Additivity, scalarity and Mandarin Universal *wh*'s

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Pre-final draft; to appear in Natural Language Semantics

Abstract

The paper offers a compositional analysis of Mandarin universal *wh*'s in construction with an additive/scalar adverb *ye* 'also/even'. In the analysis, universal force is derived from exhaustification of the subdomain alternatives activated by *wh*-items under stress, and the tendency of *wh-ye* to appear in negative sentences is explained by the interaction between *ye* and domain widening. Specifically, the *ye* in *wh-ye* is argued to be a scalar *ye* imposing a total order presupposition on its associated set of alternatives. In *wh-ye* it associates with the domain argument of the *wh*, and the requirement can be met by either an ordered *wh* or a two-point scale $\langle D', D\rangle$ made available through domain widening, specifically by widening of QUDs. The negative preference follows from the fact that a QUD is most naturally widened when it is settled negatively, as in the case of negatively biased questions with minimizers/maximizers.

1 Introduction

Mandarin *wh*-phrases can be used to express universal statements. As is typical in languages with universal/free choice *wh*-quantification, an additive/scalar particle is required (see e.g. Haspelmath 1997, Szabolcsi 2015, Fălăuş and Nicolae 2022). This is demonstrated in (1), where the presence of either *dou* 'all/even' or *ye* 'also/even' is necessary. The two variants are referred to as *wh-dou* and *wh-ye* in this paper, and they sound roughly equivalent in (1).

(1) Shei dou/ye bu shuohua.
who DOU/YE NEG speak
'Everyone was not speaking.' equivalently 'No one was speaking.'

Previous work on Mandarin universal *wh*'s in the formal tradition focuses almost exclusively on *wh-dou* (with the exception of Hole 2004), based on which several important ideas concerning Mandarin quantification, in particular on the nature of *wh*-quantification and *dou*, have been proposed. There are four ideas that are highly

influential. First, the variable and quantifier idea: Mandarin *wh*'s are variables and can be bound by *dou*, an adverbial universal quantifier (Lee, 1986, Cheng, 1995). Second, the plurality and distributivity idea: *wh*'s denote sets of individuals but can be summed into a maximal (plural) individual and distributed over by *dou*, a distributivity operator (Lin, 1996). Third, the dependent variable and maximizers idea: *wh*'s are free choice items (FCI) analyzed as dependent variables, and *dou* a maximizers (an intensional ι operator) that serves to form a definite/exhaustive FCI (Giannakidou and Cheng, 2006). Fourth, the existential and exhaustifier idea: *dou* encodes exhaustification of pre-exhaustified alternatives, giving rise to free choice effects and turning the *wh*'s, as existentials, into universals (Xiang, 2020).

The four proposals are each claimed to be independently motivated, as *dou* indeed appears to play the corresponding roles in Mandarin grammar: it participates in universal quantification as in (2a), triggers distributive predication as in (2b), and contributes to the definite reading of bare numeral phrases as in (2c), as well as to the free choice interpretation of disjunction as in (2d).

Wh-ye and its parallelism with *wh-dou* in (1) pose a challenge for all of these accounts. Unlike *dou*, *ye* is simply an additive/scalar adverb that does not participate in universal quantification, nor does it trigger distributive predication, definiteness of numeral phrases, or free choice of disjunction. This is also illustrated in (2)[1].

(2) a. Mei-ge ren dou/#ye lai-le.
every-CL person DOU/YE come-ASP
Intended: 'Every person came.' (Lee, 1986, Lin, 1996)

b. Zhangsan he Lisi dou/#ye mai-le yi-bu chezi.
Zhangsan and Lisi DOU/YE buy-ASP one-CL car
Intended: 'Zhangsan and Lisi each bought a car.' (Lin, 1996)

c. San-ge xuesheng dou/#ye lai-le.
three-CL student DOU/YE come-ASP
Intended: 'The three students all came.' (Cheng, 2009)

d. Yuehan huozhe Mali dou/#ye keyi jiao jichu hanyu.
John or Mary DOU/YE can teach intro Chinese
Intended: 'Both John and Mary can teach Intro Chinese.' (Xiang, 2020)

This paper, by offering a detailed description and a compositional analysis of *wh-ye*, contributes thus to the discussion of universal-*wh*'s and Mandarin quantification in general. It also enriches the current empirical picture of cross-linguistic *wh*-quantification and provides insights into the role additive/scalar particles play in universal/free choice quantification.

Specifically, we propose an analysis where the *ye* in *wh-ye* is a scalar particle similar to English *even*, and *wh*'s are existential quantifiers strengthened into universals via

1 # marks the infelicity of *ye* under the relevant readings. Of course, an additive or scalar interpretation of *ye* could be fine in (2).

exhaustification (Fox, 2007, Chierchia, 2013) to satisfy its presupposition. As evidence for alternative-&-exhaustification as the underlying mechanism generating the universal truth conditions, note that in *wh-ye/dou*, the *wh*'s are always stressed (Chao, 1968), indicating their status as alternative triggers via focus.

A major difference between *wh-ye* and *wh-dou* is that the former has a tendency to be restricted to negative sentences (Sugimura, 1992, Yang, 2002), as we can see by comparing (1) with (3) below. An explanation of the negative preference will be offered. It argues that *ye* as a scalar adverb has a strict scalarity requirement (not shared by *dou*) and it can only be satisfied with an totally ordered alternative set. In particular, it can be met in a pragmatic context where the speaker widens the domain D' of the contextually salient question under discussion (QUD) to D, with $\langle D', D\rangle$ forming a two-point scale. *Wh-ye* tends to appear in negative sentences, since the kind of widening on QUDs, as we will argue, often implies negative answers, analogous to questions with minimizers /maximizers as in (4), which arguably also involve widening (e.g. van Rooij 2003) .

(3) Shei dou/??ye hen yonggan.
Who DOU/YE very brave
Intended: 'Everyone is brave.' (Lu, 1986)

(4) Would you, in a million years, do that? (van Rooij, 2003, p. 259)
$\rightsquigarrow$ You would not do that.

The paper is structured as follows. §2 introduces the basic facts on *ye*, *wh*-quantification and *wh-ye* in Mandarin. In particular, a novel empirical generalization concerning *wh-ye*, negation and scalarity is proposed. §3 presents our compositional analysis of *wh-ye* and an explanation for the generalization, and §4 concludes.

2 Main facts

This section examines *wh-ye* and related phenomena. Since *ye* can act as a pure additive or a scalar additive, one question to resolve for any compositional analysis of *wh-ye* is which *ye* is involved. We will first introduce the three basic uses of *ye*, and then turn to the phenomenon of Mandarin *wh*-quantification and *wh-ye*.

2.1 Mandarin *ye*

There are three main uses of Mandarin *ye*: additive, scalar and modal[2]. We now discuss each use in turn, starting from additive-*ye*.

Additive-*ye*, similar to English *also*, exhibits focus-sensitivity and carries an additive presupposition. In (5), *ye* is associated (in the sense of focus association as in Rooth 1992) with the focus *Lisi* (with capitals indicating stress) and contributes an additive

2 The classification closely follows Biq (1989) and Yang (2020). The term "modal use" is also from Yang (2020). See also Ma (1982) and Hole (2004) for discussion of *ye*.

inference that Zhangsan introduced someone other than Lisi to Mary. It is focus sensitive since altering the position of focus, e.g., to *MALI*, would render a different inference, that is, Zhangsan introduced Lisi to someone other than Mary. The inference is a presupposition as it projects; for instance, the inference survives after adding *ma* (a polar-question sentence-final particle) to (5).

(5) Zhangsan ye jieshao-le LISI$_F$ gei Mali.
Zhangsan also introduce-ASP Lisi to Mary
'Zhangsan also introduced LISI to Mary.'

Since Kripke (2009), it is widely accepted that the additive presupposition of additives cannot have a plain existential semantics, which is too easy to satisfy and would predict (6) to be acceptable in an out-of-the-blue context (since millions of people are having dinner in New York). Kripke's observation applies to Mandarin *ye* as well, as neither can the Mandarin counterpart of (6) with *ye* be uttered out of the blue (see Yang 2020, §2.33 for relevant discussion). Based on Kripke's observation, we assume additive-*ye* presupposes that a salient alternative (referred to as the antecedent of *ye*) to the prejacent of *ye* (the sentence without *ye*) has been established true in the discourse.

(6) Sam$_F$ is having dinner in New York tonight, too.

Finally, similar to English additives as discussed in Beaver and Clark (2008) and Jasinskaja and Zeevat (2009), Mandarin additive-*ye* requires its prejacent and antecedent be logically independent. Relevant English examples are given in (7), and their Mandarin counterparts exhibit similar behaviors. (8) provides another illustration of this point in Mandarin. Note that (i) (8) without *ye* sounds fine, and (ii) (8) without entailment between the two clauses, i.e., *I invited Zhangsan. Actually I ye invited Lisi*, is also acceptable, indicating that *ye*'s non-entailing requirement is responsible for the infelicity.

(7) a. John$_F$ is coming. #[His whole family]$_F$ is coming too.
b. Sam is happy$_F$. #He's ecstatic$_F$ too.
c. I called [Alice and Mary]$_F$. #I also called Mary$_F$.

(8) Wo qing-le Zhangsan, shijishang wo (#ye) qing-le [Zhangsan he Lisi]$_F$.
I invite-ASP Zhangsan, actually I also invite-ASP Zhangsan and Lisi
'I invited Zhangsan. Actually I (#also) invited Zhangsan and Lisi.'

The above discussion suggests the entry in (9) for additive-*ye*. In (9), *ye* is assumed to take sentential scope, and C is its domain argument ranging over sets of propositions and restricted to be a subset of the focus semantic value of *ye*'s prejacent, as in Roothian Alternative Semantics. This captures focus-sensitivity, since focus affects the focus value and thus the value of C. Specifically, the focus semantic value of a sentence $[\![S]\!]_{alt}$ is the set of propositions obtained by replacing the focus within S with its alternatives of the same type. Consequently, '*I ye invited Zhangsan*$_F$' according to (9) presupposes that there is a salient alternative p of the form *that I invited x* such that p and *that I invited Zhangsan* are logically independent and p is true. When the presupposition is satisfied, the

sentence asserts *that I invited Zhangsan*.

(9) $[\![ye^{\text{ADD}}_{C} S]\!]^g(w)$ is defined only if there is a salient p in $g(C) \subseteq [\![S]\!]_{alt}$ such that
(i) $p \notin [\![S]\!]^g$ and $[\![S]\!]^g \notin p$, and (independence)
(ii) $p(w)$=1. (additivity)
If defined, $[\![ye^{\text{ADD}}_{C} S]\!]^g(w)$ =1 iff $[\![S]\!]^g(w)$=1.

Next consider scalar-*ye*. In (10a), the presence of *ye*, like *even*, conveys that for Lisi to laugh is more unlikely/surprising compared to others. Scalar-*ye* also appears in combination with minimizers as in (10b), and is the default particle used in Mandarin *even-if* conditionals and *even-though* conjunctions (see Yang 2019, table 1), illustrated in (10c,d).

(10) a. (Lian) LISI ye xiao-le.
LIAN Lisi even laugh-ASP
'Even Lisi laughed.'

b. Lisi (Lian) yi/ban-ge-ren ye mei qing.
Lisi LIAN one/half-CL-person even NEG invite
'Lisi didn't invite even a single person.'

c. (Jishi) ni bu shuo, wo ye zhidao.
Even.if you NEG say, I even know
'Even if you don't tell me, I will know it.'

d. Ta (suiran) bu jige, ye bei luqu-le.
He though NEG pass, even get admit-ASP
'Even though he failed the test, he (still) got addmitted.'

The use of *ye* in (10) with an *even*-interpretation suggests that scalar-*ye* can be analyzed on a par with *even* as encoding a scalar presupposition. There is however a complication. When *ye* is used as *even*, there is usually an additional marker attaching to either the focus/minimizer, the antecedent of the concessive conditional, or the first conjunct of the concessive conjunction. This is also illustrated in (10), where the *lian* in (10a-b) is a focus marker, the *jishi* in (10c) a marker for concessive antecedents, and the *suiran* in (10d) a marker for concessive conjunctions.

Following and extending the proposals for *lian-dou*/*ye* in Shyu (1995) and Xiang (2020), among others, we propose that the *ye* in (10), instead of the other markers, uniformly contributes scalarity. Concretely, we assume that *lian* and the other markers are semantically vacuous essentially[3], and scalar-*ye*, like *even*, encodes a presupposition that its prejacent is the most unlikely among its contextually relevant alternatives (Karttunen and Peters, 1979). The treatment is based on two considerations. First, the

3 Consider the following entry for *lian* from Xiang (2020, (80)), which states that *lian* indicates the presence of focus within its argument, without making any semantic contribution.

(i) $[\![\text{lian}(\alpha)]\!] = [\![\alpha]\!]$, defined only if $\{[\![\alpha]\!]\} \subset$ F-ALT(α)

other markers (*lian, jishi,...*) are almost always optional, already shown in (10)[4]. In other words, only *ye* (or *dou*, see below on a difference between the two) is required to convey an *even*-meaning. Second, cross-linguistically, additives often have scalar uses (König, 1991, Forker, 2016), and *ye* can be seen as an instantiation of this general pattern, thereby having a scalar meaning too.

It is now worth comparing scalar-*ye* with scalar-*dou*, as both can combine with *lian* (optionally) and express an *even*-like low-likelihood interpretation (see e.g. Shyu 1995, Chen 2008). Consider (11) (cf. Chen 2008, p. 75). Here the context is set up in a way that the scalar presupposition is satisfied (Lisi jumping over the brook is less likely than other kids, given his physical weakness), while the additive presupposition is not (Lisi was the only one who jumped over). As shown in (11), scalar-*dou* is felicitous in such a context while scalar-*ye* is not. This reveals a crucial difference between the two. While scalar-*dou* does not lexically encode an additive presupposition, scalar-*ye* always carries one[5].

