Quantifier Float does not Affect Semantic Scope: An Experimental Investigation

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Abstract

This paper reports on an experimental study of semantic scope in the context of quantifier float (Q-float) in Arabic. The results of an off-line acceptability judgment task (n = 31) indicate that Q-float does not affect quantifier scope with respect to negation, and reveal that the scope of floating quantifiers is not restricted to their surface structure, contra much work (e.g., Dowty and Brodie 1984; Bobaljik 2003, Payne 2011) which primarily derived its evidence from Indo-European languages. The study leads to the conclusion that recent correlation between Q-float and Q-raising is not correct (e.g., Jenks 2013), and that some other analysis of Q-float needs to be proposed.

Keywords Quantifier Float, Semantic Scope, Arabic, Experiment

1   Scope Shifting in Q-Float Constructions

Dowty and Brodie (1984), McCawley (1988), Deprez (1994), Bobaljik (2003), Payne (2011), and others note that the scope of floating quantifiers (FQs) is restricted to their surface position, while the quantifiers that are part of DPs may undergo scope changing operations; thus, in (1b), in which Q-float has applied, the universal quantifier cannot outscope modality. [1]

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[1]Dowty and Brodie (1984), Bobaljik (2003), and others note, however, that there are exceptions to this rule. FQs seem to be able to take scope under a following negation only if negation follows a finite auxiliary. Thus, examples like (1) are ambiguous.

(1)   The contestants all didn't win. $\forall > \neg, \neg > \forall$ (Bobaljik 2003, (47))

(1) (Bobaljik 2003, (46))

    a. All the contestants could have won. $\Diamond > \forall, \forall > \Diamond$

    b. The contestants could have all won. $\Diamond > \forall, \ast\forall > \Diamond$

More recently, Simpson (2011) and Jenks (2011, 2013) note that, at least in Thai, quantifier float lowers the scope of the subject below negation, and raises the scope of the object above negation, which amounts to what has previously been noticed, that scope in Q-float constructions is read off the surface structure. Jenks (2013) brings evidence for lowering effects of Q-float from the indefinite quantifier *sák* which cannot occur in the subject position in Thai, as shown in the pair below:

(2) (Jenks 2013, 95, (17); adapted)

    a. *nák-riian sák-khon   yaŋ mâj kin khâaw
       student   even-one-CLF still NEG eat rice
       'Not even one student has eaten.' (Intended) $\forall > \neg, \ast\neg > \forall$

    b. ʔaacaan yaŋ mâj tii nák-riian sák-khon
       teacher still NEG hit student   even.one-CLF
       'Teachers haven't hit even one student.' $\forall > \neg, \neg > \forall$

                                                          (Thai)

However, if *sák* is hosted in a QP involving Q-float, it becomes acceptable in the subject position, and may give an NPI reading.

(3) nák-riian yaŋ mâj kin khâaw sák-khon
    student   still NEG eat rice   even.one-CL
    'Not even one student has eaten.' (Jenks 2013, 95, (18); adapted)

Jenks takes this to indicate that it is Q-float that allows the subject to survive and scope below negation. On the other hand, he claims that Q-float with objects shows the opposite; it raises the scope of the quantifier above negation. While the non-floating construction in (4a) disallows a high scope reading of the universal quantifier, the floating version does (4b):

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(4) (Jenks 2013, 95, (20); adapted)

    a. Joe mâj phóp nákriian thúk-khon mûuawaanníi
       Joe NEG meet student every-CLF yesterday
       'Joe didn't meet all of the students yesterday.' $*\forall > \neg, \neg > \forall$

    b. Joe mâj phóp nákriian mûuawaanníi thúk-khon
       Joe NEG meet student yesterday   every-CLF
       'Joe didn't meet all of the students yesterday.' $\forall > \neg, \neg > \forall$

I observe the same facts in Modern Standard Arabic (MSA). Floating of the quantifier *aħad* 'someone' when it occupies a subject position results in lowering of the scope of the quantifier below negation. Sentence (5a) which involves no Q-float does not allow negation to outscope *aħad*. It is impossible for the sentence to mean that: there does not exist x such that x is a student and x attended the class. The only possible meaning is: there exists x such that x is a student and x did not attend the class. The floating version in (5b), however, admits both readings: a high and low scope readings of *aħad*.

