What person does Lisi hate?'
               ii.   *'What person does Zhangsan like and Lisi hate?'
         b.   Shenme ren   Zhangsan xihuan Lisi taoyan?
               what   person Zhangsan like   Lisi hate?
               'What person does Zhangsan like and Lisi hate?'

Now, the mechanisms I have proposed would readily account for this contrast. Due to the bijection between overt *wh*-phrases and quantificational operators that I have motivated and implemented through the Agree-based mechanism in 2.1.2, (58-a) should involve two separate instances of *wh*-operators, one in each conjunct. Then, identity reading is simply unavailable due to the two *wh*-variables being bound by different *wh*-operators in the respective Spec, FocP positions.

(59)   Qu$_1$ Foc$_{[\bullet \text{OP} \bullet]}$ ... *wh*$_1$ & Qu$_2$ Foc$_{[\bullet \text{OP} \bullet]}$ ... *wh*$_2$

Also notice that merging only one *wh*-operator, in conjunct 1, and letting it bind

both overt *wh*-variables is clearly not an option, since the [●ᴏᴘ●] feature on the Foc head of conjunct 2 will be left unchecked.

(60)   *Qu$_1$ Foc$_{[●ᴏᴘ●]}$ ... *wh*$_1$ & Foc$_{[●ᴏᴘ●]}$ ... *wh*$_1$

On the other hand, (58-b) is a topicalized version of the base configuration, whose analysis is discussed in the previous section. It should have the following structure:

(61)   [$_{ForceP}$ [$_{TopP}$ shenme ren$_1$ Top [$_{FocP}$ Qu Foc$_{[●ᴏᴘ●]}$ [$_{CP}$ Zhangsan xihuan ___$_1$]]] & [$_{CP}$ Lisi taoyan TEC$_1$]]

We see that only conjunct 1 contains an overt instance of *wh*-phrase, which corresponds with only one necessary and sufficient instance of *wh*-operator in Spec, FocP of conjunct 1. The gap in conjunct 2 derives its semantic content through LF-copying, so there is no *wh*-phrase within Narrow Syntax in conjunct 2 to trigger the activation of a [●ᴏᴘ●] feature on its Foc head to force the merger of an operator. In this way, one and only one *wh*-phrase binds into both conjuncts, although in conjunct 1 the bindee is a true *wh*-phrase in syntax, while in conjunct 2, the *wh*-variable is present only after all syntactic feature-checking has finished.

Therefore, the discussion in this section shows us that my analysis adequately accounts for what most other proposals of ATB *wh*-movement mainly intend to accomplish with Chinese ATB *wh*-questions. In the next sections, I will examine the predictions that would follow from my new analysis and check if they are borne out by the observed data. I will also hold competing analyses to the same standards.

4   Evidence for ellipsis

In the following subsections, I will examine the predictions that an ellipsis-based approach to Chinese ATB *wh*-questions can produce. We will see that such predictions are borne out by the observed patterns in Chinese sentences. Meanwhile, I will also hold the other approaches to ATB *wh*-movement to the same predictions The purpose of involving the other analyses is merely to identify the better approach to Chinese ATB *wh*-questions, not ATB *wh*-questions cross-linguistically or in general.

4.1 The existence of the newly reported ATB types

The first prediction that my proposal, which treats the second conjunct as an ordinary case of object-drop, would make is that the *wh*-phrase should be allowed to stay in situ in the first conjunct. The *wh*-phrase is generated in exactly the same fashion as in a regular, non-ATB *wh*-question. There is no additional feature to be checked other than that required for merging the *wh*-operator.

(62) Zhangsan xihuan shenme ren   Lisi taoyan?   base configuration
      Zhangsan like   which person Lisi hate
      'What person does Zhangsan like and Lisi hate?'

(63) $[_{CP}$ Qu 1 Zhangsan like $[_{DP} f_1$ $[_{NP}$ person$]]]$ & $[_{CP}$ Lisi hate TEC$]$

None of the existing approaches to ATB questions has even taken such data into account, which is understandable, since this paper is the first to report the two additional types of construction in Chinese.

The *Parallel Merge* approach of Citko (2005) predicts that the *wh*-phrase in an identity-reading ATB *wh*-question will obligatorily move since its multi-dominated status leads to a failure of linearizability at the base position. This is because, by standard linearization procedures, the *wh*-phrase will both precede and succeed itself, which cannot be realized. The basic of a *Parallel Merge* multidominance structure is illustrated below.

(64) *Parallel Merge*:

$$\alpha \qquad \beta \quad \rightarrow \quad \alpha^{\mathrm{max}}\,\beta^{\mathrm{max}}$$

$$\alpha \quad \gamma \qquad\qquad \alpha \quad \gamma \quad \beta$$
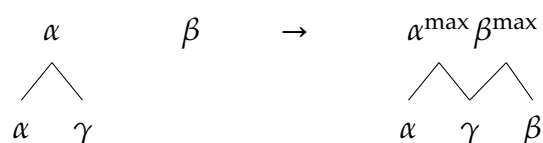
When one tries to apply the *Linear Correspondence Axiom* (LCA) of Kayne (1994) to such structure, Citko notes that γ cannot be properly linearized, regardless of whether α^{max} or β^{max} will come to precede the other. Let us suppose that α^{max} will dominate β^{max}. This means that everything α^{max} dominates will precede everything dominated by β^{max}. But both sets contain γ, so we have a linearization conflict where γ both precedes and follows itself, i.e.,

(65) $*\gamma > \gamma$.

Because of this fact, Citko argues that γ, or any such multidominated node, will

have to evacuate from the multidominated position. By the revised LCA in Chomsky (1995), an element that is not phonetically present by Spellout will no longer be subject to the LCA. Then, if a multidominated element undergoes overt movement, it can then be properly linearized, rendering the resulting construction grammatical. Citko uses the following example from Chinese to illustrate this point:

(66) a. Zhangsan xihuan shenme ren   Lisi taoyan shenme ren?
          Zhangsan like   which person Lisi hate   which   person
          i.   'Which person does Zhangsan like and which person does Lisi
               hate?'
          ii. *'Which person *x*, Zhangsan likes *x* and Lisi hates *x*?'
      b. Shenme ren   Zhangsan xihuan Lisi taoyan?
          which   person Zhangsan like   Lisi hate
          'Which person *x*, Zhangsan likes *x* and Lisi hates *x*?'

She believes that the underlying structure for ATB constructions should be a multidominance one, and that (66-a) is an illicit linearization of the multidominance structure, thus resulting in the unavailability of the ATB identity reading. On the other hand, (66-b) is a properly linearized result of the multidominance structure, so the ATB identity reading is granted.

However, as we see in the base configuration, the *wh*-phrase is allowed to stay in situ in conjunct 1, a fact unforeseen by Citko. This means that Citko's theory cannot be applied to Chinese ATB constructions, as one *is* able to get ATB identity reading without overt movement of the multidominated node. If she insists that the structure is still one of multidominance, then she must also admit that (62) *is* a proper linearization of the multidominance structure, which is inconsistent with the LCA mechanism she assumes. Otherwise, she has to admit that Chinese ATB *wh*-questions with identity reading cannot be analyzed in terms of multidominance, and accordingly, this Chinese ATB example can no longer constitute an argument for Citko's theory of *Parallel Merge*.

The *Sideward Movement* approach of Nunes (2001) has considerable difficulty with deriving the surface form of the base configuration. According to the mechanism proposed, in order to form parallel chains with the *wh*-phrase in each conjunct as the tail, two copies of the *wh*-phrase need to be made, and then we have the following structure

(67) wh_1 [$_{CP}$ ... wh_2] & [$_{CP}$ ... wh_3]

In this structure, we can form chains (wh_1, wh_2) and (wh_1, wh_3). With standard ex

situ ATB *wh*-movement, we can simply apply *Chain Reduction* to enable proper linearization (copies of the same syntactic object are considered the same individual in terms of linearization) to both chains and only keep the higher copy, which is wh_1:

(68) wh_1 [$_{CP}$ ... $\overline{wh_2}$] & [$_{CP}$ ... $\overline{wh_3}$]

However, to accommodate the Chinese construction, we need to apply different operations to the two chains: we delete the higher copy in the first chain, but delete the lower copy in the second chain, such that neither of the links of the second chain is pronounced.