4 A reviewer reports their judgement that *ye* without *lian* (e.g. (10a)) can only have an additive reading, and suggests that *lian*, instead of *ye*, contributes scalarity. We do not share this judgement. To our consultants, *lian* is not necessary for *ye* to express a scalar meaning. Indeed, examples of *ye* conveying scalarity without *lian* are easy to find (e.g. Ernst and Wang 1995, p. 235, Hole 2004, p. 25, Liao 2011, p. 257 and Yang 2020, p. 101), and acknowledged in the typological literature (e.g. Forker 2016, p. 73). We further add the following observation from Sybesma (1996), who remarks that "like *dou*, *ye*, when used as a focalizer, is unstressed; it can be stressed, in which case it means 'also' ". As is clear from Sybesma's example in (i), focalizer-*ye* is just *ye* used as *even* and (i) clearly shows that *ye* without *lian* can convey scalarity. Exactly the same observation is made in Hole (2004, p. 25): "[in the case of *lian* without *ye*,] emphatic stress on the foci will yield the *even*-readings, otherwise, we get *also*-readings". We find the generalization empirically correct; that is, when *lian* is absent, *ye* is ambiguous between *also* and *even* and stress disambiguates. This might explain why the reviewer finds it hard or even impossible to construe *ye* as *even* without *lian*, if we assume *lian*, as a special focus marker, can be used to disambiguate and unequivocalness is to be preferred.

(i) Zhangsan zhe-xie shu ye/YE mai-le.
Zhangsan these book YE/YE buy-ASP
ye: 'Zhangsan even bought [THESE books]$_F$.' (Sybesma, 1996, (6))
YE: 'Zhangsan also bought [these books]$_F$.'

5 A reviewer offers another interesting example where scalar-*dou* and *ye* differ:

(i) A: Is Zhangsan an assistant$_F$ professor?
B: Zhuli jiaoshou? Ta fu$_F$ jiaoshou dou/#ye shi-le.
assistant professor he associate professor DOU/YE be-ASP
Intended: 'Assistant professor? He is even an associate professor.'

The reviewer claims that (i) with *ye* is unacceptable because this is a scalar context, and *ye*, different from *dou*, is not scalar without *lian* (see the same reviewer's comment in fn. 4). We however find an explanation based on additivity more plausible, noting that (i) was initially used in Rullmann (1997) as evidence that *even* does not encode additivity, as the alternatives here are mutually exclusive. We propose that this feature of the alternatives, combined with the conclusion drawn from (11) that only scalar-*ye* has an additive component, explains the contrast in (i). We offer two pieces of evidence for such an explanation. First, adding *lian* to *ye* in (iB) does not improve the sentence, showing that scalarity (assuming with the reviewer that *lian-ye* is always scalar) is not the issue. Second, adding negation saves the sentence: *Ta (lian) FU$_F$ jiaoshou ye bu shi* 'he is not even an associate professor'. This is fully expected under the present view, as negation, without rendering the context non-scalar, makes the alternatives compatible.

(11) [Context: A group of kids were about to jump across a brook. Lisi, known to be physically the weakest, took the initiative and succeeded (surprisingly!). But no one else dared to jump. The teacher tried to encourage the kids, saying:]
Kuai tiao ba. (Lian) Lisi dou/#ye tiao-guoqu-le.
quick jump SFP LIAN Lisi DOU/YE jump-over-ASP
'Come on let's jump. Even Lisi jumped over!'

Finally, recall that additive-*ye* requires independence. Interestingly, scalar-*ye* does not share this requirement. This is perhaps already obvious given that minimizers can appear as *ye*'s focus as in (10b). Under the standard assumption that minimizers are emphatic elements that need be interpreted under negation to make a strong statement (Krifka, 1995, Chierchia, 2013)[6], *ye*'s prejacent in (10b) will entail all its alternatives. (12) offers another example. Here the prejacent *that 3 persons can fit into the car* entails its contextually relevant alternative *that 2 persons can fit into the car*, showing no independence for scalar-*ye*.

(12) Bie shuo [liang-ge-ren]$_F$ le, lian [san-ge-ren]$_F$ ye zuo-de-xia.
Not say two-CL-person ASP LIAN three-CL-person even fit-can-into
'Two persons of course can fit into the car. Even three persons can.'

The above discussion suggests (13) as the entry for scalar-*ye*. Note that the saliency requirement of the antecedent for additive-*ye* is absent in (13). This is based on the fact that sentences with scalar-*ye* such as the ones in (10) can be used in out-of-the-blue contexts, as highlighted by Yang (2020, p. 55) referring to a similar observation made by Tovena (2006) regarding Italian *neanche* '(n)either/(not) even'.

(13) $[\![ye^{\text{SCALAR}}_C S]\!]^g(w)$ is defined only if there is a p in $g(C) \subseteq [\![S]\!]_{alt}$ such that
(i) $p \neq [\![S]\!]^g$ and $p(w)$=1, and (additivity)
(ii) $\forall q \in g(C)[q \neq [\![S]\!]^g \rightarrow [\![S]\!]^g <_{\text{likely}} q]$. (scalarity)
If defined, $[\![ye^{\text{SCALAR}}_C S]\!]^g(w)$ =1 iff $[\![S]\!]^g(w)$=1.

Finally, we offer two examples illustrating the third use of *ye* — its modal use. In (14a), the intuition is that *ye* is used to comment on an unfavorable situation and express tactful criticism. In (14b), *ye* appears to deny a previous expectation that the speaker ate something bad. While there is currently no consensus on how to analyze this use (see Yang 2020, §5 and Wei 2020, §4 for discussion), the modal use of *ye* seems unrelated to *wh-ye*, and will not be further discussed in this paper.

(14) a. [A student was complaining about the homework:]
Laoshi, zuoye ye tai duo-le.
teacher, homework YE too much-ASP
'Teacher, the homework is really a lot.' (Wei 2020, p. 149)

6 See Xiang (2020) for the proposal that Mandarin minimizers like the one in (10b) undergo focus-reconstruction and gets interpreted below negation.

b. Wo ye mei chi shenme bu ganjing-de, zenme-hui shiwu zhongdu ne?
I YE NEG eat what not clean-DE, how-come food poisoning SFP
'I didn't not eat anything that was not clean. How is it possible to suffer from food poisoning?' (Yang 2020, p. 140)

One question that may arise at this point is whether the three uses of *ye*, or at least the first two uses, can receive a unified analysis. This is a question that goes beyond the scope of this paper, but see Tovena (2006) for some interesting discussion.

2.2 *Wh*-quantification in Mandarin

We now turn to the *wh* part of *wh-ye*. Mandarin *wh*-phrases are well-known for their non-interrogative uses. In particular, they can be interpreted existentially as in (15b), and express a universal statement in construction with *dou*/*ye*, as in (1) and (15c) (capitalization indicating stress). We briefly discuss these two uses in turn.

(15) a. SHEI lai-le? (Interrogative)
who come-ASP
'Who came?'

b. Haoxiang shei LAI-le. (Existential)
it.seem who come-ASP
'It seems that someone came.'

c. SHEI dou lai-le. (Universal/free choice)
who DOU come-ASP
'Everyone came.' (Chao 1968: p. 662)

The classical view on existential *wh*-phrases is that they have restricted distribution and are a type of polarity items (e.g. Li 1992, Lin 1998, Chierchia and Liao 2015). Specifically, they are claimed to be licensed in downward entailing (DE) contexts, in polar questions and various modal environments (Li, 1992, Lin, 1998), or to generalize the environments, in non-veridical sentences (Xie, 2007)[7]. For instance, according to this view, the *wh*-item in (15b) is licensed by the epistemic expression *haoxiang* 'it seems'.

The standard empirical picture however has recently been challenged by Yang et al. (2020), Chen (2021) and Liu and Yang (2021), who report a number of cases where existential *wh*'s are fine in veridical environments. For instance, Yang et al. (2020) experimentally confirm that (16a) with the perfective aspectual marker *le*, which makes (16a) episodic positive and thus veridical, can receive (depending on whether the *wh*-expression receives stress) either an interrogative reading, or a declarative reading where the *wh* is interpreted as an indefinite. (16b) is a naturally-occurring example reported in Liu and Yang (2021), where the *wh* is interpreted existentially under a factive

7 An operator F is non-veridical iff, for any p, $F(p)$ does not entail p. Please refer to Giannakidou (1998) and related literature for the framework that utilizes non-veridicality to explain polarity and free choice items.

verb *faxian* 'discover', which creates a veridical environment. Drawing on similar data, Chen (2021) and Liu and Yang (2021) conclude that Mandarin existential *wh*'s are not polarity items that require licensing but aligh more closely with modal indefinites (Alonso-Ovalle and Menéndez-Benito, 2010), and their alleged infelicity in veridical contexts is due either to the lack of modal inferences (e.g. ignorance) or to prosodic factors.

(16) a. Zhangsan zuotian mai-le dianr shenme (Yang et al. 2020, (3))
Zhangsan yesterday buy-ASP a.little what
i. 'What did Zhangsan buy yesterday?'
ii. 'Zhangsan bought a little of something yesterday.'

b. Shang-ke shi, wo faxian ganggang bu-hao de qiang you gei shei
have-class time, I discover just.now fixed DE wall again by who
ti-huai-le.
kick-break-ASP
"In class, I discovered that the wall that had just been fixed was blemished by someone or other again." (People's Daily, 1994)

The debate on the distribution of existential *wh*'s is relevant to our discussion, since as mentioned in the introduction, *wh-ye* tends to be limited to negative sentences. It is tempting to attribute the restriction to some general property of Mandarin non-interrogative *wh*'s, for instance to their NPI-hood (e.g. Hole 2004, pp. 120-123). However, as shown above, whether Mandarin existential *wh*-phrases are restricted in the way that NPIs are is highly debated. Moreover, even if existential-*wh*'s turn out to be somehow restricted, it is unlikely that the restriction would transfer to universal-*wh*'s, since *wh-dou*, the prime example of universal-*wh*'s, is not restricted, especially not to negative sentences. We now turn to *wh-dou*, to which most authors working on Mandarin universal *wh*'s direct their attention.

In *wh-dou*, the adverb *dou*, usually glossed as *all*/*even*, attaches to the VP, the *wh*-phrase needs to precede *dou*, and the resulting sentence expresses a universal claim, as shown in (15c). When the *wh*-phrase is the underlying object, it must move to the left of *dou* to obtain a universal interpretation, as illustrated in (17).

(17) (Shenme) ta (shenme) dou chi.
what he what all eat
"He eats everything/anything."

There are several proposals for *wh-dou* in the literature, already mentioned in the introduction. We will postpone discussing relevant details of some of these proposals to later sections when *wh-ye* is involved. For now, we focus on two properties of *wh-dou* pertinent to our discussion of *wh-ye*.

First, *wh-dou* is not restricted to negative sentences. In fact, there appears to be no syntactic/semantic constraint on its distribution, as noted in previous studies (e.g. Giannakidou and Cheng 2006, Liao 2011, Chen 2018). It can occur in positive episodic

sentences (e.g. (15c))[8], negated sentences, and sentences with modals of different strength, as demonstrated in (18). This stands in contrast with *wh-ye*, as we will see in detail in §2.3.

(18) Shei$_i$ Lisi dou [qing-le/mei-qing/neng-qing/bixu-qing t_i].
who Lisi DOU invite-ASP/NEG-invite/can-invite/must-invite
'Everyone is such that Lisi has/didn't/can/must invite(d) her.'

Second, universal *wh*'s are always stressed (Chao, 1968, Zhu, 1982), in both *wh-dou* and *wh-ye*. This is explicitly stated in Chao (1968, p. 662) "like interrogative of other parts of speech, *shei*, always stressed, usually followed by *dou* or *ye* before a verb, can refer to 'any or every member of a class', as in [(15c)]". This property of universal *wh*'s contrasts sharply with existential *wh*'s, which are never stressed (see e.g. Chao 1968, Dong 2009, Yang et al. 2020; see also Hengeveld et al. 2021 for a recent discussion of the cross-linguistic generalization that existential *wh*'s do not receive prosodic prominence). This can be illustrated by comparing (15b) and (15c) above: the existential *wh* in (15b) cannot receive prosodic prominence, whereas the same *wh*-phrase preceding *dou* in (15c) has to. This stress fact, while not playing any role in existing theories of universal *wh*'s, will receive a natural explanation under our proposal based on alternatives.

2.3 *Wh-ye*

We now turn to *wh-ye*, structurally parallel to *wh-dou* but more restricted in its distribution. The standard generalization is that in negative sentences *wh-dou* is interchangeable with *wh-ye* (see (1)), but in contrast to *wh-dou*, *wh*-ye is usually limited to negative sentences (e.g. Sugimura 1992, Yang 2002). This was noted in the introduction. Two more pairs of examples (positive vs. negative *wh-ye*) are illustrated below.

(19) a. *Shei ye xiao-le.
Who YE laugh-ASP
Intended: 'Everyone laughed.' (Yang 2002, (15))

8 A reviewer, based on Xiang's (2020) claim that (i) with the perfective marker *le* is less natural than with experiential *guo*, suggests that the acceptability of *wh-dou* in positive episodic sentences may vary among speakers. While we acknowledge that positive episodic *wh-dou*'s may have special pragmatic requirements, we do not find them unacceptable. For instance, all of our consultants accept (i) with *le* as an answer to the question *shei lai-le*? "who came?". Our empirical standpoint also aligns with previous research, such as Giannakidou and Cheng (2006, p. 137), Liao (2011, p. 97) and Chen (2018, §2). Moreover, sentences with episodic positive *wh-dou* are often used as experimental items to assess children's comprehension of universal *wh*'s, accompanied by pictures describing episodic events (e.g. Zhou 2015, (25) as shown in (ii) and Yang et al. 2022, (19)). These sentences are consistently accepted as ∀-statements by both children and adults. Lastly, the reviewer suggests examining corpus data to pinpoint the exact contextual requirements of positive episodic *wh-dou*, which we plan to investigate in future work.

(i) Shei dou lai-?le/guo.
who DOU come-ASP/EXP
'Everyone came.'