(5)   a. *aħadu alTullab   lam yaħdar aldarsa
       one   the.students NEG attend the.class
       'Not even one student attended the class.' (intended) $\exists > \neg, *\neg > \exists$

    b. alTullab   lam yaħdar aldarsa aħad-u=hum
       the.students NEG attend the.class one-NOM=3MPL
       'Not even one student attended the class.'

       'One of the students did not attend the class' $\exists > \neg, \neg > \exists$

                                                      (MSA)

Furthermore, as in Thai, Q-float from the object position appears to raise the scope of the object. A quantifier that is hosted by an object QP may not outscope negation, unless it undergoes Q-float, as exemplified in the pair below. In (6a), the reading where the universal quantifier *kulla* takes a wide scope is blocked. The only reading available is: it is not the case that for all x, such that x is a student, Ali met x, meaning that Ali met some students but not all of them. Compare this sentence to the floating version in (6b) which is ambiguous. In addition to the reading in (6a), this sentence allows the universal quantifier to outscope negation, thus the sentence can mean: for all x such that x is a student, it is not the case that Ali met x.

(6)   a. Ali lam   yuqabil kulla altullab
       Ali NEG meet   all   the.students

'Ali did not meet all the students.' $*\forall > \neg, \neg > \forall$

 b. Ali lam yugabil altuallaba kullu=hum
   Ali NEG meet   the.students all-ACC=3MPL
   'Ali did not meet any students.'

   'Ali did not meet all the students.' $\forall > \neg, \neg > \forall$

                     (MSA)

2 New Counter Claim

More recently, Chaiphet (2017) shows that there are various issues with the observation made by Jenks (2013) and indicates that the judgments that Jenks hinges on are not firm, (as was actually admitted by Jenks himself). Based on an (informal) empirical investigation which involved 15 speakers (including himself), Chaiphet shows that quantifier float does not change the scope of the quantifier in many cases, contrary to what Jenks claims. First, speakers report that examples like (2a) admit a reading in which negation outscopes the quantiifer, giving rise to an NPI reading, so the ambiguity is available even in absence of Q-float. Chaiphet offers similar other examples like the ones below:

(7) (Chaiphet 2017, (52),(53))

  a. kaj sak-tua   (yaŋ) maj [VP khan]
    rooster even.one-CLF still NEG crow
    'Not even one rooster has crowed.'

  b. khaaw sak-med   (yaŋ) maj [VP tok thuuŋ thu uŋ]
    rice even.one-CLF still NEG fall at stomach
    'Not even one grain of rice has fallen into the stomach.'   (Thai)

 Moreover, Jenks' generalization does not seem to make the right predication about Q-float in contexts other than negation. For instance, floating of a universal quantifier associated with a subject position does not prevents it from scoping above an existential quantifier, as in (8b).

(8) (Chaiphet 2017, 33-34, (55))

  a. nak.riian thuk-khon [VP kin khaaw caan-nuuŋ]
    student every-CLF eat rice CLF-one
    'Every student eats a plate of rice.' $\forall > \exists, \exists > \forall$

b. nak.riian [VP kin khaaw caan-nuuŋ] thuk-khon
   student   eat rice   CLF-one   every-CLF
   'Every student eats a plate of rice.' $\forall > \exists, \exists > \forall$

            (Thai)

Furthermore, if we consider examples with generalized quantifiers, Jenks generalization does not make the correct predictions. As Chaiphet notes, the dual classifier *2-khon* does not allow negation to outscope it in non-floating constructions (9a). Jenks' analysis predicts that Q-float would lower the scope of the classifier below negation; however, this prediction is not borne out. Even when Q-float applies the classifier still outscopes negation (9b).

(9) (Chaiphet 2017, 34, (57))

    a. nak.riian 2-khon (yaŋ) maj [VP kin khaaw]
       student 2-CLF still NEG   eat rice
       'Two students still haven't eaten.' $2 > \neg, *\neg > 2$

    b. nak.riian (yaŋ) maj [VP kin khaaw] 2-khon
       student still NEG   eat rice   2-CLF
       'Two students still havent eaten.' $2 > \neg, *\neg > 2$

            (Thai)

(Other examples offered by Chaiphet (2017) show the same result with respect to object QPs involving quantifier float.)