(69) $\overline{wh_1}$ [$_{CP}$ ... wh_2] & [$_{CP}$ ... $\overline{wh_3}$]

This would also resolve the linearization issue with sideward movement constructions. However, if we allow this differential treatment of the two conjuncts, then the problem of overgeneration arises: why is it that we cannot have covert movement in the first conjunct and overt movement in the second conjunct?

(70)   *Zhangsan xihuan, Lisi taoyan shenme ren?
          Zhangsan like Lisi hate which person
          Intended: 'Who does Zhangsan like and Lisi hate?'

This means that the following deletion scheme is unavailable.

(71)   *$\overline{wh_1}$ [$_{CP}$ ... $\overline{wh_2}$] & [$_{CP}$ ... wh_3]

But if (69) is grammatical, we cannot readily explain this unavailability. Nunes might have to stipulate an *ad hoc* constraint on the deletion scheme, which can be considered undesirable.

Notice that (70) is different from the Right-Node-Raising configuration, which we will introduce in 6, but I have provide a preview here:

(72)   Zhangsan xihuan, (danshi) Lisi taoyan, shenme ren?
          Zhangsan like but Lisi hate what person
          'Who does Zhangsan like and Lisi hate?'

This grammatical construction looks superficially identical to (70); however, there is a crucial difference: a significant pause must be inserted between conjunct 2 and the right-dislocated *wh*-phrase for the grammatical RNR construction. (70), derived through covert movement, should not contain a prosodic pause between

the *wh*-phrase and the rest of conjunct 2.

Yet the ungrammaticality of (70) is readily predicted by my approach. According to my approach, ATB *wh*-constructions are essentially object-drop constructions. Therefore, it is expected that the grammaticality pattern of ATB *wh*-constructions should follow that of object-drop constructions. That is indeed the case: object-drop constructions are not allowed in conjunct 1, when there is no prosodic pause between the over *wh*-phrase and the rest of conjunct 2:

(73) *Zhangsan xihuan, (danshi) Lisi taoyan na-ge ren.
       Zhangsan like but Lisi hate that-cL person
       Intended: 'Zhangsan likes but Lisi hates that person.'

For reference, compare with the following two grammatical object-drop constructions:

(74) Zhangsan xihuan, (danshi) Lisi taoyan, na-ge ren.
      Zhangsan like but Lisi hate that-cL person.
      'Zhangsan likes but Lisi hates that person.'

(75) Zhangsan xihuan na-ge ren, (danshi) Lisi taoyan.
      Zhangsan like that-cL person but Lisi hate
      'Zhangsan likes that person, but Lisi hates (that person).'

Both correspond to the grammatical ATB *wh*-constructions seen above.

The discussion up to this point means that there is no good way to constrain the *Sideward Movement* approach to generate only the desired surface configuration. In other words, the grammaticality pattern of the relevant constructions is not predicted by this approach.

Ha's (2008) dissertation features an "extraction from conjunct 2, ellipsis in conjunct 1" approach to ATB constructions, which can be illustrated in the following example:

(76) Who$_i$ does [John love ~~who~~] and [Mary hate t_i]?

This approach is transparently problematic. Since the *wh*-phrase is obligatorily deleted in conjunct 1, there is a complete failure to account for an in situ *wh*-phrase in this conjunct.

As for the parasitic gap account of ATB constructions involving null operator movement in the second conjunct, exemplified by Munn (1992), it is well-known from the literature that LF movement or covert movement does not license parasitic gaps. See Lin (2005) for discussion about such facts in Chinese, and Nissenbaum

([2000](#)) for an explanation based on operation timing and semantics of movement.

Then, in the list of alternative analyses to mine, there remain those of Zhang (2009) and Salzmann (2012).

Zhang (2009) has a similar problem to the analysis in Citko (2005), in that the movement of the *wh*-phrase is obligatory. For Zhang, *wh*-phrases in identity readings are considered *similarity expressions*, which must be licensed by a plural element, such as a conjoined structure. However, according to Carlson (1987), which Zhang appeals to, the licensee cannot be contained within the licensing structure. This way, the *wh*-phrase must move out of and land above the conjoined structure. This predicts the ungrammaticality of the base configuration, with the *wh*-phrase in situ in conjunct 1.

Salzmann (2012) develops a similar approach to Ha's. Crucially, what happens to conjunct 1 for Ha now happens to conjunct 2, and vice versa:

(77)   Who$_1$ does [John love t_1] and [~~who$_2$~~ Mary hate t_2]?

On the surface, as long as I assume covert movement in the first conjunct, then this analysis is able to account for the existence of the base configuration, at least in conjunct 1. However, after a closer examination, we see that Salzmann posits an ellipsis feature on the conjunction itself, and also subscribes to the *Phase Impenetrability Constraint*, which implies that the *wh*-phrase in conjunct 2 must undergo overt movement, landing above the phase head, i.e., C, in order for the ellipsis feature to access it for deletion. Then, here comes an unwelcome asymmetry: conjunct 1 requires covert movement for obtaining the *wh*-phrase in situ, while conjunct 2 requires overt movement for the *wh*-phrase to be deleted. Other than this additional stipulation, we might consider Salzmann's approach to fare fairly well with this prediction.

Therefore, the only other approach that can survive the test of the base configuration is Salzmann's, albeit with stipulations not entirely uncontroversial, and mine. We shall see how the approaches will fare with the other predictions that my approach makes.

4.2   The absence of island effects

Looking at an illustration of my proposal, we easily see that there is no movement of any sort anywhere in conjunct 2 or in conjunct 1; the *wh*-phrase overtly present in conjunct 1 is in this base position, without covert movement to its scope position; and the conjunct 2 gap does not contain a trace, but a base-generated empty category whose syntactic content is copied from an antecedent at LF. This fact straight-

forwardly predicts that there are no island effects in both conjuncts. We will look at data for either conjunct separately, starting with conjunct 2. The prediction that there are no island effects in conjunct 2 is borne out, as in the following cases of complex NP island, *wh* island, and subject island, and adjunct island. Below, the (a) examples belong to the base configuration, while the (b) examples are of the *wh*-topicalized sort; t_1 is associated with the *wh*-topicalized phrase, while $\_\_1$ is the gap in conjunct 2 that is also within an island.

(78) Complex NP island

    a. Zhangsan xihuan shenme dianying, danshi Lisi taoyan [$_{RP}$
       Zhangsan like   what   movie   but   Lisi hate
       zhuyan $\_\_1$ de ren]?
       be.lead.actor   DE person
       'What movie does Zhangsan like and Lisi hate the person who is the lead actor of?'

    b. shenme dianying, Zhangsan xihuan t_1, danshi Lisi taoyan [$_{RP}$
       what   movie   Zhangsan like   but   Lisi hate
       zhuyan $\_\_1$ de ren]?
       be.lead.actor   DE person
       'What movie does Zhangsan like and Lisi hate the person who is the lead actor of?'

(79) *Wh* island

    a. Zhangsan xihuan shenme ren$_1$,   Lisi shuo bu zhidao weishenme
       Zhangsan like   what   person Lisi say   NEG know   why
       ziji taoyan $\_\_1$?
       self hate
       'Which person does Zhangsan like and Lisi say he doesn't know why he hated?'

    b. shenme ren$_1$,   Zhangsan xihuan t_1, Lisi shuo bu zhidao
       what   person Zhangsan like   Lisi say   NEG know
       weishenme ziji taoyan $\_\_1$?
       why   self hate
       'Which person does Zhangsan like and Lisi say he doesn't know why he hated?'