(ii) Shei dou tiao-guo-le fangzi.
who DOU jump-over-ASP house
'Everyone jumped over the house.'

b. Shei ye mei xiao.
who YE NEG laugh
'Everyone didn't laugh.' or 'Nobody laughed.'

(20) a. *Shenme ye kan-de-jian.
what YE see-DE-able
Intended: 'Everything can be seen.' (Sugimura 1992, (21))

b. Shenme ye kan-bu-jian.
what YE see-NEG-able
'Everything is such that it cannot be seen.' or 'Nothing can be seen.'

On the other hand, the negative restriction on *wh-ye* is not an absolute requirement. It is usually characterized as a tendency or preference (e.g. Zhu 1982, p. 93, Lin 1996, p. 125), and positive sentences with *wh-ye*, though few in number, are not difficult to find. Some naturally-occurring examples from previous studies are given in (21).

(21) a. Youqian shei ye keyi jin xuetang.
with.money who YE can enter college
'With money, everyone/anyone can enter a college.' (Sugimura 1992, (33))

b. Sha shi ye you liwai.
what thing YE have exception
'Every rule has an exception.' (Sugimura 1992, (39))

c. Shangtou shei-de zhishi ye dei ting.
top who-DE instruction YE must listen (Yang 2002, (25))
'Everyone from the management is such that you should follow her instruction.'

Considering examples like (21), Hole (2004, §3.3.3) proposes to relax negation to nonveridicality as the proper constraint on *wh-ye*, as in (22). Indeed, many instances of positive *wh-ye* discussed in the literature are intensional: there is *keyi* 'can' in (21a), *dei* 'must' in (21c), and (21b) is arguably a generic sentence. Hole also offers (23) to support the generalization: the *wh-ye* sentences in (23) according to Hole are only acceptable with a modal element (possibility or necessity).

(22) **Nonveridicality and the grammaticality of *wh…ye*:**
In assertions involving *wh*-words/indefinite pronominals conveying the meaning of (some kind of) universal quantification over the domain of the *wh*-word/indefinite pronominal, *ye* may only be used in nonveridical contexts.

(23) a. Wo shenme-yang-de shu ye *(hui/neng/nenggou) zhaodao.
I what-kind-DE book YE will/may/can find
'I will/may/can find any kind of book.'

b. Wo shenme-yang-de shu ye *(dei/yinggai/yao/xiang) kan.
I what-kind-DE book YE must/should/must/want read
'I must/should/must/want to read any kind of book.'

Hole's generalization however is not satisfactory either. First, there is a notable asymmetry between negation and the other nonveridical operators in their ability to host *wh-ye*. According to several corpus studies, more than 95% of naturally-occurring *wh-ye* appear in negative sentences (96.1% according to Yang 2002; 96.7% according to Ba and Zhang 2012). The pattern is unexpected if negation and modals are lumped together as licensors of *wh-ye*.

In fact, as acknowledged by Hole himself, there are instances where "even though non-veridcial operators are used, *dou* must be used, and the use of *ye* is not accepted by my consultants" (Hole 2004, p. 57). This is exemplified in (24a), which features a possibility modal but is judged unacceptable by Hole. Similarly, (20a) and (24b) with possibility modals are judged odd by Sugimura (1992) and Biq (1989)[9]. These facts cast doubt on the role of modals (and thus nonveridicality) in licensing *wh-ye*.

(24) a. (Buguan) cong shenme difang dou/*ye keyi shang-qu.
no.matter from what place DOU/YE can ascend-go
'You can ascend from any direction.' (Hole 2004, §3, (90))

b. Wo na-yi-tian dou/?ye keyi.
I which-one-day DOU/YE possible
'Whichever day is possible with me.' (Biq 1989, (21))

Another issue with (22), also acknowledged by Hole (2004), is that we can still find positive *wh-ye*'s in veridical sentences. Consider (25a), which according to Hole is fine with *ye* but ends with the perfective marker *le* and thus veridical. We offer another naturally-occurring example (25b) to illustrate the same point. In (25b), the sentence containing *wh-ye* describes a state that actually hold in the past.

9 Two clarifications are needed. First, the marker *buguan* in (24a), likewise *wulun*, is usually glossed as 'no matter'. These markers can optionally attach to universal *wh*'s and to antecedents of unconditionals, referred to as nominal and clausal-*wulun* respectively in Lin (1996) . Second, speakers may have varying judgements about (24) and positive *wh-ye* in general. The variation will be discussed below.

(25) a. Tamen shenme dou/ye gailiang-le. (Hole 2004, §4, (146))
they what DOU/YE change.for.the.better-ASP
'They have changed EVERYTHING for the better, no matter WHAT it is.'

b. Ji-tian-lai, women dou yan-zhe qianmian duiwu jingguo-shi
several-day-for, we all follow-ASP front troop pass-time
suo-zuo-de jihao, hen-xunsu-de panxing-zhe. *shei ye shi xiaoxin-yiyi-de*,
mark-DE sign, very-quick-DE clime-ASP who YE be careful-DE
bu gan da-sheng.
NEG dare big-voice
'For several days, we followed the marks left by the troops in front of us, and climbed quickly. *Everyone was very careful*, and didn't dare to speak aloud.'

The aforementioned facts, especially the corpus data, indicate that *wh-ye* is not inherently linked to nonveridicality. This is actually a welcome result since eventually we want to derive the constraint on *wh-ye* from independently motivated properties of *wh* and/or *ye*, but neither *wh*'s (existential or universal, as shown in (16), (15c) and fn. 8) nor *ye* as a focus adverb appear to be restricted to nonveridical contexts. We thus conclude that nonveridicality does not provide an accurate characterization of *wh-ye*.

To further complicate the empirical picture, it is worth noting that judgements of *wh-ye* in positive sentences are often subtle and can vary considerably among speakers. This is illustrated in (26): while the positive *wh-ye* in (26a) is marked as unacceptable in Hole (2004), it is taken to be fine in Yuan (2004), and similar examples (26c)-(26d) are judged natural in Biq (1989) and Ma (1982).

(26) a. Shei dou/*ye zhidao zhe-jian shi.
who DOU/YE know this-CL matter
"Everyone knows about this matter." (Hole 2004, §4, (129))

b. Shei ye (bu) zhidao zhe-jian shi.
who YE NEG know this-CL matter
"Everyone (doesn't) know(s) about this matter." (Yuan 2004, (40))

c. Shei ye zhidao Gelunbu faxian-le Meizhou.
who YE know Columbus discover-ASP America
"Everyone knows that Columbus discovered America." (Biq 1989, (14b))

d. Shei ye dongde.
who YE understand
"Everyone understands (it)." (Ma 1982, (52))

To make sense of the puzzling behaviours of *wh-ye*, we now turn to Yang (2019), which establishes a connection between *wh-ye* and the presence of a scale. According to this proposal, *wh-ye* is acceptable only when the "alternatives denoted by the *wh*-word" form a scale (Yang 2019, §2.2.1). For example, Yang argues that (25a) with positive *wh-ye*

is acceptable because it expresses that "they have improved everything for the better, even the most unnoticeable part!", where the *wh* ranges over things from ordinary to the most unnoticeable. Furthermore, Yang proposes that the *ye* in *wh-ye* is a type of "parametric *ye*" (adopting the term from Hole 2004), which encompasses not only the standard scalar-*ye* (such as the *ye* in *lian-ye* 'even' and *even-if* conditionals), but also the *ye* in *wh-ye* and unconditionals, and that parametric *ye* is always associated with scales, as stated in (27).

(27) Parametric *ye* is always associated with scale: only when there is a scale, parametric *ye* can appear and whenever we have parametric *ye*, a scalar interpretation is obligatory. (Yang 2019, (32))

The idea that *wh-ye* is linked to scales is prevalent in the literature. Several previous accounts try to analyze *wh-ye* on a par with *lian-ye* 'even' (Sugimura 1992) or minimizer-*ye* (Yang 2002), both of which involve scales and scalar-*ye*. As further support for the generalization in (27), Yang (2019) observes that when the entities ranged over by the *wh*-expression do not form an obvious scale, the corresponding (positive) *wh-ye* sounds odd. This is illustrated in (28), where the contextually salient set of children does not seem to invoke a scalar interpretation and the sentence is indeed odd. The relevance of scales is also apparent in unconditionals with *ye*, and is especially revealing there because the alternatives can be explicitly specified by a disjunctive antecedent. Consider the contrast in (29). In both (29a) and (29b), the antecedent introduces two alternatives, yet only (29b) is fine with *ye*. Intuitively, the contrast is related to the fact only in (29b) can a scale be constructed: keeping the oil lamp burning during the day is less likely than doing so in the evening.

(28) Zhe-ji-ge haizi, (wulun) na-yi-ge dou/*ye hen congming.
this-several-CL child no.matter which-one-CL DOU/YE very smart
'Everyone of these children is smart'. (Yang 2019, (14))

(29) a. Wulun ni haishi ta, wo dou/*ye xihuan.
no.matter you or he I DOU/YE like
'No matter it is you or him, I simply like'. (Yang 2019, (16))

b. Wulun baitian wanshang, ta dou/ye yao dian-zhe you-deng.
no.matter day.time evening he DOU/YE want ignite-ASP oil-lamp
'No matter whether it is during the day or in the evening, he always wants to keep the oil lamp burning.' (Yang 2019, (25))

We share the intuition behind Yang's (2019) generalization. Indeed, most examples with positive *wh-ye* discussed in the literature sound scalar. For instance, the *wh*-phrase in (21a) is readily interpreted as ranging from those clearly qualified to those who fail the college-entrance exam. (21c) is about taking orders from management, where the people from the management – the domain of *shei* 'who' – can be ranked and ordered accordingly. The requirement for scales may also explain the variation in judgements regarding examples like (26). In fact, several "unacceptable" examples presented earlier,

such as (20a), (23b) without the modals and (24), are judged fine by some of our consultants. This variation could stem from the context-dependent nature of the *wh*'s domain and differences in how speakers interpret such examples out of context: some speakers may imagine a scalar domain while others may not.

While we concur with Yang (2019) that a scalar reading of the *wh* is relevant to *wh-ye*, we believe that, at a descriptive level, it is not needed for negative *wh-ye*. Consider (30). Here the domain of the *wh* consists of two individuals, and there is no need for one to be ranked higher than the other for the sentence to be acceptable. The contrast between (28) and (30) reveals that an intuitive notion of scalarity is only crucial for positive *wh-ye*. We thus propose the revised empirical generalization in (31).

(30) Ta-lia shei ye mei shuo-hua.
they.two who YE NEG say-word
'Neither of the two said anything' or 'Both of the two said nothing'.

(31) ***Wh-ye*, negation and scalarity**
Wh-ye is always fine in negative sentences; in positive sentences, *wh-ye* requires the domain of the *wh* be construed as a scale.

The asymmetry between positive and negative *wh-ye* is reflected in (31): while the latter is always fine, the former requires a scalar interpretation of the *wh*. This may explain the high frequency of negative *wh-ye* in the corpus, if we assume that typical *wh*-phrases such as *who*, *which* and *what* range over unordered set of individuals (Szabolcsi and Zwarts, 1993) and thus do not trigger a scalar interpretation unless forced by special contexts. This then raises the question of how *wh*-phrases such as *how* and *how many*, ranging over ordered sets, behave. Although a comprehensive corpus study is beyond the scope of this paper, a quick search of *duoshao* 'how many/much'…*ye* (with ≤4 characters between the two) in the online corpus CCL returns 463 occurrences without a subsequent negation, out of a total number of 1,182 occurrences of such combinations[10]. In other words, roughly 40% of *how many/much-ye* are positive in the corpus. This contrasts sharply with *who-ye*: a similar search returns 400 occurrences of positive *shei*…*ye* out of 12,772, suggesting only 3.1% of *who-ye* are positive, which aligns with the results of previous corpus studies(Yang, 2002, Ba and Zhang, 2012). An exemplary positive *duoshao-ye* from the corpus is provided in (32a). (32b) illustrates another type of positive *wh-ye* examples commonly found in corpora and used for illustration in the literature, where the head noun of the *wh*-phrase is inherently scalar.

(32) a. Ta xin-li duoshao ye youdian nanshou.
he heart-in how.much YE a.bit uncomfortable
'He was more of less uncomfortable'.

10 Specifically, we first searched for "*duoshao* $4 *ye*", which looks for tokens with ≤ 4 characters between *duoshao* and *ye*. This query yielded 1,182 results. We then added the condition "*ye*–6(*bu*|*mei*|*wu*|*bie*|*xiu*|*nan*|*mo*|*beng*|*wei*)", requiring that there be no negation of any kind after *ye* within the next 6 characters. This returned 463 occurrences. See http://ccl.pku.edu.cn:8080/ccl_corpus for the CCL corpus.

b. Shenme kunnan dou/ye neng kefu.
what difficulty DOU/YE can overcome
'We can overcome any difficulty'. (Lin 1996, p. 125)

2.4 Summary

To summarize the empirical picture presented so far, in §2.1 we introduced the basic properties of Mandarin *ye*, which, like additives in many other languages, can be interpreted as either a plain additive or a scalar additive. In §2.2, we highlighted the relevant properties of Mandarin *wh*-items used non-interrogatively. We demonstrated that (i) neither existential *wh*'s nor universal *wh*'s with *dou* are subject to the same restrictions as *wh-ye*, and (ii) while existential *wh*'s are not stressed, universal *wh*'s always are. Lastly, in §2.3 we examined the distribution of *wh-ye*, showing that its negative preference is not an absolute requirement. Positive *wh-ye*'s can be readily found, and when they do occur, the *wh* usually exhibits a scalar reading, as depicted in (31).