Similar counter examples to my initial observation can also be found in MSA. For example, considering a quantifier like *kila* 'both' in the context of the negative marker *lam*, it appears that the generalization that Q-float lowers the scope of the subject with respect to negation is not accurate. Jenks' generalization predicts that in (10b), *kila* cannot outscope negation; however the sentence admits such a reading. Thus the sentence could mean: for both x's, such that x is a child, it is not the case that x won the tournament. Additionally, *kila* can still scope above negation even in the non-floating constructions.

(10) a. kila aT-Tiflayn   lam yafuzaa fi-l-musabaqah
       both the-child.DU NEG win.DU in-the-tournament
       'Both kids did not win the tournament' $2 > \neg, \neg > 2$

    b. aT-Tiflayn   lam yafuz   fi-l-musabaqah   kila=huma
       the-child.DU NEG win.3MSG in-the-tournament both=3M.DU

'Both kids did not win the tournament' $\qquad 2 > \neg, \neg > 2$

(MSA)

Therefore, given that the evidence for the effects of Q-float on the scope of the quantifier with respect to other scope-taking elements like negation is conflicting and is not based on a robust empirical ground, I seek to investigate the issue by conducting an experiment, focusing on MSA.

3   Acceptability Judgment Norming Task

The experimental investigation to be conducted builds on Anderson (2004), Lee and O'Grady (2016), among others, where participants were asked to do a self-paced reading task, in which test items that are potentially ambiguous appear in contexts that bias the speaker to a particular reading.

Participants

Thirty five participants, all native speakers of Arabic, studying at the University of Jordan, participated in the experiment. None of the speakers was given instruction about the subject of the experiment.

Method and Materials

The experiment was intended to test one dependent variable, the Rating of the sentence, and four independent variables: (i) Q-float (Q-float, No_Q-float), (ii) Scope (the scope to which the context is biased, which has two values: below negation and above negation), (iii) Function (of the quantified NP, which has two values: subject, object), and (iv) Quantifier (universal, existential, and generalized (*both*). Table 1 shows the experimental design:

Independent Variable	Q-Float	N
Q-Float	Q-Float	12
	No_Q-Float	12
Scope	above negation	12
	below negation	12
Function	Subject	12
	Object	12
Quantifier	Universal	8
	Existential	8
	Generalized ('both')	8

Table 1. The Experimental Design

As seen above, the study involved 24 test items. The test items were distributed in a Latin Square design, creating two lists. They were pseudo-randomized and mixed with 36 fillers that involve phenomena other than scope. Each participant saw a total of 30 sentences from one of the two lists.

Each test sentence was preceded by a context that biased it to one of two readings: (i) a reading in which the quantifier scopes above negation, and (ii) a reading in which the quantifier scopes below negation. Below is a sample test item:

(11)   Context: dakhal muʕallim ʔila ghurfat aS-Safi ghaThiban luʔanahu lam yanjaħ aħad min aT-Talabati fi ikhtibar ar-riyadiyat

'The teacher entered the class and he was upset because no one in class passed the math exam.'

Test Sentence:

kull aT-Tullab   lam yanjaħu fil-imtiħan
all   the-students NEG pass   in-the-exam

'All the students didn't pass the exam.'

The participants' task was to rate test sentences on a scale from 1-4, with the following description:

(12)   Rating scale:

1 = unacceptable

2 = not very acceptable

3 = somewhat acceptable

4 = acceptable

Results

All but four participants scored well on responding to the filler items and the mean accuracy rate of 96.88% confirms that the participants were attending to the experiment. Table 2 presents the participants' mean acceptability ratings and standard deviation values for the test items in contexts of scope above and below negation in the subject and object conditions, grouped in terms of Q-float condition.

Q-Float	Function	Scope	Mean Rating	Std. Deviation
Q-Float	Subject	above negation	3.26	0.82
		below negation	1.9	0.8
	Object	above negation	2.32	0.9
		below negation	2.57	0.2
No_Q-float	Subject	above negation	3.7	0.14
		below negation	1.35	0.04
	Object	above negation	3.24	0.17
		below negation	2.75	0.89