(80) Subject island

    a. Zhangsan xihuan shenme ren   shi hao shi, danshi Lisi xihuan
       Zhangsan like   what   person be good thing but   Lisi like

       __ shi huai shi?
        be bad thing
       'Which person x, that Zhangsan likes x is a good thing, but Lisi likes x is a bad thing?'

  b. shenme ren$_1$, Zhangsan xihuan t_1 shi hao shi, danshi Lisi
      what person Zhangsan like be good thing but Lisi
      xihuan __$_1$ que shi huai shi?
      like yet be bad thing
      'Which person x, that Zhangsan likes x is a good thing, but Lisi likes x is a bad thing?'

(81)   Adjunct island

  a. Zhangsan yinwei hui shuo na-zhong yuyan$_1$ bei luyong,
      Zhangsan because be.able.to speak which-CL language BEI admit
      Lisi yinwei bu hui shuo __$_1$ bei jujue?
      Lisi because NEG be.able.to speak BEI reject
      'Which language x, Zhangsan is admitted because he speaks x, and Lisi is rejected because he does not speak x?'

  b. na-zhong yuyan$_1$, Zhangsan yinwei hui shuo t_1 bei
      which-CL language Zhangsan because be.able.to speak BEI
      luyong, Lisi yinwei bu hui shuo __$_1$ bei jujue?
      admit Lisi because NEG be.able.to speak BEI reject
      'Which language x, Zhangsan is admitted because he speaks x, and Lisi is rejected because he does not speak x?'

We see that in such examples, conjunct 2 contains an island which in turn contains a gap, co-indexed with the overt *wh*-phrase in conjunct 1. The grammaticality of such examples clearly supports an analysis where conjunct 2 is movement-free, which the current proposal is.

    Conjunct 1, on the other hand, behaves just like regular *wh*-in-situ questions in Chinese, lacking island effects when the *wh*-phrase is in argument positions.

(82)   Complex NP island

  a. Zhangsan xihuan [$_{RC}$ zhuyan shenme dianying de ren],
      Zhangsan like be.lead.actor what movie DE person
      danshi Lisi taoyan?
      but Lisi hate
      'What movie does Zhangsan like the person who is the lead actor of

but Lisi hate?'

(83)   *Wh* island

    a.   Zhangsan shuo bu   zhidao weishenme ziji taoyan shenme ren,
           Zhangsan say   NEG know   why   self hate   what   person
           danshi Lisi shuo zhidao weishenme Zhangsan taoyan __?
           but   Lisi know why   Zhangsan   hate
           'What person *x*, Zhangsan says he doesn't know why he hates *x*, but
           Lisi says he knows why Zhangsan hates *x*?'

Examples (80) and (81) for the lack of island effects in subjects and adjuncts in conjunct 2 is also an example for conjunct 1, so the reader is advised to refer those examples.

However, many of the competing analyses would not be able to predict the same. Citko's *Parallel Merge* approach will again force the movement of the multidominated *wh*-phrase, resulting in overt movement in both conjunct 1 and conjunct 2. Island effects cannot be avoided in such an analysis.

Sideward Movement of Nunes (2001) also requires covert movement in conjunct 2, i.e., forming a movement chain where the higher copy is deleted, as illustrated in 4.1. This is uncontroversially the type of movement that displays island effects, in a Minimalist framework.

Munn's (1992) parasitic gap analysis using null operator movement fails, as 'null operator movement' in conjunct 2 clearly suggests. More compellingly, Munn appeals to the similarity in island effects of overt ATB *wh*-movement and parasitic gap constructions as an argument for his unified analysis. Munn cites evidence from Kayne (1983) to show that the same island effects are seen in both kinds of constructions:

(84)   a.   Who did John describe *t* without examining any pictures of *e*?
        b.   *Who did John describe *t* without any pictures of *e* being on file?
        c.   Who did John describe *t* and Mary examine pictures of *e*?
        d.   *Who did John describe *t* and pictures of *e* upset Mary?

Here, neither a parasitic gap nor an ATB gap is allowed in the subject of an adjunct. This is evidence for the presence of movement in parasitic gaps, which prompted Chomsky (1986) to give a null-operator analysis thereof. Then, if we are still going to analyze parasitic gaps in the same fashion, then this approach will certainly not be a viable candidate of Chinese ATB *wh*-questions due to the unavoidable island effects predicted.

Ha's (2008) analysis locates the base position of the *wh*-phrase in the second

conjunct. The *wh*-phrase then moves out of it, achieving surface scope.

(85) $[_{CP}$ What$_i$ did$_{[+Q, +wh]}$ $[_{\&P}$ $[_{TP_1}$ John LIKE$_{[E_{RNR}]}$ ~~what~~] and $[_{TP_2}$ Mary $[_{vP}$ t_i' HATE $t_i]]]]$

If we need to adapt this analysis to Chinese ATB *wh*-questions, then perhaps we need to convert overt *wh*-movement from conjunct 2 into covert *wh*-movement. However, this approach immediately faces the problem since with covert movement essentially obeying the same set of conditions on movement as overt movement in Minimalism, island effects cannot be obviated for such an analysis.

Salzmann (2012) posits overt *wh*-movement from conjunct 1, and movement followed by ellipsis in conjunct 2. As long as it is movement, instead of unselective binding that is proposed in conjunct 2, the lack of island effects will pose a problem given a Minimalist framework, as in the case of Ha.

The only analysis that also avoids movement in conjunct 2 is Zhang's (2009) pro-ϕP analysis, where the gap is occupied by this silent pronoun which is bound by the moved *wh*-phrase from conjunct 1.

(86) Zhangsan xihuan shenme dianying$_1$, Lisi taoyan zhuyan   pro-ϕP$_1$
      Zhangsan like   what   movie   Lisi hate   be.lead.actor
      de ren?
      DE person
      'What movie does Zhangsan like and Lisi hate the person who is the lead actor of ?'

Only this analysis shares the same predictions in terms of island effects as those of the present analysis pursued; in fact, the lack of island effects in certain ATB constructions is properly acknowledged in Zhang (2009), and is one of the motivations for her proposal. For example, Zhang gives the following contrast:

(87) a. *Who did Bill lose business because he hired and Mary praise a lot?
      b.   Who did Bill praise a lot and Mary lose business because she hired?

This means that even in English, gaps in islands in conjunct 2 of an ATB *wh*-question will often not result in ungrammaticality. If there is *wh*-movement at all, it could only be in conjunct 1.[7]

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7. Notice, however, a crucial difference between my analysis of ATB *wh*-constructions in Chinese and Zhang's (2009) analysis of ATB *wh*-constructions in general: while I attempt to unify ATB *wh*-constructions with another phenomenon, i.e., object-drop, in terms of the fundamental derivational mechanism, the pro-ϕP proposed by Zhang is a new addition specifically used for ATB and other

4.3 The availability of sloppy readings

One of the most important predictions that an ellipsis-based analysis makes is about sloppy readings, which have been known to be a hallmark of ellipsis. Specifically, the sloppy readings are of the canonical sort where the subjects in the two conjuncts each bind a pronoun at LF in the object domain, which also contains a *wh*-phrase.

(88)   Zhangsan xihuan shei dui ziji shuo de hua   danshi Lisi taoyan ne?
               Zhangsan like   who to   self say   DE words but   Lisi hate   Q

       i.   'Who is the person x, such that Zhangsan$_i$ likes the words x said to him$_i$, but Lisi$_j$ hates the words x said to him$_j$?'
       ii.   'Who is the person x, such that Zhangsan$_i$ likes the word x said to him$_i$, but Lisi$_j$ hates the words x said to him$_i$?'