The next section presents a compositional account of *wh-ye* that aims to capture the aforementioned facts and reduce (31) to independently motivated properties of *wh*'s, *ye* and domain widening. In this account, the *wh*-items are analyzed as existential quantifiers strengthened into universals via free choice exhaustification, as proposed in recent alternative-based accounts of English *any* (Chierchia, 2013, Dayal, 2013, Crnič, 2019b). This captures the interpretation of *wh-ye* in positive sentences, and is necessary for cases of negative *wh-ye* where the *wh* cannot scope under negation, as we will discuss in §3.1. Meanwhile, we will not put any constraint on universal-*wh*'s *per se* (cf. the viability constraint on *any* in Dayal 2013), which explains why they are unrestricted with *dou*. Finally, the stress on universal *wh*'s is explained by assuming that focus on *wh*'s is necessary to activate the alternatives required for exhaustification.

Moving on, the *ye* in *wh-ye* is argued to be a scalar-*ye* associated with the *wh*'s domain argument. Moreover, scalar-*ye* is proposed to have a strict scalar presupposition (not shared by *dou*) that its alternatives form a total order. This accounts for the more restricted distribution of *wh-ye* and explains the correlation between positive *wh-ye* and scales. Lastly, negative sentences create a favorable environment for satisfying the total order requirement, as it can be fulfilled via domain widening on QUDs, and widening in questions often give rise to negative bias and expects negative answers.

3 Compositional analysis

This section explicates the proposal outlined above. §3.1 presents the exhaustification account of universal *wh*'s. §3.2 shows how *ye* is compositionally integrated into the structure with exhaustification operators. §3.3 argues that *wh-ye* involves scalar-*ye* with a total order requirement, explaining its affinity to scales in positive sentences. §3.4-§3.5

discuss the negative preference of *wh-ye*, linking it to *ye*'s scalar requirement via domain widening on QUDs and its negative bias. Finally, §3.6 briefly discusses *wh-dou*.

3.1 Universal *wh*'s and free choice strengthening

To capture the universal force of *wh-ye* and Mandarin universal *wh*'s in general, we adopt the theory of free choice proposed in Fox (2007) and Chierchia (2013). The theory treats free choice inferences, such as the quasi-conjunctive interpretation of the disjunction in (33), as implicatures (for they disappear under negation), and derives them through recursive exhaustification over alternatives triggered by disjunction or existential quantifiers using a covert operator EXH (cf. the grammatical view to scalar implicatures in Chierchia et al. 2011).

(33) John can invite Anna or Betty. $\rightsquigarrow \Diamond a \wedge \Diamond b$[11]

Concretely, EXH, defined as (34), takes a set of propositions C and a proposition p (its prejacent) as arguments, and returns a proposition that is true in a world w iff p is true and all the alternative propositions in C that are *innocently excludable* relative to p are false in w (Fox, 2007). The idea behind innocent exclusion is that we want EXH to negate as many alternatives as possible, without getting a contradiction or making arbitrary choice. Formally, the set of innocently excludable alternatives of p in C, represented as $IE(p, C)$, is the intersection of all the maximal subsets of C that can be jointly negated with p being true.

(34) $[\![\text{EXH}]\!] = \lambda C \lambda p \lambda w[p(w) \wedge \forall q[q \in IE(p, C) \rightarrow \neg q(w)]]$, where
$IE(p, C) = \cap\{C' \mid C' \text{ is a maximal subset of } C \text{ s.t } \{\neg q : q \in C'\} \cup \{p\} \text{ is consistent}\}$

Next, a disjunction can trigger as its alternatives not only the corresponding conjunction but also its individual disjuncts (Sauerland, 2004, Fox and Katzir, 2011).

Free choice inferences can then be derived if EXH is applied recursively (Fox, 2007), or to use Chierchia's (2013) terms, EXH is applied to *pre-exhaustified* alternatives. Consider *John can invite Anna or Betty*. Its (plain) alternatives are the disjuncts and conjunction in (35b). Applying EXH relative to these alternatives will not deliver free choice, but simply returns the prejacent with a scalar implicature, as only $\Diamond(a \wedge b)$ is innocently excludable. To derive free choice, Fox (2007) and Chierchia (2013), drawing on Kratzer and Shimoyama (2002), propose that the relevant alternatives are actually the enriched, pre-exhaustified alternatives in (35c), where each alternative comes with its own EXH. In general, the set of pre-exhaustified alternatives of a sentence S, represented as $[\![S]\!]_{\text{EXH-}alt}$, can be defined as the set of propositions one gets by applying EXH to each alternative of S relative to the set of S's alternatives, as in (36). Finally, exhaustifying $\Diamond(a \vee b)$ with respect to its pre-exhaustified alternatives, indicated by using C^{EXH} as the domain argument of EXH in (35d), leads to the free choice inference, as in (35d).

11 $\Diamond a$ stands for *John can invite Anna*. For simplicity, we will conflate logical forms and their denotations. That is, $\Diamond(a \vee b)$ will stand for either the LF where an existential modal scopes over a disjunction, or the corresponding proposition. Similarly, D and C could be syntactic or semantic objects (i.e. variables or sets).

(35) John can invite Anna or Betty.

a. $[\![\text{John can invite A or B}]\!] = \Diamond(a \vee b)$

b. $[\![\text{John can invite A or B}]\!]_{alt} = \{\Diamond a, \Diamond b, \Diamond(a \wedge b)\}$

c. $[\![\text{John can invite A or B}]\!]_{\text{EXH-}alt}$
$= \{\text{EXH}_C[\Diamond a], \text{EXH}_C[\Diamond b], \text{EXH}_C[\Diamond(a \wedge b)]\}$, where C is $[\![\text{John can invite A or B}]\!]_{alt}$
$= \{\Diamond a \wedge \neg \Diamond b, \Diamond b \wedge \neg \Diamond a, \Diamond(a \wedge b)\}$

d. $[\![\text{EXH}_{C^{\text{EXH}}}[\text{John can invite A or B}]]\!]$, where C^{EXH} is $[\![\text{John can invite A or B}]\!]_{\text{EXH-}alt}$
$= \Diamond(a \vee b) \wedge \neg(\Diamond a \wedge \neg \Diamond b) \wedge \neg(\Diamond b \wedge \neg \Diamond a) \wedge \neg \Diamond (a \wedge b)$
$= \Diamond a \wedge \Diamond b \wedge \neg \Diamond (a \wedge b)$

(36) Pre-exhaustified alternatives (based on Chierchia 2013, p. 138)
$[\![S]\!]_{\text{EXH-}alt} = \{\text{EXH}([\![S]\!]_{alt})(p) \mid p \in [\![S]\!]_{alt}\}$

The above alternative-&-exhaustification mechanism can also strengthen an existential into a universal, and is employed in several recent accounts of free choice *any* (Chierchia, 2013, Dayal, 2013, Crnič, 2019b). We adopt this strategy for Mandarin universal *wh*'s. First, we follow Liao (2011) and Chierchia and Liao (2015) in assuming (for now) that Mandarin *wh*-items are existential quantifiers triggering subdomain alternatives, as in (37).

(37) a. $[\![\text{shei}_D]\!]^g = \lambda P \exists x \in g(D)[\text{person}(x) \wedge P(x)]$

b. $[\![\text{shei}_D]\!]^g_{alt} = \{\lambda P \exists x \in D'[\text{person}(x) \wedge P(x)] \mid D' \subseteq g(D)\}$ (to be revised)

Second, these domain alternatives at the sentence level can be pre-exhaustified and targeted by another EXH, resulting in a universal statement. This is illustrated in (38) for sentence (38a), whose LF is in (38b) (to be refined in (44b)), where *ye* is assumed to take matrix scope and the *wh*-item is interpreted below *ye* but above negation (see below for discussion of this syntactic assumption). We will discuss the role of *ye* in detail in §3.2-3, for now we focus on ②, that is, on how exhaustification turns the prejacent of *ye* into a universal statement. Note first that in ② an EXH is present, and its subscript C^{EXH} indicates that its first argument is a set of pre-exhaustified alternatives. Next, (38c) gives the meaning of ①, its subdomain alternatives, and the pre-exhaustified alternatives respectively. Since all of the pre-exhaustified alternatives in $[\![①]\!]^g_{\text{EXH-}alt}$ are innocently excludable (except for the prejacent itself, which amounts to letting $D' = g(D)$), as witnessed by their negation being jointly consistent with $[\![①]\!]^g$, they are negated by EXH. The result is: the prejacent is true — that there is someone in D not speaking — and that for every subdomain D' of D, it is false that there is someone in D' not speaking but no one in $D \backslash D'$ not speaking. This second inference amounts to that for every subdomain D' of D, if there is someone in D' not speaking, then there is someone in $D \backslash D'$ not speaking. Together with the prejacent, this corresponds to the proposition that every person in D is not speaking. A universal statement is derived.

(38) a. Shei ye bu shuohua.
who YE NEG speak
'Everyone was not speaking.'

b. LF: $[ye_{C'}\ [_{②}\ \textsc{exh}_{C^{\textsc{exh}}}\ [_{①}\ \text{who}_D\ [\textsc{neg}\ \text{speak}]]]]$

c. $[\![①]\!]^g = \exists x \in g(D)[\text{person}(x) \wedge \neg\text{speak}(x)]$
$[\![①]\!]^g_{alt} = \{\exists x \in D'[\text{person}(x) \wedge \neg\text{speak}(x)] \mid D' \subseteq g(D)\}$
$[\![①]\!]^g_{\textsc{exh}\text{-}alt} = \{\exists x \in D'[\text{person}(x) \wedge \neg\text{speak}(x)] \wedge$
$\neg\exists x \in g(D) \backslash D'[\text{person}(x) \wedge \neg\text{speak}(x)] \mid D' \subseteq g(D)\}$

d. $[\![②]\!]^g = \exists x \in g(D)[\text{person}(x) \wedge \neg\text{speak}(x)] \wedge \forall D' \subset g(D)$
$\neg[\exists x \in D'[\text{person}(x) \wedge \neg\text{speak}(x)] \wedge \neg\exists x \in g(D) \backslash D'[\text{person}(x) \wedge \neg\text{speak}(x)]]$
$= \exists x \in g(D)[\text{person}(x) \wedge \neg\text{speak}(x)] \wedge \forall D' \subset g(D)$
$[\exists x \in D'[\text{person}(x) \wedge \neg\text{speak}(x)] \rightarrow \exists x \in g(D) \backslash D'[\text{person}(x) \wedge \neg\text{speak}(x)]]$
$= \forall D' \subset g(D) \cap [\![\text{person}]\!]^g[\exists x \in D' \wedge \neg\text{speak}(x)]$
$= \forall x \in g(D)[\text{person}(x) \rightarrow \neg\text{speak}(x)]$

Finally, for this analysis to work, it is important that Mandarin *wh*-items, as existential quantifiers, do not trigger universal quantifiers as their (scalar) alternatives[12]. The reason is that if they did, the universal alternative would trigger a scalar implicature that the corresponding universal statement is false. In the case of (38), the implicature is $\neg\forall x \in g(D)[\text{person}(x) \rightarrow \neg\text{speak}(x)]$, which would be incompatible with the result of free choice strengthening, and thus would prevent EXH from strengthening the sentence into a universal statement, contrary to fact.

Mandarin universal-*wh*'s thus differ from free choice disjunction/*any*, typically assumed to trigger conjunction/universal as their scalar alternatives, as in e.g. Fox (2007) and Chierchia (2013). By positing scalar alternatives for FC disjunction/*any*, these accounts are able to capture their restricted distribution. For example, a plain disjunction certainly cannot be strengthened into a conjunction, and this is due precisely to the presence of $a \wedge b$ in the alternative set: exhaustifying $a \vee b$ relative to $\{a, b, a \wedge b\}$ simply adds a scalar implicature, while exhaustifying relative to pre-exhaustified alternatives $\{a \wedge \neg b, b \wedge \neg a, a \wedge b\}$ generates no extra inference (as none of the alternatives is innocent excludable[13]). Plain disjunction then differs from disjunction under $\diamond$, where the conjunctive alternative does not block free choice strengthening and the scalar implicature can coexist with the free choice implciature, as we saw in (35d). In other words, the presence of scalar alternatives restricts free choice effects to modal environments.

Assuming that Mandarin *wh*-items lack universal alternatives thus allows us to explain their relatively unrestricted distribution. This is most obvious with *wh-dou*, which as shown in §2.2 can appear in positive episodic sentences. It is also needed, as we

12 For application of the idea to various phenomena see e.g. Bowler (2014), Singh et al. (2016), Bar-Lev (2021).

13 There are three maximal subsets of $\{a \wedge \neg b, b \wedge \neg a, a \wedge b\}$ that can be jointly negated with $a \vee b$ being true: $\{a \wedge \neg b, a \wedge b\}$, $\{b \wedge \neg a, a \wedge b\}$, $\{a \wedge \neg b, b \wedge \neg a\}$. Their intersection is $\varnothing$, and thus there is no innocent excludable alterantive. See also Chierchia (2013, pp. 120-122).

saw with (38), for cases of negative *wh-ye* where the *wh* is interpreted as ∀ above negation (and hence in positive environments too). We made the syntactic assumption in (38b), and here offer evidence for such a treatment. Consider (39), where *wh-ye* is compared with true NPIs like minimizers with *ye*, both in negative sentences.

(39) a. Lisi na-ge-zi$_i$/yi-ge-zi$_i$ ye bu renshi t_i.
Lisi which-CL-character/one-CL-character YE NEG know
'Lisi does not know any/a single character.'.

b. Shei$_i$/*yi-ge-ren$_i$ ye t_i bu renshi zhe-ge zi.
who/one-CL-person YE NEG know this-CL character
'No one knows this character.' (Guo 1998, (5)-(6))

In (39a) the sentence with *wh-ye* is roughly equivalent to its minimizer-*ye* counterpart, suggesting that both can be analyzed as ∃ under ¬ (Yang 2002, Hole 2004). However, the parallelism breaks down in (39b), where *wh-ye* remains acceptable while minimizer-*ye* does not. The crucial difference is that in (39a) the *wh*/minimizer are syntactic objects while in (39b) subjects, indicated by the respective traces.