Here, the *wh*-phrase is still shared between the conjuncts, with the two conjuncts necessarily inquiring about the same person x. However, the objects as a whole of the two conjuncts now have disjoint construal; the conjunct 1 object is identified with the words x said to Zhangsan, but the conjunct 2 object is identified with the words x said to Lisi. This suggests that the gap in conjunct 2 derives its semantic content via ellipsis, so an index is present in the gap for the conjunct 2 subject to bind.

     Most other approaches treat the gap in conjunct 2 as an atomic element, either a trace of the *wh*-phrase, as in the various movement accounts, or a variable over individuals, which also essentially behaves like an $\overline{\text{A}}$-trace, as in Zhang (2009). Below is an illustration of Zhang's analysis of an English ATB *wh*-question:

(89)   a.   Which picture of himself did Tom paint and Mary buy?
       b.   [$_{DP_2}$ which $\emptyset_{same}$ picture of himself] [t_{DP_2} did Tom paint t_{DP_2} and pro-ϕP$_1$ ~~did~~ Mary buy t_1]

Here, the pro-ϕP in conjunct 2 directly gets its reference from the *wh*-phrase from the first conjunct. It must be coreferential with the former. However, consider what will happen when we fill in the gap in conjunct 2 for my example (88) with a pro-ϕP:

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similar constructions, with special licensing requirements not generally satisfied. This is why English, without object-drop availability, can still have ATB constructions that evade island conditions in conjunct 2.

(90) Zhangsan xihuan [$_{DP}$ shei dui ziji shuo de hua]$_1$ danshi Lisi taoyan
Zhangsan like   who to   self say   DE words but   Lisi hate
pro-ϕP$_1$ ne?
        Q

    i.   *'Who is the person x, such that Zhangsan$_i$ likes the words x said to
        him$_i$, but Lisi$_j$ hates the words x said to him$_j$?'
    ii.   'Who is the person x, such that Zhangsan likes [the words x said to
        him$_i$]$_k$, but Lisi$_j$ hates [the words x said to him$_i$]$_k$?'

The pro-ϕP can only have its reference derived from the object in the first conjunct to get a roughly similar meaning. However, we immediately notice that if the pro-ϕP corefers with the conjunct 1 object, the sloppy reference can no longer be achieved. The crucial point about such sloppy readings is that while the minimal *wh*-phrases themselves are necessarily co-construed, as in an identity reading, the entire gap in conjunct 2 does not need to be identified with any element in conjunct 1; its meaning is subject to influence from other elements appearing only in conjunct 2, such as the subject. This means that an atomic pronominal in conjunct 2 will not adequately account for such sloppy readings; there must be sub-elements in the gap which can be bound by the subject.

The same problem is present with all other analyses where the conjunct 2 object is a bound variable, such as Ha (2008); Salzmann (2012); Munn (1992), due to the syntactically and semantically atomic nature of the gap, only capable of being directly covariant with an antecedent.

Citko's (2005) *Parallel Merge* approach is also problematic, in that no clear predictions can be drawn regarding the availability of sloppy readings, since there is no explicitly defined method of semantic interpretation for multidominance structures. It will be hard to evaluate her theory before a semantic proposal has been advanced. Besides, even Citko herself acknowledges in Citko (2005) with the following examples that the anaphor in the *wh*-phrase cannot be bound by the conjunct 2 subject:

(91)   a.   *Which picture of himself$_i$ did Mary sell and John$_i$ buy?
       b.   Which picture of himself$_i$ did John$_i$ sell and Mary buy?

As long as we assume that *Parallel Merge* can even account for ATB *wh*-questions at all, then this failure of conjunct 2 subjects to bind anaphors in the *wh*-phrase should be considered as a prediction that the approach makes, which is clearly not borne out by the Chinese data.

Finally, with an ellipsis approach, it is no surprise that such sloppy readings are available. Here, I illustrate with the following derivation of (88). We start with the following base configuration, prior to LF insertion into the TEC:

(92)   [Qu 1 Zhangsan 2 like [[$_{\text{RP}}$ [f_1 person] to self$_2$ say] words]] & [Lisi 2 hate TEC]

Then, the contents of the object in conjunct 1 copied entirely into the TEC:

(93)   [Qu 1 Zhangsan 2 like [[$_{\text{RP}}$ [f_1 person] to self$_2$ say] words]] & [Lisi 2 hate [[$_{\text{RP}}$ [f_1 person] to self$_2$ say] words]]

Finally, given the redefined *Predicate Abstraction* operation proposed, we can arrive at the denotation (with many simplications for the ease of presentation and understanding):

(94) $\text{Qu}_f\{\mathbf{like}(\mathbf{z}, \iota y.[\mathbf{word}(y) \wedge \mathbf{say}(\mathbf{z}, y, f(\mathbf{person}))]\} \wedge \mathbf{like}(\mathbf{l}, \iota y.[\mathbf{word}(y) \wedge \mathbf{say}(\mathbf{l}, y, f(\mathbf{person})),$

which is readily equivalent to

(95) $\text{Qu}_f\{\mathbf{like}(\mathbf{z}, \iota y.[\mathbf{word}(y) \wedge \mathbf{say}(\mathbf{z}, y, f(\mathbf{person})) \wedge \mathbf{like}(\mathbf{l}, \iota y.[\mathbf{word}(y) \wedge \mathbf{say}(\mathbf{l}, y, f(\mathbf{person}))]\}$

through an extension to choice functions of the interpretative mechanisms of the dynamic predicate logic of Groenendijk and Stokhof (1991). Crucially, because of the copying, indices in the conjunct 1 object will also be able to appear at LF in conjunct 2, which is in turn available for binding by the conjunct 2 subject.

Notice that the final occurrence of the index 2 in conjunct 2 is not going to be affected by the **update** function called through *Predicate Abstraction* over index 2 in the interpretation of conjunct 1, since another call of **update** is incurred in conjunct for index 2 as well, whose result will overwrite the variable conversion of the call in conjunct 1.

5   Evidence for the asymmetrical analysis of the *wh*-operator

One of the major characteristics of my analysis of the ATB *wh*-construction in Chinese is the asymmetrical distribution of the *wh*-operator; it is only located in conjunct 1, throughout the derivation. This approach makes two crucial predictions, which are related to the interactions specific to *wh*-operators and other elements

in the clause. First, there should be asymmetry in Weak Crossover effects: they should be observed only in conjunct 1, but not in conjunct 2. Second, focus intervention effects in the style of Beck (2006) should also appear only in conjunct 1. Both of these predictions are borne out, as we will see in the following sections.

5.1   Weak Crossover effects

The structural asymmetry of the two conjuncts with respect to the Qu operator (Qu is contained in conjunct 1 alone) is going to make the prediction that only conjunct 1 will show Weak Crossover effects, but not conjunct 2. This prediction is borne out.

(96)   Base configuration

    a.   Zhangsan xihuan shenme ren$_1$ danshi ta$_1$ ziji de mama taoyan
        Zhangsan like   what   person but   he self DE mother hate
        —$_1$?

        'What person x does Zhangsan like but x's mother hate?'

    b.   *ta$_1$ ziji de mama taoyan shenme ren$_1$,   danshi Zhangsan xihuan
        he self DE mother hate   what   person but   Zhangsan like
        —$_1$?

        Intended: 'What person x does x's mother hate but Zhangsan like?'

(97)   *wh*-topicalized

    a.   Shenme ren$_1$ Zhangsan xihuan —$_1$ danshi ta$_1$ ziji de mama
        what   person Zhangsan like   but   he self DE mother
        taoyan —$_1$?
        hate
        'What person x does Zhangsan like but x's mother hate?'

    b.   *shenme ren$_1$ ta$_1$ ziji de mama taoyan —$_1$, danshi Zhangsan
        what   person he self DE mother hate   but   Zhangsan
        xihuan —$_1$?
        like
        Intended: 'What person x does x's mother hate but Zhangsan like?'

In each of the (a) examples, conjunct 1 does not contain a co-indexed pronoun with the *wh*-phrase, but conjunct 2 does. In all cases, the example is grammatical. However, if we switch the order of the conjuncts, and still intend the examples

to be ATB *wh*-questions with identity readings, as in the (b) examples, then the sentences all become ungrammatical.

Further, we see that conjunct 1 in ATB *wh*-questions behave just as if they are standalone *wh*-questions: the sentences of (b) are still ungrammatical with their second conjuncts removed:

(98)   *ta_1 ziji de mama   taoyan shenme ren_1?   in situ
       he self DE mother hate   what   person
       Intended: 'What person *x* does *x*'s mother hate?

(99)   *$Shenme\ ren_1$ ta_1 ziji de mama   taoyan $\_\_1$?   *wh*-topicalized
       what   person he self DE mother
       Intended: 'What person *x* does *x*'s mother hate?

A complication might arise as to how the pronoun in conjunct 2 gets its co-indexed reading without being syntactically bound by the Qu operator. We submit that such pronouns are E-type pronouns, and a co-indexing relationship is established between them and the type *e wh*-phrase in conjunct 1, which precedes it. Recall that I adopt choice function quantification for Ā-dependencies, so we have the following scheme underlying (96-a).

(100) $[_{\text{FocP}_1}\ \text{Qu}\ \lambda f \ldots [f, \text{NP}]_i]\ \&\ [_{\text{FocP}_2}\ \ldots \text{E-type}_i \ldots \text{TEC}_i]$

The E-type analysis predicts that it should be replaceable by a full DP, at least according to such E-type accounts as Elbourne's (2013). This prediction is borne out.

(101)   Zhangsan xihuan shenme ren_1 danshi na-ge ren_1 ziji de mama
         Zhangsan like   what   person but   that-CL person self DE mother
         taoyan $\_\_1$?
         hate
         'What person *x* does Zhangsan like but *x*'s mother hate?'

Such E-type pronouns are naturally unavailable in conjunct 1, since there is not even a type *e* element that can potentially serve as the co-indexed antecedent.

(102)   *$[_{\text{FocP}_1}\ \text{Qu}\ \lambda f \ldots \text{TEC}_i]\ \&\ [_{\text{FocP}_2}\ \ldots \text{E-type}_i \ldots [f, \text{NP}]_i]$

Therefore, Weak Crossover effects in conjunct 1 cannot be avoided through positing an E-type analysis for the pronoun intervening between the operator and the bound variable.

Asymmetry between the conjuncts in Weak Crossover effects poses a problem for many of the other approaches to ATB *wh*-questions.

First, Citko's *Parallel Merge* approach, in giving a completely identical treatment of the two conjuncts through multidominance, fails to predict any asymmetry in the two conjuncts. She properly acknowledges this problem with the following WCO examples:

(103)   a. *Who$_i$ did his$_i$ boss fire and John hire?
          b.   Who$_i$ did John hire and his$_i$ boss fire?

Regarding this and other asymmetries, she admits that she '[does] not have a clear idea of why different reconstruction diagnostics yield different results.' Therefore, the question is unanswered.

The situation is quite the same with the asymmetrical approaches of Salzmann (2012) and Ha (2008). Although in Salzmann's analysis, the *wh*-extraction is from conjunct 1 only, *wh*-movement inside conjunct 2 is nevertheless posited. This is an instance of movement that can potentially cross over a co-indexed pronoun. As such, Weak Crossover effects are unavoidable.

For Ha, the problem is worse, since, in his analysis, the covert extraction is asymmetrically from conjunct 2, making Weak Crossover effects there solidly predicted. Ha, nevertheless, gives an explanation for the lack of Weak Crossover effects in conjunct 2, based on the following facts:

(104)   a. ?Which employee$_i$ did Mary think t' that his$_i$ boss would fire t next week?
          b. ?Which man$_i$ did Mary say to her friends t' that his$_i$ boss would fire t next week?
          c. *Which man$_i$ did his$_i$ boss think t' that Mary would love t very much?
          d. *Which man$_i$ did his$_i$ boss tell Bill t' that Mary would love t so much?

Ha argues that the contrast in (104) demonstrates *proximity effects* (Williams, 1990), where the farther away the *wh*-phrase is linearly separated from the co-indexed pronoun, the less pronounced the Weak Crossover effects are. However, when we look at the Chinese examples, we immediately notice the problem: in the Chinese examples, the base configuration, in particular, the *wh*-phrase is immediately to the left of the conjunct containing the co-indexed pronoun. The same linear distances would have resulted in ungrammaticality in the English examples; however, in the Chinese examples, they are fine. Notice that the proximity effects cannot be about the traditional long versus short distinction construed as the presence or lack

of additional layers of embedding: when Ha tries to invoke such effects for ATB constructions, there is no more layer of embedding when the co-indexed pronoun is in conjunct 2, as it is coordinated with, not embedded in conjunct 1.

One advantage of using a choice function quantification approach is the straightforward derivation of Weak Crossover effects, as seen in Sauerland (1998). With the *wh*-operator being a quantifier one over choice functions instead of individuals, pronouns, themselves individual-typed, cannot be bound by the quantifier directly. This is illustrated below in Sauerland (1998):

(105)   ??[Which boy] λf did his$_f$ sister send a postcard to [f, boy]?

For Sauerland, overt *wh*-movement also establishes quantification over choice functions, with the NP-part of the *wh*-phrase left behind in situ, as in the example above. Then, it is clear that *he*, being a type *e* element, in the specifier of the DP *his sister* cannot be bound by λf, a binder over the type of choice functions.

In order for such pronouns to be bound, there must be an individual-typed intervening DP (possibly an A-trace of the moved *wh*-phrase) containing a choice function variable bound by the quantifier to serve as the proper antecedent of the pronoun, in such cases as the following:

(106)   Which boy$_i$ λf [t_f, boy]$_i$ λx t_x received a postcard from his$_x$ sister?

Since the movement from Spec, *v*P to Spec, TP is A-movement, and by Sauerland's assumptions, does not require the NP part to be left in situ; therefore, the trace produce is of type *e*, and a λ-operator of type *e* is inserted just below the landing site of this A-movement to bind both the t_x subject trace and the he_x pronoun. It is also a well-known fact that A-movement, in general, obviates Weak Crossover effects, as shown in this example:

(107)   Which girl$_i$ seemed to her$_i$ brother to be a good player?

Hence, a simple explanation of Weak Crossover effects is derived without stipulating any *ad hoc* syntactic constraints, given that I assume that $\overline{\text{A}}$-dependencies involve quantification over choice functions over individuals.

5.2   Focus intervention

Beck (2006) has famously provided an analysis for the cross-linguistically prevalent phenomenon of *focus intervention*, which is described by the following constraint:

(108)　A quantificational or focusing element may not intervene between a *wh*-phrase and its licensing complementizer.

Quantificational or focusing elements include (counterparts of) the following:

(109)　only, even, also, not, (almost) every, no, most, few (and otehr nominal quantifiers), always, often, never (and other adverbial quantifiers)

Focus intervention is robustly observed in Chinese, as in observed in Kim (2002). For example, simplex *wh*-constructions containing negation or *only*-type focus markers do display characteristic intervention effects: with a *wh*-phrase in situ in the c-command domain of a quantificational or focusing element, the construction is of at most questionable acceptability; with a *wh*-phrase topicalized across the quantificational or focusing element in discussion, the construction fully recovers in acceptability.