More generally, Guo (1998) observes that in negative sentences with minimizer-*ye*/*dou*, the minimizers can only be internal arguments (e.g. objects of transitives and subjects of unaccusatives), but not external arguments (e.g. subjects of transitives/unergatives). An obvious explanation, given in Xiang (2020) for minimizer-*dou*, is that (i) these minimizers have to scope under negation at LF, (ii) negation as a VP adjunct cannot scope over external arguments in Mandarin (given that Mandarin is scope rigid), and (iii) focus-reconstruction can only reconstruct the minimizer (at most) to its base position.

Returning to *wh-ye*, Guo (1998) crucially observes that although *wh-ye* prefers negation, the *wh*'s in negative *wh-ye* sentences are not restricted to internal-arguments, as demonstrated in (39b). In other words, *wh-ye* is acceptable as long as there is a negation after *ye*, even if the *wh* cannot scope under it at LF. This fact motivates our treatment of (38a) with an unergative *shuohua* 'speak', where the *wh* is analyzed as a universal above negation. Indeed, the counterpart of (38a) with a minimizer sounds odd, as shown in (40a), and for the minimizer to be acceptable, negation has to appear in a higher position above it, as in (40b). This confirms that the *wh* in (38a) is not in a position to be interpreted below negation.

(40) a. ??Yi/??Ban-ge-ren ye bu shuohua.
one/half-CL-person YE NEG speak
Intended: 'No one was speaking.'

b. Mei-you yi/ban-ge-ren shuohua.
NEG-have one/half-CL-person speak
'No one was speaking.'

The above discussion highlights the need of interpreting the *wh*'s in *wh-ye* as wide

scope universals. We now offer evidence supporting the exhaustification framework and propose a modification to (37), concerning the generation of subdomain alternatives for Mandarin *wh*-items.

First, using alternative-&-exhaustification to derive the correct truth conditions, instead of the classical treatment that takes *wh*'s as variables bound by an adverbial universal quantifier (typically *dou*, as in Lee 1986, Cheng 1995, among others), is motivated by the fact that universal *wh*'s are always interpreted universally and never show quantificational variability (Lin 1996, p. 123; Chen 2008, p. 142), analogous to English *any* (Dayal, 1998). Consider the contrast in (41). (41a) establishes that Mandarin indefinites can be quantified over by non-universal Q-adverbs like *usually*, and *dou* is compatible with this type of quantificational variability. In contrast, the corresponding sentence in (41b) with universal-*wh* must come with *dou*/*ye*, and is odd with Q-adverbs. This shows that universal-*wh*'s resist quantificational variability (, leaving (41b) with only a frequency reading that is incompatible with the individual-level predicate).

(41) a. Yi-ge erci-fangcheng tongchang (dou) you laing-ge jie.
a-CL quadratic-equation usually DOU have two-CL solution
'A quadratic equation usually has two solutions.'
≈ 'Most quadratic equations have two solutions.'

b. Na-ge erci-fangcheng (#tongchang) dou/ye you laing-ge jie.
which-CL quadratic-equation usually DOU/YE have two-CL solution
'Any quadratic equation (#usually) has two solutions.'

Second, recall that universal-*wh*'s are always stressed (Chao, 1968, Zhu, 1982). This receives a natural explanation under the current exhaustification-based account, where alternatives play an essential role. Concretely, we propose that the stress indicates focus, and it is the focus that activates the domain alternatives of the *wh*-item, which are further subject to recursive exhaustification and give rise to the free choice/universal effect. Stress is thus an integral part of universal-*wh*'s.

Furthermore, this view fits well with recent proposals for existential-*wh*'s as modal indefinites akin to Spanish *algún* (Chen 2021, Liu and Yang 2021; see the discussion of (16)). An observation from Liu and Yang (2021) relevant to the current discussion is that Mandarin existential-*wh*'s obligatorily trigger modal inferences (primarily ignorance or indifference) in non-DE environments. Crucially, these modal inferences are partial, meaning that they do not require all individuals to be possibilities, unlike universal free choice inferences. For instance, (42a) with an unstressed existential-*wh* can be true in scenarios where not all times next week are possible for the addressee. In contrast, the truth of (42b) with a stressed universal-*wh* (in combination with *dou*) does require the addressee be allowed to come at *any* time next week. The partial ignorance triggered by existential-*wh*'s can be straightforwardly analyzed under Alonso-Ovalle and Menéndez-Benito's (2010)'s proposal for Spanish *algún*, as Liu and Yang (2021) propose. In this analysis, existential-*wh*'s are treated as existential quantifiers with individual alternatives (or equivalently, singleton domain alternatives), as in (43b). The individual

alternatives undergo the same exhausitifcation process demonstrated above using EXH, yielding the extra modal inferences (see Liu and Yang 2021 for details). Importantly, since existential-*wh*'s induce less alternatives than universal free choice items, they convey weaker inferences (partial but not total variation)[14].

(42) a. Ni keyi xia-zhou shenme-shihou lai-yi-tang.
You can next-week what-time come-one-time
'You can come sometime or other next week.'

b. Ni xia-zhou shenme-shihou dou keyi lai.
You next-week what-time DOU can come
'You can come anytime next week.'

(43) encapsulates this unified treatment of Mandarin non-interrogative *wh*-items. The ordinary semantic value of a *wh*-item is given in (43a), which is simply an $\exists$-quantifier and hence straightforwardly captures the truth-conditional contribution of existential-*wh*'s as indefinites. *Wh*-items moreover trigger alternatives. Concretely, they lexically trigger individual alternatives as in (43b), explaining their status as modal indefinites conveying partial variation. Next, to obtain the full set of subdomain alternatives, focus is needed. Specifically, we assume with Crnič (2019b) and Jeong and Roelofsen (2022) that the focus falls on the domain argument D of the *wh* (referred to as *domain focus* in Jeong and Roelofsen 2022) and thus activates semantic objects of the same type as D, namely other domains, as alternatives, as in standard Roothian alternative semantics. We also assume that the domain alternatives can be pruned to subdomain ones (Chierchia 2013; see Crnič 2019a for technical details)[15], resulting in the focus semantic value of a *wh*-expression as in (43c). This explains the role of stress on

14 To address a concern raised by a reviewer regarding the claim that existential-*wh*'s trigger partial modal inferences, we offer (i) involving Mandarin exceptive *chule* to sharpen the intuition. Assuming that exceptives are sensitive to some sort of $\forall$-quantification, the contrast between (ia) and (ib-c) shows that existential-*wh*'s, unlike universal-*wh*'s and universal FCI *renhe* 'any', do not convey free choice of the universal variation type. See Giannakidou (2018, §5) for additional evidence that Mandarin existential *wh*'s are not "exhaustive".

(i) a. #Chule zhou-san, ni keyi shenme-shihou lai-yi-tang. (Existential-*wh*'s)
except Wednesday you can what-time come-one-time
'#Except for Wednesday, you can come sometime or other.'

b. Chule zhou-san, ni shenme-shihou dou keyi lai. (Universal-*wh*'s with *dou*)
except Wednesday you what-time DOU can come
'Except for Wednesday, you can come anytime.'

c. Chule zhou-san, ni keyi renhe-shihou lai. (*renhe* 'any')
except Wednesday you can any-time come
'Except for Wednesday, you can come anytime.'

15 One way to guarantee that only subdomain alternatives are triggered, as proposed for *any* in Jeong and Roelofsen (2022), is to assume that the domain argument of the *wh* that receives focus is the set D_e of all entities, and contextual restriction happens when D_e is intersected with D^c, the set of things relevant in c. Under this treatment, $[\![\text{shei}_{D_e}]\!]^c = \lambda P \exists x \in D_e \cap D^c[\text{person}(x) \wedge P(x)]$, and focus on D_e will deliver all and only subdomain alternatives.

universal *wh*'s, i.e., to activate domain alternatives. Finally, exhaustification over the set of subdomain alternatives will strengthen the *wh*-item into a universal, capturing universal-*wh*'s. In this way, the current treatment improves on Liao (2011) and Chierchia and Liao (2015) in that it offers a more accurate characterization of the interpretation of existential-*wh*'s and a way to understand the role of stress on universal-*wh*'s.

(43) a. $[\![\text{shei}_D]\!]^g = \lambda P \exists x \in g(D)[\text{person}(x) \wedge P(x)]$

b. $[\![\text{shei}_D]\!]^g_{alt} = \{\lambda P[\text{person}(u) \wedge P(u)] \mid u \in g(D)\}$
or equivalently $= \{\lambda P \exists x \in \{u\}\,[\text{person}(x) \wedge P(x)] \mid \{u\} \subseteq g(D)\}$

c. $[\![\text{shei}_{D_F}]\!]^g_{alt} = \{\lambda P \exists x \in D'[\text{person}(x) \wedge P(x)] \mid D' \subseteq g(D)\}$

To summarize the discussion so far. The proposed analysis treats the universal force of a universal-*wh* as the result of a covert EXH recursively exhaustifying its subdomain alternatives. Evidence supporting this treatment includes: first, unlike true NPIs, the *wh*'s in *wh-ye* do not need to scope under negation, suggesting the need to derive the universal force in the absence of negation; second, universal-*wh*'s never show quantificational variability, unexpected under the view that *wh*-items are variables; third, the use of (domain) alternatives relates nicely to the fact that universal-*wh*'s are always stressed, and offers a unified view of Mandarin *wh*-expressions, which can be either unstressed modal indefinties or stressed universal/free choice items.

3.2 *Wh-ye*: semantic composition

We now bring *ye* into the picture. We propose that in *wh-ye*, *ye* as a focus adverb associates with the *wh*-item, specifically, with its domain argument, and we offer (44b) as the LF of (44a). The LF closely follows the analysis of free choice *any* as having a covert *even* associated with its domain argument (Crnič 2017, 2019b). In particular, we follow Crnič (2017) in assuming that the domain argument D of the *wh*-item can be separated from its existential part and interpreted between *ye* and EXH, as in (44b). In this way, D_F can be associated with *ye* above EXH, independently of its association with EXH. The LF thus improves on its previous version (38b) in that it makes explicit how *ye* is associated with the *wh*-item after the latter is exhaustified. As we will see, this allows EXH and *ye* to work with its own (possibly different) set of alternatives. Syntactically, since the *wh*-item appears above *ye* at the surface, this amounts to reconstructing its domain argument between *ye* and EXH, and the rest further below EXH, as in (44b).

(44) a. Shei ye bu shuohua.
who YE NEG speak
'Everyone was not speaking.'

b. LF: [~~who~~$_{[D_F]_F}$ [$ye_{C'}$ [D_F [3 [EXH$_{C^{EXH}}$ [who$_{[t_3]_F}$ [NEG speak]]]]]]]

As Xiang (2020) points out for a similar proposal for *wh-dou*, (44b) is a case of multiple association, which "requires D-alternatives to be used twice — once by the local exhaustifier, and once by the global focus-sensitive operator" (Xiang, 2020, fn. 36). Xiang

finds this feature problematic and uses it as an argument in favor of her treatment of *wh*/disjunction-*dou* where EXH is hardwired into *dou* and exhaustification coincides with focus association.

We do not consider multiple association an issue. Since *ye* is just a focus adverb and does not seem to inherently encode exhaustification (cf. (2d)), the *wh*-item would need to be "used twice" for exhaustification to be employed in analyzing *wh-ye*.

Moreover, there are cases of focus association that do involve multiple association (Krifka 1992, Rooth 1996, Wold 1996). An example from Rooth (1996) is given in (45a), where *WINE* is associated with both *only* and *also*. In fact, the LF with movement we assume in (44b) is exactly what Rooth suggests to ensure correct associations for such cases ("nested focus structures" as Rooth calls them). As we can see in (45b), moving $wine_F$ above *only* allows it to correctly interact with *also* in Rooth's system, where "all foci are bound by the first focus-interpretation operator they meet" (Rooth 1996, 287)[16].

(45) a. Last month John only drank beer. He has also only drunk WINE.

b. LF: $\text{also}_{C'}$ [wine_F 1 [have [only_C [John drunk [t_1]$_F$]]]]

Multiple association further allows us to capture an interesting observation from Sugimura (1992), who notes that universal-*wh*, *ye* and *dou* can co-occur, as in (46). In fact, it seems that for most *wh-ye*'s, an additional *dou* can be added without an obvious change of meaning, as shown in (47a) for our running example (44a). For such cases, multiple association, where the *wh* is associated with both *dou* and *ye*, seems inevitable. (47b) shows how (47a) can be analyzed under our account. In (47b), the domain of the *wh* moves first above EXH to be associated with *dou* (which according to Liao 2011, Liu 2017 is also an *even*-like adverb; see §3.6), and then across *dou* to be associated with *ye*.

(46) Shei ye dou mingbai, zhe-yiqie jiangyao fuchu duo-da-de daijia.
who YE DOU know these-all will pay how-big-DE price
'Everyone knows how big the price all these will take.' (Sugimura 1992, (11))

(47) a. Shei ye dou bu shuohua.
who YE DOU NEG speak
'Everyone was not speaking.'

b. LF: [~~who~~$_{[[D_F]_F]_F}$ [$ye_{C''}$ [D_F [2 [$dou_{C'}$ [[t_2]$_F$ [3 [$\text{EXH}_{C^{\text{EXH}}}$ [$\text{who}_{[t3]_F}$ [NEG speak]]]]]]]]]]

With the LF in (44b) (repeated in (48a)), we now show how *ye*'s prejacent is semantically composed. In (48a), the trace t_3 left by D_F is interpreted as a variable that is later bound by the index that D_F bears. As a result, the prejacent of EXH in ① is simply an assignment-dependent existential claim, which can be exhaustified into a universal statement as described in (38) (assuming that $who_{[t_3]_F}$ triggers subdomain alternatives,

16 We can also use indexed foci (Wold, 1996) to regulate associations, as in (i). We prefer (44b) using movement however, as there is indeed overt movement of the *wh* to the left of *ye* (see e.g. (17) and (39a)).

(i) LF of (44a): [~~who~~$_{D_{F1,F2}}$ [ye_1^{SCALAR} [EXH_2 [$\text{who}_{D_{F1,F2}}$ [NEG speak]]]]]

as specified in (43c)). The domain slot $g(3)$ in the universal statement in (48b) then gets abstracted over in (48c) and saturated by D, and we arrive at the ordinary semantic value of the prejacent of *ye* in (48d).