(110)　Negation: *mei*
　　a.　?Zhangsan mei mai shenme dongxi?
　　　　Zhangsan NEG buy what　　thing
　　　　'What thing did Zhangsan not buy?'
　　b.　shenme dongxi Zhangsan mei mai?
　　　　what　　thing　Zhangsan NEG buy
　　　　'What thing did Zhangsan not buy?'

(111)　*Only*: *zhiyou*
　　a.　?*zhiyou Zhangsan mai-le　shenme dongxi?
　　　　only　　Zhangsan bought what　　thing
　　　　'What thing did only Zhangsan buy?'
　　b.　shenme dongxi zhiyou Zhangsan mai-le?
　　　　what　　thing　only　Zhangsan bought
　　　　'What thing did only Zhangsan buy?'

Given the unselective binding analysis of *wh*-in-situ in Chinese that we adopt, where the Qu operator is merged to check [●OP●] features on the Foc head, the licensing complementizer should be Foc, and the intervention scheme can therefore be represented in the following way:

(112)　*$[_{\text{FocP}}$ Qu $[_{\text{Foc}'}$ Foc ... Op $[_{\phi}$ ... XP$_{\text{F}}$ ... *wh*]]]

The subscript F on XP indicates its association with a quantificational or focusing element, represented by Op.

Then, given our asymmetrical analysis of the *wh*-operator in ATB *wh*-constructions, it is predicted that focus intervention effects are only present in conjunct 1, since there is no *wh*-phrase to be licensed in conjunct 2 to begin with. The prediction is borne out. I will illustrate with negation as well as *only*-type focus markers.

We see that with ATB *wh*-constructions, only conjunct 1 follows this pattern. Below, (113) contains NEG *mei* in conjunct 1 with the *wh*-phrase in situ. (114) contains NEG *mei* in conjunct 1 with the *wh*-phrase topicalized. The former has only questionable acceptability, while the latter is completely acceptable.

(113)   ?Zhangsan **mei** mai shenme dongxi danshi Lisi mai-le?
         Zhangsan NEG buy what   thing but   Lisi bought
         'What thing *x*, Zhangsan didn't buy *x* but Lisi bought *x*?'

(114)   shenme dongxi Zhangsan **mei** mai danshi Lisi mai-le?
         what   thing Zhangsan NEG buy but   Lisi bought
         'What thing *x*, Zhangsan didn't buy *x* but Lisi bought *x*?'

If we move NEG *mei* to conjunct 2, the contrast between the base configuration and the topicalized version disappears:

(115)   Zhangsan mai-le shenme dongxi danshi Lisi **mei** mai?
         Zhangsan bought what   thing but   Lisi NEG buy
         'What thing *x*, Zhangsan bought *x* but Lisi didn't buy *x*?'

(116)   shenme dongxi Zhangsan mai-le danshi Lisi **mei** mai?
         what   thing Zhangsan bought but   Lisi NEG buy
         'What thing *x*, Zhangsan bought *x* but Lisi didn't buy *x*?'

The same patterns, with even more pronounced contrasts in acceptability, are seen with the *only*-type focus markers. If *zhiyou* 'only' is in conjunct 1, *wh*-in-situ is very marginally acceptable, while *wh*-topicalization renders the construction completely fine.

(117)   ?***zhiyou** Zhangsan mai-le shenme dongxi Lisi mei mai?
         only   Zhangsan bought what   thing but Lisi NEG buy
         'What thing *x*, only Zhangsan bought *x* and Lisi didn't buy *x*?'

(118)   shenme dongxi **zhiyou** Zhangsan mai-le Lisi mei mai?
         what   thing only   Zhangsan NEG buy but Lisi NEG buy
         'What thing *x*, Zhangsan didn't buy *x* but Lisi bought *x*?'

The contrast is again dissolved with *zhiyou* "only" relocated to conjunct 2:

(119)   tamen mai-le shenme dongxi **zhiyou** Lisi mei mai?
           they bought what   thing only   Lisi NEG buy
           'What thing x, they bought x and only Lisi didn't buy x?'

(120)   shenme dongxi tamen   mai-le **zhiyou** Lisi mei mai?
           what   thing Zhangsan bought but   Lisi NEG buy
           'What thing x, they bought x and only Lisi didn't buy x?'

The data speaks to the fact that the scheme in (112) is not present in conjunct 2, which is exactly predicted by my asymmetrical approach to *wh*-operators in Chinese ATB *wh*-constructions.

6   A new construction predicted: Right-Node-Raising

Our analysis, which unifies ATB *wh*-questions with object-drop in Chinese, predicts that constructions derivable from object-drop configurations should also be possible with ATB *wh*-questions. In the following subsections, I examine an Right-Node-Raising version of ATB *wh*-construction, which, as we will see, is an instance of the RNR version of object-drop in Chinese. I have already referred to an example of RNR *wh*-construction in § 4.1. I repeat the relevant example here:

(121)   Zhangsan xihuan, (danshi) Lisi taoyan, shenme ren?
           Zhangsan like but Lisi hate what person
           'Who does Zhangsan like and Lisi hate?'

Below, I will show that such RNR ATB *wh*-constructions display all of the properties of RNR object-drop constructions, which is predicted by my approach which unifies these two phenomena. I will start with an exposition of the properties RNR object-drop constructions.

    We observe the following form with object-drop:

(122)   Zhangsan xihuan __$_1$, danshi Lisi taoyan TEC$_1$, na-bu dianying$_1$.
           Zhangsan like   but   Lisi hate   that-CL movie
           'Zhangsan likes, but Lisi hates, that movie.'

Notice that a prosodic break is obligatory between the dislocated object and the rest of conjunct 2, so the overt object is not in situ in conjunct 2. The version with no prosodic break there, which should correspond to a structure where the ellipsis site is in conjunct 1, while conjunct 2 contains the *wh*-phrase in situ, is ungrammatical.

(123) Li xihuan TEC$_1$, danshi Xu taoyan na-bu dianying$_1$.
       Li like   but   Xu hate   that-CL   movie
       'Li likes, but Xu hates, that movie.'

Therefore, as indicated in the example, the object at the rightmost of the sentence is displaced from its base position in conjunct 1, and conjunct 2 contains an ellipsis site at the object position.

   Additionally, we have reason to believe that this construction is an instance of Right-Node-Raising, if we adopt the criteria of *Right Edge Restriction* as a diagnostic for it (Sabbagh, 2014):

(124) *Right Edge Restriction*
       a. A constituent which typically occurs at the right periphery of the sentence (hereafter, the Pivot) is associated with an argument position within each of the preceding conjuncts.
       b. The pivot must be connected to a licit right peripheral position within each conjunct.

Together, the properties together imply that the pivot at the right edge of an RNR construction should correspond to an argument position in each conjunct that can licitly appear at the right periphery in the respective conjunct. This condition can be observed with the contrast between the following two sets of sentences from Sabbagh (2014):

(125) a. Some people love, but other people hate, the role that government plays in this country.
       b. The children donated some old toys, and encouraged their parents to donate some old clothes, to the local orphanage.

(126) a. *Love fried pickles __, but hate fried artichokes __, some people.
           (cf. *Love fried pickes some people.)
       b. *Max sent __ some books, and Sally sent __ some letters, the local orphanage.
           (cf. *Max sent some books the local orphanage.)

The Chinese RNR object-drop configuration displays the same properties. As long as the pivot is not associated with the rightmost argument in each conjunct, the construction becomes ungrammatical:

(127) Constructions with illicit rightmost arguments:

a. *Zhangsan xihuan zhidao ___ de ren   na-bu dianying.
   Zhangsan like   direct   DE person that-CL movie.
   Intended: 'Zhangsan likes the person who directed that movie.'

b. *Zhangsan song-le   ___ gei Lisi na-ben shu.
   Zhangsan send-PFV   to Lisi that-CL book
   Intended: 'Zhangsan send that book to Lisi.'

c. *Zhangsan song-le   ___ yi-ben shu na-ge   ren.
   Zhangsan send-PFV   one-CL book that-CL person
   Intended: 'Zhangsan sent a book to that person.'

(128)   Corresponding ungrammatical RNR constructions:

a. *Zhangsan xihuan zhidao ___ de ren,   danshi Lisi taoyan
   Zhangsan like   direct   DE person but   Lisi hates
   zhuyan   ___ de ren, na-bu dianying.
   be.lead.actor   DE person that-CL movie
   Intended: 'That movie, Zhangsan likes the person who directed it
   and Lisi hates the person who was the lead actor of it.'

b. *Zhangsan song-le   ___ gei Lisi, Wangwu mei song ___ gei Lisi,
   Zhangsan send-PFV   to Lisi Wangwu NEG send   to Lisi
   na-ben shu.
   what   book
   Intended: 'That book, Zhangsan sent it to Lisi but Wangwu didn't
   send it to Lisi.

c. *Zhangsan song-le   ___ yi-ben shu, Wangwu song-le   ___ yi-zhi
   Zhangsan send-PFV   one-CL book Wangwu send-PFV   one-CL
   bi, na-ge   ren.
   pen that-CL person
   Intended: 'That person, Zhangsan sent a book to him and Wangwu
   sent a pen to him.'

The (b) and (c) examples can be rephrased so that the pivot can be associated
with a licit rightmost argument position; the rephrased versions are in (129-a)
and (129-b), respectively. Then, the constructions become grammatical.

(129)   a. Zhangsan song-le   Lisi ___, Wangwu mei song Lisi ___, na-ben shu.
           Zhangsan send-PFV Lisi   Wangwu NEG send Lisi   that-CL book
           'That book, Zhangsan send it to Lisi but Wangwu didn't send it to
           Lisi.'

    b.   Zhangsan song-le   yi-ben shu __, Wangwu song-le   yi-zhi bi
           Zhangsan song-PFV one-CL book   Wangwu send-PFV one-CL pen
           __, gei na-ge   ren.
              to   that-CL person.
           'That person, Zhangsan sent a book to him and Wangwu sent a pen
           to him.'

This set of contrasts show that the constructions in (122) is indeed an instance of RNR.

    Now, since my analysis of ATB *wh*-questions unifies them with regular object-drop in Chinese, we expect ATB *wh*-questions to also permit this dislocation of the conjunct 1 object, and the construction as a whole should be subject to the same constraints in Right Edge Restriction. This prediction is borne out, as we can simply replace the definite pivots with *wh*-phrases in all of the examples above without affecting the grammaticality status.

(130)   Illicit rightmost *wh*-argument constructions:
        a. *Zhangsan xihuan zhidao __ de ren   shenme dianying?
           Zhangsan like   direct   DE person what   movie?
           'What is the movie such that Zhangsan like the person who directed it?'
        b. *Zhangsan song-le   __ gei Lisi shenme shu?
           Zhangsan send-PFV   to Lisi what   book
           'What book is it such that Zhangsan send it to Lisi?'
        c. *Zhangsan song-le   __ yi-ben shu   shenme ren?
           Zhangsan send-PFV   one-CL book what   person
           'Who is the person such that Zhangsan sent a book to him?'

(131)   Corresponding ungrammatical *wh*-RNR constructions

    a. *Zhangsan xihuan zhidao __ de ren,   danshi Lisi taoyan
       Zhangsan like   direct   DE person but   Lisi hate
       zhuyan   __ de ren,   shenme dianying?
       be.lead.actor   DE person what   movie
       'What is the movie *x* such that Zhangsan likes the person who directed it and Lisi hates the person who was the lead actor of it? '

    b. *Zhangsan song-le   __ gei Lisi, Wangwu mei song __ gei Lisi,
       Zhangsan send-PFV   to Lisi Wangwu NEG send   to   Lisi
       shenme shu?
       what   book
       'What book is it such that Zhangsan send it to Lisi but Wangwu didn't?'

    c. *Zhangsan song-le   __ yi-ben shu, Wangwu song-le   __ yi-zhi
       Zhangsan send-PFV   one-CL book Wangwu send-PFV   one-CL
       bi,   shenme ren?
       pen what   person
       'Who is the person such that Zhangsan sent a book to him and Wangwu sent a pen to him?'

(132)   Rephrased grammatical counterparts for (b), (c):

    (b) Zhangsan song-le   Lisi __, Wangwu mei song Lisi __, shenme
       Zhangsan send-PFV Lisi   Wangwu NEG send Lisi   what
       shu?
       book
       'What book is it such that Zhangsan send it to Lisi but Wangwu didn't?'

    (c) Zhangsan song-le   yi-ben shu   __, Wangwu song-le   yi-zhi bi
       Zhangsan song-PFV one-CL book   Wangwu send-PFV one-CL pen
       __, gei shenme ren?
          to what   person?
       'Who is the person such that Zhangsan sent a book to him and Wangwu sent a pen to him?'

The exact correspondence between constructions with non-*wh*-objects and those with *wh*-objects show that the same underlying structure is likely at work. This set of data then constitutes another piece of evidence that ATB *wh*-questions in Chinese *are* just object-drop constructions, and RNR is a correct characterization

of both the definite object and *wh*-object configurations due to compliance with Right Edge Restriction.

Additionally, if we adopt the analysis that such RNR *wh*-constructions are derived through right dislocation of the conjunct 1 object, then we can account for the variety of properties that the RNR *wh*-constructions display which are also displayed by the base configuration and the *wh*-topicalized constructions. These properties include the lack of island sensitivity in conjunct 2,

(133)   Zhangsan xihuan t_1, danshi Lisi bu   zhidao ziji weishenme taoyan
        Zhangsan like   but   Lisi NEG know   self why   hate
        TEC$_1$, shenme ren$_1$?
              what   person
        'Who is the person x such that Zhangsan likes x but Lisi does not know why he hates x?'

the lack of Weak Crossover in conjunct 2,

(134)   Zhangsan xihuan t_1, danshi ta ziji de mama   taoyan TEC$_1$, shenme
        Zhangsan like   but   he self DE mother hate   what
        ren$_1$?
        person
        'Who is the person x such that Zhangsan likes x but x's mother hates x?'

and the availability of sloppy readings.

(135)   Zhangsan xihuan t_1, danshi Lisi taoyan TEC$_1$, shei dui ziji shuo de
        Zhangsan like   but   Lisi hate   who to   self say   DE
        hua$_1$?
        words
        'Who is the person x such that Zhangsan$_i$ likes the words x said to him$_i$ and Lisi hates the words x said to him$_j$?'

In the examples above, t_1 indicates a movement trace, while TEC$_1$ indicates an ellipsis site. These examples show conclusively that not only are these RNR *wh*-constructions RNR object-drop configurations, but they are also ATB *wh*-constructions as we have analyzed in this paper.