(48) a. LF of (44a): $[\overline{\text{who}_{[D_F]_F}}\ [ye_{C'}\ [_{③}\ D_F\ [_{②}\ 3\ [_{①}\ \text{EXH}_{C^{\text{EXH}}}\ [\text{who}_{[t_3]_F}\ [\text{NEG speak}]]]]]]]$

b. $[\![①]\!]^g = \forall x \in g(3)[\text{person}(x) \rightarrow \neg\text{speak}(x)]$

c. $[\![②]\!]^g = \lambda P \forall x \in P[\text{person}(x) \rightarrow \neg\text{speak}(x)]$

d. $[\![③]\!]^g = \forall x \in g(D)[\text{person}(x) \rightarrow \neg\text{speak}(x)]$ (Prejacent of *ye*)

e. $[\![③]\!]^g_{alt} = \{\forall x \in g(D)[\text{person}(x) \rightarrow \neg\text{speak}(x)] \mid D' \subseteq g(D)\}$ (Alternatives)

To see how *ye* enters the derivation, we need to consider: (i) the alternatives of D_F, which determine the set of propositions *ye* works with (i.e., the C' in (48a)), and (ii) which *ye* is involved (additive or scalar). Consider (i) first. As D_F is a domain argument, we assume that its alternatives are other domains. Furthermore, since a focused *wh*-item triggers subdomain alternatives as discussed in §3.1, it is natural to assume that D_F, as the domain argument of a *wh*-item, also triggers subdomain alternatives (see also Crnič 2017). This gives (48e) as the alternative semantic value of *ye*'s prejacent.

Regarding (ii), we need to determine which *ye* is involved and whether its presupposition can be satisfied with (48d) as the prejacent and (48e) as the alternatives. In view of the close connection between *wh-ye* and scales in positive sentences discussed in §2.3, we assume, following Sugimura (1992), Yang (2002) and Yang (2019), that the *ye* in *wh-ye* is a scalar-*ye*. In fact, there is reason to believe that it cannot be the additive-*ye*, which has an independence requirement that its prejacent and the antecedent be logically independent, illustrated by the infelicity of (49) (repeated from (8)). The requirement cannot be satisfied under the current setup, as *ye*'s prejacent in (48d) entails all its alternatives in (48e), making it impossible for the antecedent, no matter which alternative it is, to be logically independent of the prejacent.

(49) Wo qing-le Zhangsan, shijishang wo (#ye) qing-le [Zhangsan he Lisi]$_F$.
I invite-ASP Zhangsan, actually I also invite-ASP Zhangsan and Lisi
'I invited Zhangsan. I actually invited Zhangsan and Lisi (#too).'

On the other hand, scalar-*ye* does not require independence, as demonstrated in (50) (from (12)). It demands instead that the prejacent be less likely than all its alternatives. With the set in (48e), where the prejacent entails all other alternatives, the scalar presupposition can be easily satisfied, for likelihood respects entailment[17]. *Ye* is then predicted to be fine in (44)/(48). As correct universal truth conditions are also posited for (44)/(48), we seem to have an analysis of *wh-ye*.

17 That is, if p entails q, then p is also less likely than q, unless p and q are contextually equivalent (see e.g. Crnič 2019b). This means that the scalar presupposition is satisfied in any context where the prejacent is not contextually equivalent with its alternatives. The latter requirement is easy to satisfy in normal contexts.

(50) Bie shuo [liang-ge-ren]$_F$ le, (lian) [san-ge-ren]$_F$ ye zuo-de-xia.
Not say two-CL-person ASP LIAN three-CL-person even fit-can-into
'Two persons of course can fit into the car. Even three persons can.'

An important aspect that is currently missing from the account is an explanation for the restricted distribution of *wh-ye*. Specifically, since negation does not play any role in the analysis, it fails to explain *wh-ye*'s tendency to appear in negative sentences (consider removing negation from (48); the derivation would stay the same and *ye*'s scalar presupposition satisfied). Neither is the intuition that positive *wh-ye* are tied to scales reflected: the set of propositions based on subdomain alternatives can always form a partial order, with the prejacent of *ye* entailing the other alternatives, regardless of the scalarity of the *wh* or the polarity of the sentence.

3.3 *Wh-ye*: scalarity and total order

We propose that scalar-*ye* has a stricter scalar requirement, which constrains the distribution of *wh-ye* and captures its intuitive connection to scales. In fact, the requirement can already be detected by a closer comparison between (49) and (50). First consider why scalar-*ye* cannot be used in (49), that is, why (49) is outright unacceptable but cannot be interpreted as involving a scalar-*ye*. This is puzzling since (49) and (50) share the same logical profiles: in both cases, the second clause entails the first. If scalar-*ye*, as proposed in (13) (equivalent to (53) below without (iii)), presupposes (besides an additive presupposition that is satisfied in both cases) that its prejacent be less likely than its alternative in C and likelihood respects entailment, then (49) and (50) should be equally good with scalar-*ye*[18]. More specifically, in (49) since *I invited Zhangsan and Lisi* entails *I invited Zhangsan* and the two are not contextually equivalent, the former is unlikely than the latter (even without a probability measure salient in the context). Consequently, the prejacent of *ye* in (49) is indeed less likely than its (non-equivalent) alternatives, its scalar presupposition is satisfied and the sentence is predicted to be acceptable with a scalar-*ye*, contrary to fact.

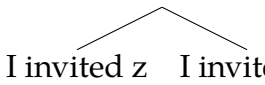
We propose that scalar-*ye*, in addition to the classical scalar presupposition, has a total order requirement that its associated set of alternatives be totally ordered[19]. This reflects the intuition that scalar-*ye* is indeed about scales and explains the contrast

18 There is a syntactic difference: the focus in (49) appears to *ye*'s right while in (50) to its left. This does not affect the point under discussion, as moving the focus in (49) to *ye*'s left does not save the sentence.

19 A total order is a partial order in which any two elements are comparable. We suspect that this may be a requirement for other *even*-like particles, as similar puzzles have been observed for English *even*, as shown in (i) from Greenberg (2016, (20)). Greenberg considers several accounts of (i), but finds them inadequate and uses (i) as evidence against the standard likelihood-based semantics of *even*. It remains to be seen whether total order can offer a new perspective. Interestingly, total order has also been used in Chierchia (2013) to regulate the choice between $O(nly)$-exhaustification and $E(ven)$-exhaustification, as shown in his Optimal Fit in (ii) (with O being our EXH). Thus, total order, according to Chierchia, also plays a role in the felicitous use of covert *even*.

between (49) and (50). Consider the two sets of alternatives in (51)[20]. Since in the first set *I invited z* and *I invited l* are not comparable by entailment and there is no salient probability measure in the context, the total order requirement is not satisfied as in (52a), and (49) is correctly predicated to be unacceptability with scalar-*ye*. In contrast, the alternative set for (50) is indeed totally ordered as in (52b) and hence scalar-*ye* is fine.

(51) a. {I invited Zhangsan, I invited Lisi, I invited Zhangsan and Lisi} (49)
b. {two persons can fit into the car, three persons can fit into the car} (50)

(52) a.


b.


The discussion above suggests the lexical entry of scalar-*ye* in (53), with total order incorporated.

(53) $[\![ye_C^{\text{SCALAR}} S]\!]^g(w)$ is defined only if there is a p in $g(C) \subseteq [\![S]\!]_{alt}$ such that
(i) $p \neq [\![S]\!]^g$ and $p(w)$=1, and (additivity)
(ii) $\forall q \in g(C)[q \neq [\![S]\!]^g \rightarrow [\![S]\!]^g <_{\text{likely}} q]$, and (scalarity)
(iii) $g(C)$ is totally ordered. (total order)
If defined, $[\![ye_C^{\text{SCALAR}} S]\!]^g(w) = 1$ iff $[\![S]\!]^g(w)$=1.

(53) imposes a stronger requirement than its previous version (13). We now explore the consequences of incorporating total order into the analysis of *wh-ye*. First, it turns out that total order allows us to understand the connection of positive *wh-ye* to scales, reflected by the empirical generalization we propose in §2.3 drawing on Yang (2019), repeated here in (54).

(54) ***Wh-ye*, negation and scalarity**
Wh-ye is always fine in negative sentences; in positive sentences, *wh-ye* requires the domain of the *wh* be construed as a scale.

To see total order help explain (54), specifically, its second part concerning positive sentences, we need to show that (i) total order can be satisfied by (at least some) positive sentences with ordered *wh*-items, and (ii) it cannot be satisfied by positive sentences with unordered *wh*-items. We establish (i) first. Specifically, we show that for *wh*-items whose domain can be construed as a scale, the corresponding set of sentential alternatives serving as input for *ye* can indeed be totally ordered. We illustrate this with (55).

(i) A: Bill drank tea or coffee.
B: He (#even) drank $[\text{tea}]_F$.

(ii) Optimal Fit (Chierchia, 2013, p. 153)
In exhaustifying ϕ, use O unless $O(\phi)$ is trivial (= contradictory or vacuous) and there is a salient probability measure μ. A probability measure μ is salient iff one of the following holds:
(a) μ is salient in the context (b) ALT is totally ordered by "$\subseteq$" (entailment)

20 In (51a) we assume that the individual conjuncts are alternatives to the conjunction. This is a standard assumption as they are simply the domain alternatives of the conjunction (Chierchia, 2013, p. 138).

(55) Shenme kunnan ye neng kefu.
what difficulty YE can overcome
'We can overcome any difficulty'.

a. LF: [$ye^{\text{SCALAR}}_{C'}$ [D_F [3 [$\text{EXH}_{C^{\text{EXH}}}$ [what$_{[t3]_F}$ difficulty [can overcome]]]]]]
b. Prejacent of *ye*: $\forall d \in g(D)$[we can overcome difficulty of degree d]
c. Alternatives: $\{\forall d \in D'$[we can overcome difficulty of degree d] $\mid D' \subseteq g(D)\}$
d. Downward scalarity: for any d, d' such that $d > d'$,
we can overcome difficulty of degree d entails *we can overcome difficulty of degree d'*

The LF of (55) is given in (55a), and we assume that *shenme kunnan* 'what difficulty' can be understood along a scale of difficulty. The prejacent of *ye*, after exhaustification, can then be represented as the universal statement in (55b), and its alternatives are the subdomain alternatives in (55c). For the set of alternatives in (55c) to be a total order, we need to show that any two subdomain alternatives are comparable. This is indeed the case, due to the fact that the predicate λd[we can overcome difficulty of degree d] is downward scalar (Beck and Rullmann, 1999), as shown in (55d). More specifically, given downward scalarity, a subdomain alternative with a domain D' (that is, $\forall d \in D'$[we can overcome difficulty of degree d]) is equivalent to the proposition that *we can overcome difficulty of degree d'* where d' is the maximal degree in D'. Consequently, any two subdomain alternatives with domains D' and D'' are comparable, as their maximal degrees and the corresponding propositions the comparable.

We now show (ii), that is, total order cannot be satisfied with an unordered *wh* under the current setting. This is demonstrated in (56) (from (28)). For illustration, let's assume *these children* refer to *a, b and c*. Then the prejacent and its alternatives are the conjunction in (56a) and its subdomain alternatives in (56b). Obviously, (56b) is not totally ordered, as smart(a) and smart(b) for instance are not comparable. (56) is correctly predicted to be unacceptable.

(56) ∗Zhe-ji-ge haizi, na-yi-ge ye hen congming.
this-several-CL child which-one-CL YE very smart
Intended: 'Everyone of these children is smart.'

a. Prejacent of *ye*: smart(a) ∧ smart(b) ∧ smart(c)
b. Alternatives: {smart(a), smart(b), smart(c), smart(a) ∧ smart(b), ∧smart(b) ∧ smart(c), ∧smart(a) ∧ smart(c), smart(a) ∧ smart(b) ∧ smart(c)}

To sum up, we have introduced total order as a presupposition of scalar-*ye*. This additional requirement has some desirable consequences. It explains a puzzling behavior of *ye* as a simple scalar adverb, and captures the intuitive link between positive *wh-ye* and scales. However, it turns out that total order yields an undesirable result for (44), the prime example we successfully analyzed in (48).

(44), a typical example of negative *wh-ye*, is repeated in (57). Its LF and *ye*'s prejacent stay the same as in (44)/(48). However, under the assumption that D_F triggers

all its subdomain alternative (cf. the discussion of (48e)), scalar-*ye*'s total order presupposition cannot be satisfied, for exactly the same reason that it is not in (56)[21]. (57a) is thus incorrectly predicated to be infelicitous. In other words, total order, as a way to constrain *wh-ye*'s distribution, does too much, and it fails to capture the fact that negative *wh-ye* need not refer to scales.

(57) a. Shei ye bu shuohua.
who YE NEG speak
'Everyone was not speaking.'

b. LF: $[ye^{\text{SCALAR}}_{C'}$ [D_F [3 [$\text{EXH}_{C^{\text{EXH}}}$ [$\text{who}_{[t3]_F}$ [NEG speak]]]]]]

c. Prejacent of *ye*: $\forall x \in g(D)[\text{person}(x) \rightarrow \neg\text{speak}(x)]$

d. Subdomain alternatives: $\{\forall x \in g(D)[\text{person}(x) \rightarrow \neg\text{speak}(x)] \mid D' \subseteq g(D)\}$
(Total order not satisfied)

3.4 Two-point scale, domain widening and negative bias

We propose that there is another way for (57) to satisfy total order, namely, by contextually restricting the set of alternatives C' relevant for the interpretation of *ye* to a set of exactly two propositions, as in (58). Since there is an entailment relation between the two elements, the set is totally ordered and constitutes a two-point scale. The option is legitimate, because C' is only required, as is standard in Roothian alternative semantics, to be a subset of the focus semantic value of *ye*'s prejacent (i.e. the set in (57d)) and is subject to contextual pruning. Furthermore, the move need not affect the lower exhaustification process, since the domain of EXH (i.e. C^{EXH} in (57b)), also required to be a subset of the (pre-exhaustified) alternatives of its prejacent, can be set independently of C', even if D_F and $_{[t3]_F}$ might have the same focus semantic value.

(58) **Two-point scale**
$g(C') = \{\forall x \in D'[\text{person}(x) \rightarrow \neg\text{speak}(x)], \forall x \in g(D)[\text{person}(x) \rightarrow \neg\text{speak}(x)]\}$,
where $D' \subset g(D)$

Next, we suggest that (58) is a case of domain widening (Kadmon and Landman 1993)[22]. It is used in a context where the speaker proposes to widen the domain of the *wh*-item under discussion to a larger set of entities, including those that were not previously considered relevant. The idea is similar to what Zanuttini and Portner (2003) propose for *wh*-exclamatives (e.g. *what things he eats!*), which, like *wh*-interrogatives, denote a set of true propositions (Karttunen, 1977), but also trigger domain widening to

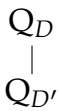
21 Assume that there are exactly three persons a, b and c in the model. The prejacent in (57c) is equivalent to $\neg\text{speak}(a) \wedge \neg\text{speak}(b) \wedge \neg\text{speak}(c)$, and its set of subdomain alternatives in (57d) is $\{\neg\text{spk}(a), \neg\text{spk}(b), \neg\text{spk}(c), \neg\text{spk}(a) \wedge \neg\text{spk}(b), \neg\text{spk}(a) \wedge \neg\text{spk}(c), \neg\text{spk}(b) \wedge \neg\text{spk}(c), \neg\text{spk}(a) \wedge \neg\text{spk}(b) \wedge \neg\text{spk}(c)\}$. The set is obviously not totally ordered.

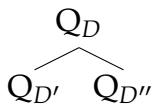
22 See also Fălăuş and Nicolae (2022) for using domain widening to explain the presence of an additive particle in a class of Romanian free choice items.

convey that the true answers include the extreme cases (hence the exclamatory effect). Similarly, Den Dikken and Giannakidou (2002) propose that *wh-the-hell* phrases (e.g. *who on earth*) involve domain widening, and thus are "aggressively non-D-linked", expressing a sense of extreme ignorance, that is, "the speaker has exhausted all reasonable answer alternatives and, being at a loss, considers more than the usual possibilities" (Eckardt and Yu, 2020). Collectively, these accounts suggest that *wh*-items can easily be widened, supporting our proposal that (58) involves widening of the *wh*'s domain.

Domain widening from this perspective differs from subdomain alternatives (see also Iatridou and Zeijlstra 2021 for making the distinction). The latter, described as "anti-domain-restriction" in Jeong and Roelofsen (2022), has been used to account for polarity-sensitive items like *any*/*ever* (e.g. Krifka 1995, Chierchia 2013), which do not necessarily involve actual widening as a pragmatic process and do not always sound emphatic. In contrast, domain widening as we propose for *wh-ye* does correspond to actual widening of a contextually salient domain. The distinction can be illustrated schematically in (59): (59a) is a case of domain widening while (59b) involves subdomain alternatives. Clearly, only (59a) totally ordered.

Furthermore, we propose that the kind of domain widening involved here operates though QUDs. Concretely, we take the D' in (58), i.e. the domain of the single alternative to the prejacent of *ye* in (58), to be the domain of the QUD immediately before the assertion of the *ye*-sentence. This is depicted in (59a), representing a case where the speaker proposes to change the current QUD $Q_{D'}$ to a new one Q_D, with a wider domain.

(59) a. 

b. 

Assuming that QUDs are the same semantic objects as questions (Roberts 2012), we can draw an analogy between widening of QUDs and similar phenomena observed with actual interrogative sentences. Specifically, we suggest that interrogatives with minimizers/maximizers, which according to van Rooij (2003) also involve widening, are a parallel case at hand. Crucially, as demonstrated in (60), these interrogatives exhibit a negative bias, which we suggest also occurs with QUD widening of the type shown in (59a) and underlies *wh-ye*'s negative preference. In the following, we briefly show how the negative bias of interrogative with minimizers[23] is captured in Jeong and Roelofsen (2022) (building on van Rooij 2003), and then extend the idea to QUD widening and *wh-ye*.

(60) a. Did John lift a finger to help Mary? $\rightsquigarrow$ John did not help.
b. Who lifted a finger to help Mary? $\rightsquigarrow$ Nobody helped.
c. Would you, in a million years, do that? $\rightsquigarrow$ You would not.
d. Who would, in a million years, do that? $\rightsquigarrow$ Nobody would.

23 Maximizers like *in a million years* are not discussed in Jeong and Roelofsen (2022), but as pointed out in van Rooij (2003, p. 259) and clear from the discussion below, they can be analyzed in the same way.

First, Jeong and Roelofsen (2022) assume with Krifka (1995), Chierchia (2013) and many others that a minimizer denotes a minimal degree d_{min}, activates other (higher) degrees as alternatives, and contains a covert EVEN. In interrogatives with minimizers, EVEN scopes over the entire question, and thus its prejacent has a set of questions as its alternatives. In (60a) for instance, the set of questions that serves as the input for EVEN is $\{$*Did John help Mary to some degree d*? $\mid d > d_{min}\}$.

Next, EVEN is proposed to have an additive requirement that a salient alternative be resolved in the speaker's doxastic state. In (60a), the requirement is that the question *Did John help Mary to* d_c? (d_c being the contextually salient threshold for being helpful) is resolved (either positively or negatively) in the speaker's doxastic state. That is, the speaker must believe either the positive or the negative answer to this alternative issue.

Finally, pragmatic reasoning leads to the inference that the speaker must believe the negative answer. This is because if the speaker believed the positive answer (i.e. *John helped to* $d_c \approx$ *John helped*), she would also believe the positive answer to the question she actually asked (i.e. *Did John lift a finger?*), for the former entails the latter answer (i.e. *John helped to* d_c entails *John helped to* d_{min}), and this would make the interrogative with the minimizer pointless and inappropriate. In other words, for the interrogative in (60a) to be felicitously asked, the alternative issue, roughly *Did John help Mary?*, need be resolved negatively, and this leads to the negative bias that John didn't help Mary.

We find the above account appealing and suggest that similar things occur with the domain widening of QUDs with *wh-ye* as described in (59a). Specifically, we propose that pragmatic reasoning on the speaker's act of widening $Q_{D'}$ leads to the inference that the speaker believes a negative answer to $Q_{D'}$. This negative inference would then clash with a positive universal statement, and thus *wh-ye* through domain widening prefers to appear in negative sentences. In this way, we reduce the negative preference of *wh-ye* to the negative bias of domain widening. We now spell out the details of this account.

First, an important step in the derivation of negative bias in interrogatives, as we saw above, is the assumption that a contextually salient alternative issue regarding a non-extreme degree/unwidened domain is resolved in the speaker's doxastic state. This is achieved by the additive requirement of EVEN that comes with the minimizer in Jeong and Roelofsen (2022). In the case of *wh-ye* with widening, we can also assume that the QUD before widening (i.e. $Q_{D'}$) is always resolved in the speaker's doxastic state. This is because as the speaker asserts a sentence with *wh-ye*, she is essentially making a universal statement ($\forall$ or $\forall > \neg$ depending on whether negation is present), which means that her doxastic state entails such a universal statement and hence must be one where the QUD is resolved (positively or negatively), regardless of whether it is widened. In other words, the resolution assumption simply follows from the quality implicature of asserting a sentence with *wh-ye*. In addition, widening of QUDs as a pragmatic move is subject to constraints on discourse, a natural one being (61), which will force the QUD to be resolved, at least in the speaker's doxastic state, before a widened one is attended to.

(61) Relevance:
Stick to a question until it is sufficiently resolved. (Büring 2003, p. 517)

Second, we need be more specific about the types of QUDs that can appear in the kind of widening described in (59a), as not all widened interrogatives exhibit negative bias. Consider interrogatives with minimizers/maximizers again. As demonstrated in (60), both polar and *wh*-questions can convey negative bias. There is a difference though. Polar questions always trigger negative bias, as can be seen from the earlier discussion of (60a). In contrast, Jeong and Roelofsen (2022) point out that negative bias is expected to only arise with *wh*-questions that are interpreted non-exhaustively. This is because, if a *wh*-question (e.g. *who lifted a finger to help Mary?*) receives an exhaustive interpretation, a positive resolution to the contextually salient alternative issue (e.g. *Bill help Mary to* d_c) would not necessarily resolve the actual question that was asked (i.e. *Who helped Mary to* d_{min}*?*). In other words, *wh*-questions with minimizers/maximizers under exhaustive readings can be sincerely asked even if their contextually salient issues are resolved non-negatively, and thus no negative bias is derived. This differs from non-exhaustive (also called mention-some) *wh*-questions, where a positive resolution to a non-extreme/unwidened question indeed entails a non-exhaustive positive answer to the extreme/widened question.

We suggest that domain widening as described in (59a) always involves a non-exhaustive interpretation of the QUD after widening (i.e. Q_D). This is because, as depicted in (59a), the added part, i.e. $D \backslash D'$, does not have its own QUD in the discourse tree (due to the total order requirement; cf. D'' in (59b)). We take this to mean that the identities of the entities in $D \backslash D'$ are not relevant for the current question, and hence an exhaustive specification of the entities in D that have the inquired property is not required. In other words, Q_D is not interpreted exhaustively.

After establishing that in (59a) the unwidened $Q_{D'}$ is resolved in the speaker's doxastic state and that the QUD after widening, i.e. Q_D, is either a polar or non-exhaustive *wh*-question, we can apply a similar line of reasoning as discussed earlier with interrogatives featuring minimizers. Specifically, since a positive resolution to $Q_{D'}$ also resolves Q_D, interpreted non-exhaustively in (59a), the widening would be pointless if the speaker already believed the positive resolution to $Q_{D'}$. Therefore, given that $Q_{D'}$ is resolved in the speaker's doxastic state, she must believe the negative resolution, namely, a *no* answer for polar questions and *on one* for *wh*-questions. In other words, QUD widening of type shown in (59a) results in a negative inference that $Q_{D'}$ is resolved negatively. This actually aligns well with the intuitive idea that the speaker proposes to widen the domain only if an appropriate (say positive) answer cannot be found in the current QUD (cf. Den Dikken and Giannakidou 2002).

We can now demonstrate how the negative bias induced by QUD widening offers an explanation for *wh-ye*'s negative preference. Specifically, we will show that, under plausible assumptions regarding the relation between a sentence and its potential QUDs, only negative sentences with *wh-ye* are compatible with the negative bias triggered by QUD widening.

First consider *wh-ye* in negative sentences. In (62), the LF and the meaning for *ye*'s prejacent are as before. As the *wh*-item is not inherently ordered (see §3.3), the

alternative set C' that serves as input for *ye* needs to be contextually restricted to the two-point scale in (62d) to satisfy *ye*'s total order requirement. Next, we assume that the two-point scale represents QUD widening and the relevant QUDs are *Who were speaking in* D'/D (under a non-exhaustive reading), as in (62d). As discussed above, the widening triggers a negative bias that Q'_D is resolved negatively in the speaker's doxastic state, that is, no one was speaking in D'. The negative inference is compatible with (and entailed by) the assertion, and thus the sentence is predicted to be fine, with both scalar-*ye*'s presupposition and the pragmatics of domain widening satisfied.

(62) a. Shei ye bu shuohua.
who YE NEG speak
'Everyone was not speaking.'

b. LF: $[ye^{\text{SCALAR}}_{C'}$ [D_F [3 [$\text{EXH}_{C^{\text{EXH}}}$ [$\text{who}_{[t3]_F}$ [NEG speak]]]]]]

c. Prejacent of *ye*: $\forall x \in g(D)[\text{person}(x) \rightarrow \neg\text{speak}(x)]$

d. $g(C') = \{\forall x \in D'[\text{person}(x) \rightarrow \neg\text{speak}(x)], \forall x \in g(D)[\text{person}(x) \rightarrow \text{speak}(x)]\}$, where $D' \subset g(D)$

e. QUD widening: Q_D: who were speaking in D?
|
$Q_{D'}$: who were speaking in D'?
Negative bias: no one was speaking in D'.

For positive *wh-ye*, the situation is different. As (63) shows, for the scalar presupposition of *ye* to be satisfied, the assertion would be the (positive) $\forall$-statement in (63c), which would be incompatible with the negative bias triggered by the QUD widening in (63e)[24]. Consequently, the two-point scale in (63d) is not authorized. As the *wh* is not ordered either, *ye*'s total order requirement is not met and (63a) is correctly predicted to be unacceptable.

(63) a. *Shei ye zai shuohua.
who YE be speak
Intended: 'Everyone was speaking.'

b. LF: $[ye^{\text{SCALAR}}_{C'}$ [D_F [3 [$\text{EXH}_{C^{\text{EXH}}}$ [$\text{who}_{[t3]_F}$ [speak]]]]]]

c. Prejacent of *ye*: $\forall x \in g(D)[\text{person}(x) \rightarrow \text{speak}(x)]$

24 Clemens Mayr (*NLS* editor) points out correctly that the proposed negative bias also conflicts with *ye*'s additive presupposition, which requires everyone in D' to be speaking, and wonders whether the additive presupposition might actually prevent the emergence of the negative bias in the first place. We suggest that the negative bias is a calculable obligatory implicature (potentially a manner implicature due to the speaker's act of widening the QUD), and its conflict with the meaning of the *wh-ye* sentence, whether in terms of its assertion or presupposition, would result in deviance. Furthermore, several recent proposals (e.g. Szabolcsi 2017, Fălăuş and Nicolae 2022) argue that the standard additive presupposition of (scalar) additives is not inherent to the particles but derived from obligatory exhaustification. From this perspective, the conflict between the negative bias and the additive "presupposition" can been seen as a clash of implicatures. We appreciate the editor's valuable comment, and hope to study the precise nature of the negative bias and the additive presupposition in future work.

d. $g(C') = \{\forall x \in D'[\text{person}(x) \rightarrow \text{speak}(x)], \forall x \in g(D)[\text{person}(x) \rightarrow \text{speak}(x)]\}$, where $D' \subset g(D)$

e. QUD widening: Q_D: who were speaking in D?
$Q_{D'}$: who were speaking in D'?
Negative bias: no one was speaking in D'.