7 Conclusion

In this paper, I have presented understudied ATB *wh*-constructions ATB in Chinese, and argued that such constructions necessitate a new, complex analysis that relies on unselective binding, revised semantics for *wh*-questions (including a semantic implementation of the Split-CP hypothesis), choice function quantification for $\overline{\text{A}}$-dependencies, an ellipsis approach to null objects, and an algorithmic approach to semantic interpretation. The complexity should be seen as the result of a unification which provides each of these proposals with further empirical evidence and theoretical interconnectedness with the other proposals. Further, my approach actually *simplifies* my understanding of ATB *wh*-questions in Chinese, since they are now subsumed under the general phenomenon of object-drop, ubiquitous in Chinese. The existing analyses of ATB *wh*-questions all fail to accommodate one or more verified predictions that my new ellipsis-based analysis makes. All approaches except Salzmann's cannot correctly predict the presence of the base configuration without overgenerating ungrammatical structures. All movement-based approaches (all approaches except Zhang's (2009) pro-ϕP analysis) fail to explain the lack of island effects in conjunct 2. No existing approach can allow for sloppy readings between the two conjuncts. No existing approach can anticipate the lack of Weak Crossover effects in conjunct 2, not even with a proximity-based explanation, since it loses its power with the Chinese data. Therefore, there is no competing analysis that can achieve the same level of empirical coverage for Chinese ATB *wh*-questions as mine. As I reaffirm, I do entertain the idea that different languages might have different mechanisms for achieving their own version of ATB constructions, so one of the competing analyses might still be the correct analysis for ATB constructions in a different language, such as English. Chinese happens to have the powerful object-drop mechanism, which helps produce the brand of data traditionally labeled as ATB constructions. Nevertheless, our analysis, which involves no mechanism specially devised to accommodate ATB constructions, brings such ATB-specific mechanisms as Sideward Movement and Parallel Merge into question, since the evidence for these proposals from Chinese is discredited in this paper. The success of this analysis adds to the body of evidence for the diverse syntactic and semantic components summarized above, and it remains to be explored what further implications of some of the components newly proposed in this paper could have, especially the algorithmic perspective as a way of handling scope irregularity.

References

Aoun, J. and Y.-h. A. Li (1993). Wh-Elements in Situ: Syntax or LF? *Linguistic Inquiry 24*(2), 199–238.

Beck, S. (2006). Intervention Effects Follow From Focus Interpretation. *Natural Language Semantics 14*(1), 1–56.

Cable, S. (2010). *The Grammar of Q: Q-Particles, Wh-Movement, and Pied-Piping*. Oxford Studies in Comparative Syntax. Oxford, New York: Oxford University Press.

Carlson, G. (1987). Same and Different: Some Consequences for Syntax and Semantics. *Linguistics and Philosophy 10*(4), 531–566.

Chomsky, N. (1986). *Barriers*. Cambridge, Massachusetts: MIT Press.

Chomsky, N. (1995). *The Minimalist Program*. Cambridge, Massachusetts: MIT Press.

Citko, B. (2005). On the Nature of Merge: External Merge, Internal Merge, and Parallel Merge. *Linguistic Inquiry 36*(4), 475–496.

Elbourne, P. (2013). *Definite Descriptions*. Oxford Studies in Semantics and Pragmatics. Oxford, New York: Oxford University Press.

Goldberg, L. M. (2005). *Verb-Stranding VP Ellipsis: A Cross-Linguistic Study*. PhD Thesis, McGill University, Montreal.

Groenendijk, J. and M. Stokhof (1984). *Studies on the Semantics of Questions and the Pragmatics of Answers*. PhD Thesis, University of Amsterdam, Amsterdam.

Groenendijk, J. and M. Stokhof (1991). Dynamic predicate logic. *Linguistics and Philosophy 14*(1), 39–100.

Ha, S. (2008). *Ellipsis, Right Node Raising, and Across-the-Board Constructions*. PhD Thesis, Boston University, Boston University, Boston Massachusetts.

Hamblin, C. (1958). Questions. *The Australasian Journal of Philosophy 36*, 159–168.

Hamblin, C. (1973). Questions in Montague grammar. *Foundations of Language 10*(1), 41–53.

Heck, F. and G. Müller (2007). Extremely local optimization. In *Proceedings of WECOL*, Volume 26, pp. 170–183. Citeseer.

Heim, I. and A. Kratzer (1998). *Semantics in generative grammar*. Malden, MA: Blackwell.

Huang, C.-T. J. (1982). *Logical relations in Chinese and the theory of grammar*. PhD Thesis, Massachusetts Institute of Technology.

Huang, C.-T. J. (1991). Remarks on the Status of the Null Object. In R. Freidin (Ed.), *Principles and Parameters in Comparative Grammar*(20), pp. 56–76. Cambridge, Massachusetts: MIT Press.

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

Karttunen, L. (1977). Syntax and Semantics of Questions. *Linguistics and Philosophy 1*(1), 3–44.

Kayne, R. S. (1983). Connectedness. *Linguistic Inquiry 14*(2), 223–249.

Kayne, R. S. (1994). *The Antisymmetry of Syntax*. Cambridge, Massachusetts: MIT Press.

Kim, S.-S. (2002). Focus matters: Two types of intervention effect. In *Proceedings of the 21st West Coast Conference on Formal Linguistics*.

Li, Y.-H. A. (2014). Born empty. *Lingua 151*, 43–68.

Lin, J. (2005). Does Wh-in-Situ License Parasitic Gaps? *Linguistic Inquiry 36*(2), 298–302.

Lin, J.-W. (2004). Choice Functions and Scope of Existential Polarity Wh-Phrases in Mandarin Chinese. *Linguistics and Philosophy 27*(4), 451–491.

Munn, A. (1992). A Null Operator Analysis of ATB Gaps. *The Linguistic Review 9*(1), 1–26.

Murphy, A. (2017). Toward a unified theory of wh-in-situ and islands. *Journal of East Asian Linguistics 26*(2), 189–231.

Nissenbaum, J. (2000). *Investigations of covert phrase movement*. PhD Thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts.

Nunes, J. (2001). Sideward Movement. *Linguistic Inquiry 32*(2), 303–344.

Otani, K. and J. Whitman (1991). V-raising and VP-ellipsis. *Linguistic Inquiry 22*(2), 345–358.

Reinhart, T. (1998). Wh-in-situ in the Framework of the Minimalist Program. *Natural Language Semantics 6*(1), 29–56.

Rizzi, L. (1997). The fine structure of the left periphery. In L. Haegeman (Ed.), *Elements of grammar*, pp. 281–337. Dordrecht: Kluwer Academic Publishers.

Ross, J. (1967). *Constraints on variables in syntax*. PhD Thesis, Massachusetts Institute of Technology.

Ruys, E. G. (2000). Weak Crossover as a Scope Phenomenon. *Linguistic Inquiry 31*(3), 513–539.

Sabbagh, J. (2014). Right Node Raising. *Language and Linguistics Compass 8*(1), 24–35. _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/lnc3.12058.

Salzmann, M. (2012). A derivational ellipsis approach to ATB-movement. *The Linguistic Review 29*(3), 397–438.

Sauerland, U. (1998). *The meaning of chains*. PhD Thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts.

Sauerland, U. (2004). The Interpretation of traces. *Natural Language Semantics 12*, 63–127.

Thuan, T. and B. Bruening (2013). Wh-phrases as indefinites: A Vietnamese perspective. In *Linguistics of Vietnamese: An International Survey*, pp. 217–242. De Gruyter Mouton.

Tsai, W.-T. D. (1994). *On Economizing the Theory of A-Bar Dependencies*. PhD Thesis, MIT.

Tsai, W.-T. D. (1999). The hows of *Why* and and whys of *How*. In F. Del Gobbo and H. Hoshi (Eds.), *UCI Working Papers in Linguistics*, Volume 5, Irvine, CA: University of California, pp. 155–184.

Tsai, W.-T. D. (2008). Left periphery and *how-why* alternations. *Journal of East Asian Linguistics 17*(2), 83–115.

Urk, C. v. (2015). *A uniform syntax for phrasal movement: A case study of Dinka Bor*. Thesis, Massachusetts Institute of Technology. Accepted: 2016-03-03T21:11:08Z.

von Stechow, A. (2000). Some remarks on choice functions and LF-movement. In K. von Heusinger and U. Egli (Eds.), *Proceedings of the Konstanz Workshop "Reference and Anaphorical Relations"*, pp. 193–228. Dordrecht: Kluwer Publications.

Williams, E. (1990). The ATB-Theory of Parasitic Gaps. *The Linguistic Review 6*, 265–279.

Zhang, N. N. (2009). *Coordination in Syntax*. Cambridge Studies in Linguistics. Cambridge: Cambridge University Press.