3.5 QUD asymmetry and the negative preference of *wh-ye*

An implicit assumption was made in the above explanation, namely that both (62a) and (63a) have the same positive question, i.e. *who were speaking?*, as their QUD. This is crucial, because if the negative (62a) can *only* have a negative QUD (i.e. *who weren't speaking in D?*), the bias triggered (*no one wasn't speaking in D'*) would be incompatible with the assertion, leading to an incorrect prediction that (62a) is unacceptable. Similarly, if the positive (63a) can have a negative QUD (i.e. *who weren't speaking in D?*), the bias would align with the assertion, resulting in an incorrect prediction that (63a) is acceptable.

To avoid these undesirable results, we propose that while negative sentences can easily come with positive QUDs, positive sentences in general do not have negative QUDs. We argue that this follows from plausible assumptions concerning the relation between a sentence and its possible QUDs, in particular, the assumption that the alternative semantic value of a declarative sentence must be a superset of its QUD taken as a set of Rooth-Hamblin alternatives (Rooth 1992, Beaver and Clark 2008). For concreteness, we adopt the Focus Principle in (64) from Beaver and Clark (2008, p. 37) (cf. the *question-answer constraint* in Rooth 1992, p. 86).

(64) Focus Principle:
Some part of a declarative utterance should evoke a set of alternative containing all the Rooth-Hamblin alternatives of the CQ.

According to the Focus Principle, negative sentences can indeed have positive QUDs, as negation can be focus marked, allowing sentences without negation in the alternative set[25]. Conversely, no constituent can be focused in positive sentences to activate their negative alternatives, and thus no negative QUD is possible for them. The distinction is illustrated in (65).

25 There are other options. For instance, the alternative set could be built below and without negation, as Rooth (1996, §5.1) and Beaver and Clark (2008, §3.2) propose for the "focus sensitive" negation in (66). A Roothian LF for (66b) under this treatment would be $[\text{NEG}\ [\text{I}_F\ \text{took your car}]^{\sim}_C]$, with the focus evaluated below ¬. Rooth's solution is not adopted for *wh-ye* because it requires negation to scope over the focus, but as we saw in §3.1, there are cases of negative *wh-ye* where negation cannot scope over the *wh*. Alternatively, we could adopt the structure-based theory of alternatives in Fox and Katzir (2011), where positive alternatives without negation are deletion-alternatives. It is worth noting that under both of these accounts, positive sentences do not readily activate negative alterantives, in line with the treatment assumed in the main text.

(65) a. LF of negative *wh-ye*: $[ye^{\text{SCALAR}}_{C'}\ [_{①}\ D_F\ [\ 3\ [\ \text{EXH}_{C^{\text{EXH}}}\ [\text{who}_{[t3]_F}\ [\ \text{NEG}_F\ \text{speak}]]]]]]$

b. $[\![①]\!]_{alt} = \{\forall x \in D'[\text{person}(x) \rightarrow \neg\text{speak}(x)],$
$\forall x \in D'[\text{person}(x) \rightarrow \text{speak}(x)] \mid D' \subseteq g(D)\}$

c. LF of positive *wh-ye*: $[ye^{\text{SCALAR}}_{C'}\ [_{②}\ D_F\ [\ 3\ [\ \text{EXH}_{C^{\text{EXH}}}\ [\text{who}_{[t3]_F}\ [\ \text{speak}]]]]]]$

d. $[\![②]\!]_{alt} = \{\forall x \in D'[\text{person}(x) \rightarrow \text{speak}(x)] \mid D' \subseteq g(D)\}$

Specifically, under this view, the LF of the negative *wh-ye* sentence in (62) becomes (65a), which explicitly shows how the positive QUD is licensed. In (65a), the negation is focus marked, triggering the identity function, which shares the same semantic type as negation, as its alternative. Hence, the alternative semantic value of *ye*'s prejacent, which we assume determines the QUD, includes both negative and positive propositions, as in (65b)[26]. Obvisouly, the set in (65b), which contains propositions like *John was speaking* (by letting $D' = \{\text{John}\}$), is a superset of the Rooth-Hamblin alternatives of *who were speaking?*. The Focus Principle is thus satisfied and the positive QUD licensed.

In contrast, the positive *wh-ye* sentence in (63), as indicated by its LF in (65c) (identical to (63b)), lacks an overt expression that can be focus marked and trigger negative alternatives (see also fn. 25). Consequently, its alternative semantic value, as given in (65d), is not a superset of the meaning of *who weren't speaking?*. According to the Focus Principle, the sentence therefore cannot have the negative question as its QUD.

Empirically, there does seem to be evidence that negative sentences can naturally have positive QUDs. Consider (66), which involves the so-called "focus sensitive" negation (Jackendoff, 1972). Intuitively, the negation in (66) only targets the focused content, with the rest of the sentence unaffected: (66a) still conveys that I took something of yours and (66b) that someone took your car.

(66) a. I didn't take your car_F.

b. I_F didn't take your car.

A widely accepted account of (66) by Rooth (1996) uses precisely the idea that negative sentences can be associated with positive QUDs. Specifically, (66a) can have *what did you take from me?*, while (66b) *who took your car?* as as their QUDs. Assuming that a speaker normally believes that there is a true answer in the (Hamblin) denotation of the question under discussion, such QUDs would implicate *I took something of yours* and *someone took your car*, for (66a) and (66b) respectively, and thus explain the intuition and capture "focus sensitive" negation.

Turning now to positive sentences, the question-answer pair in (67) (offered by Clemens Mayr) seems to suggest that positive sentences can also have negative QUDs. We believe, however, that (67) is subject to an alternative account. Specifically, (67A) might still have *who passed?* as its QUD, and the answer involves an implicit shift of QUDs, in the sense that the speaker expresses her ignorance regarding the question

26 It is worth highlighting that enriching the alternative semantic value of *ye*'s prejacent need not affect the value of C', the actual input for *ye*, since C' is only required to be a subset of the former.

actually asked and tries to address a different but related question. In other words, (67) does not offer decisive evidence for positive sentences with negative QUDs.

(67) Q: Who didn't pass?
A: I_F passed.

On the other hand, we do not intend to completely dismiss the possibility of positive utterances with negative QUDs. We suggest such cases could arise under special contexts (cf. the idea of contextually salient objects being alternatives in Fox and Katzir 2011). In the case of *wh-ye*, the story based on QUD widening predicts that positive *wh-ye* sentences should be possible in these contexts. An interesting contrast reported by Zhang (2021, p. 52) provides support for this prediction. In (68), the same positive *wh-ye* sentence is judged unacceptable in (68a) by Zhang (2021), but is improved in (68b) with appropriate contextual support[27].

(68) a. *Shenme ye maidao-le.
what YE buy-PERF
Intended: '(We) bought everything.'

b. Shangdian shuo huoyuan bu-zu, danshi women qu-le yihou,
store say supply NEG-sufficient but we go-PERF after
shenme ye maidao-le.
what YE buy-PERF
'The store says there is insufficient supply. But after we got there, we bought everything.'

What is special about (68b) is that the preceding utterance creates an expectation that there were things that the speaker didn't buy. We propose that this makes the question *what didn't you buy?* salient, serving as the QUD for the following positive *wh-ye* sentence. Due to the negative QUD, the bias triggered by QUD widening (i.e. *we bought everything in D'*) is compatible with the positive assertion, correctly predicting its acceptability. The explanation also fits nicely with the intuition that Zhang (2021) uses (68) to highlight, that is, *wh-ye* expresses contrast and unexpectedness (see also Yuan 2004). In our account, the intuition is captured by the contrast between *wh-ye* and its QUD of the opposite polarity, as well as the resulting existential inference, namely that there is a true answer in the Hamblin-Roberts QUD.

While we acknowledge the possibility of positive sentences with negative QUDs, it is important to emphasize that such cases still constitute an apparent violation of the Focus Principle, and are thus, as the contrast between (68a) and (68b) indicates, dispreferred and typically require special contextual support. Therefore, there is still an asymmetry between positive and negative sentences regarding their potential QUDs,

27 While our consultants all agree there is a contrast between (68a) and (68b), some find it not as sharp as Zhang (2021) claimed. Specifically, some speakers indicate that (68a) is not entirely unacceptable while a few judge (68b) less natural. We hypothesize that the variation may be attributed to the varying levels of ease or difficulty among speakers in accommodating negative QUDs for positive *wh-ye* sentences.

and our account of the positive-negative asymmetry of *wh-ye* (that is, its negative preference) is not undermined[28]. We now summarize this account.

We first proposed in §3.1 that the *wh*-items in *wh-ye* (and Mandarin universal *wh*'s in general) are not NPIs but existential quantifiers exhaustified (freely, due to the absence of scalar alternatives) into universals. This captures the fact that universal *wh*'s do not need to appear below negation, but leaves the negative preference of *wh-ye* unexplained. We then proposed in §3.2-3 that *ye* is associated with the domain of the *wh*, and as a scalar adverb it has a total order requirement. To satisfy total order, either the *wh*-item needs to be inherently scalar like *how many*/*much*, or its domain under discussion must be (strictly) widened to form a two-point scale. Furthermore, we proposed in §3.4 that the type of widening involved here operates through QUDs, and analogous to widening in interrogatives with minimizer/maximizers, it triggers a negative bias. Finally, we argued in §3.5 that negative *wh-ye* can naturally have positive QUDs and thus are compatible with the negative bias due to QUD widening. In contrast, positive *wh-ye* because of the Focus Principle have generally only positive QUDs, and are thus incompatible with the negative bias. The positive-negative asymmetry is thus explained.

In a nutshell, negative *wh-ye* can always rely on domain widening to satisfy *ye*'s presupposition, but in positive sentences, because of the clash between the bias triggered by widening and the assertion, domain widening is usually not possible and thus a scalar interpretation of the *wh* is required. This explains the empirical generalization concerning *wh-ye*, negation and scalarity proposed in (31)/(54).

3.6 *Wh-dou*

We brief demonstrate how *wh-dou* can be analyzed within the approach developed in this paper. First, recall that *wh-dou*, unlike *wh-ye*, is not constrained. This is expected if *wh-dou* is treated analogous to *wh-ye* but *dou* has a weaker requirement. A proposal of this kind is explored in Liu (2019), who follows Liao (2011) and Liu (2017) in assuming that *dou* is uniformly an *even*-like adverb, and in *wh-dou* it carries a presupposition that its prejacent entails all the other alternatives. Recursive exhaustification is then needed to turn the *wh*-item as an existential quantifier into a universal to satisfy *dou*'s presupposition, as is done in the current paper. Crucially, since there is no extra total order requirement for *dou*, *wh-dou* is predicted to be less restricted than *wh-ye*.

A related fact is that free choice disjunction is fine with *dou* but impossible with *ye* (without an additional additive/scalar interpretation; see (2d)). This can also be captured: the subdomain alternatives of a disjunction do not naturally form a totally

28 Further research is needed to investigate the possibility of positive sentences with negative QUDs and their specific contextual requirements. If it turns out that (67) (i.e. I_F *passed*) does involve a negative QUD, as suggested by Clemens Mayr, and ordinary question-answer pairs are not constrained by the Focus Principle as stated in (64), we can still maintain the current analysis, by directly building a version of (64) into the semantics of *ye*. Specifically, we can add into the lexical entry of *ye* an additional requirement stating that $[\![ye_C S]\!]^g$ is defined only if QUD $\subseteq [\![S]\!]_{alt}$. By doing so, we can preserve the asymmetry predicted by the Focus Principle solely for *wh-ye* sentences.

ordered scale; if we further assume that domain widening (i.e. contextually restricting the alternative set to a two-point scale) is limited to *wh*-items, then the total order requirement of *ye* cannot be satisfied with disjunction in the same way as it is with *wh*'s.

4 Conclusion

The paper provided a comprehensive analysis of Mandarin universal-*wh*'s in construction with the additive/scalar adverb *ye*. A novel generalization was proposed that combines the negative preference of *wh-ye* with its scalar flavor in positive environments. An compositional account was also presented, where the universal force is derived from exhaustification of the domain alternatives triggered by *wh*-items under stress, and the negative preference of *wh-ye* is explained by the interaction between *ye*, QUDs and domain-widening.

Compared to the well-known *wh-dou*, Mandarin *wh-ye* is a rather understudied pattern. By examining its empirical properties and offering a concrete proposal, the paper thus contributes to the discussion of *wh*-quantification in Mandarin, and enriches the current empirical picture of *wh*-based polarity sensitive expressions and free choice quantification across languages.

Going forward, there are several questions and open issues. One question is why the focus adverb *dou*/*ye*, in addition to focus, is necessary for Mandarin *wh*'s to express a universal meaning. For instance, why is it that (69a), which lacks *dou*/*ye* but has stress on *who*, cannot be exhaustified into a ∀-statement?

(69) SHEI (dou/ye) mei lai
who DOU/YE NEG come
a. Without *dou*/*ye*: 'Who did not come?' NOT: 'Everyone didn't come.'
b. With *dou*/*ye*: 'Everyone didn't come.'

While we currently lack a definitive answer to this question, it is worth noting that Mandarin *wh*-items used as question words also require stress (e.g. Dong 2009, Yang et al. 2020). Recently, Hengeveld et al. (2021) propose that question words cross-linguistically require stress because they need to receive contrastive focus to signal the presence of contrasting resolutions to the question. This, together with the results of the present paper, suggests that Mandarin *wh*-items can in fact receive two types of focus: contrastive focus and domain focus. The presence of *dou*/*ye* can then be viewed as a disambiguating factor, indicating the intention of domain focus (perhaps syntactically agreeing with it) and thereby suggesting a non-interrogative interpretation. We hope to work out the details of this solution in future research and investigate in more detail the roles stress, focus and focus sensitive particles play with *wh*-items.

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