Table 2. Mean Ratings and Standard Deviations

A three-way analysis of variance (ANOVA) was conducted with Q-float (Q-float, No_Q-float), Scope (above negation, below negation), and Function (subject , object). The analysis revealed a main effect of Scope ($F(1)$= 15.552, p = .001). It also revealed a significant interaction between Function and Scope ($F(1)$ = 12.089, P = .003). No three-way interaction was found between Q-float, Scope and Function ($F(1)$ = .066, p = .801). Figures 1 and 2 illustrate the interactions between Scope and Function in Q-float and No Q-Float conditions, respectively.
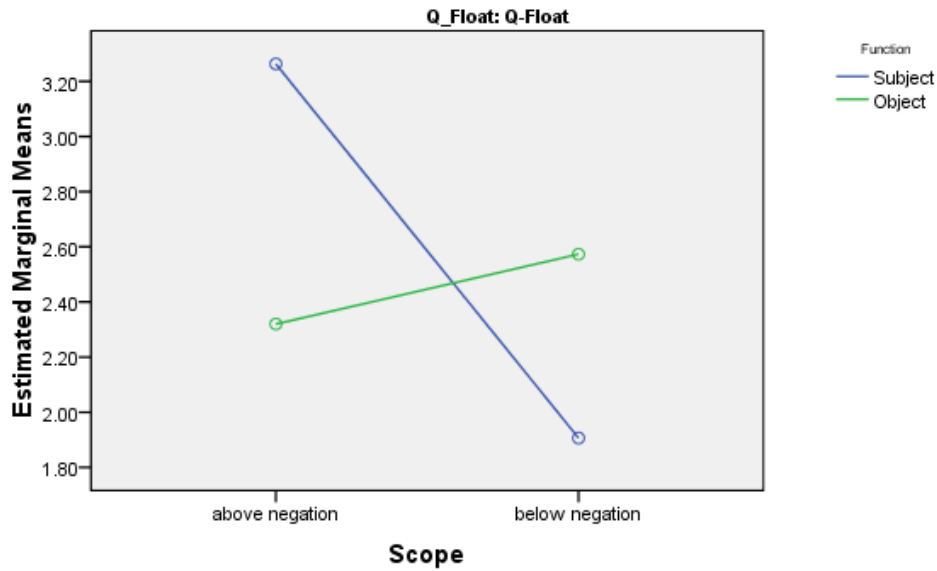
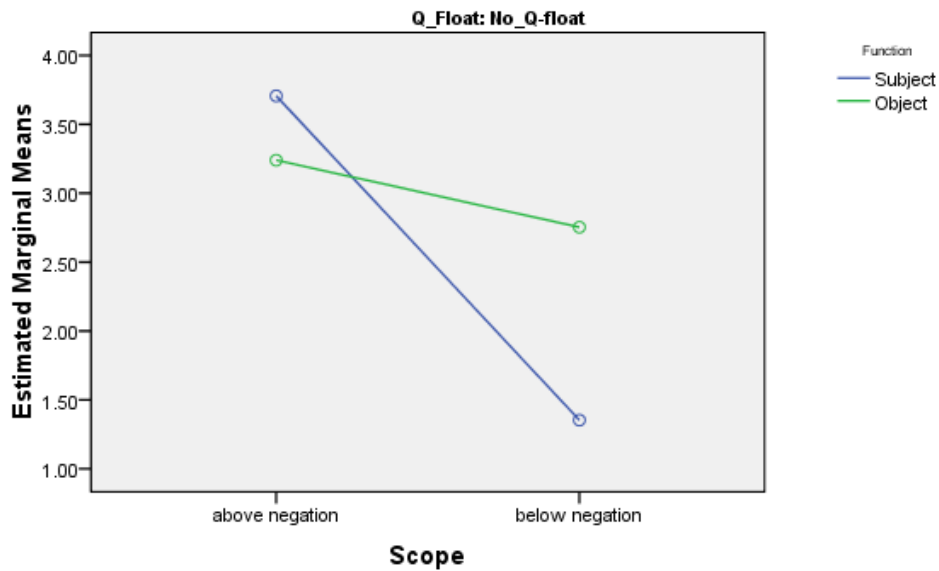Figure 1. Interaction between Scope and Function Variables at Q-Float Condition

Figure 2. Interaction between Scope and Function Variables at No$_Q$-Float Condition

A second three-way ANOVA was applied on Q-float, Scope, and Quantifier (universal, existential, and generalized *both*). Scope shows a significant effect, again ($F(1) = 7.715$, p =.017). There was found no significant interaction between Q-float, Scope and Quantifier ($F(2) = .348$, p = .713). A third three-way ANOVA was applied to Scope, Function and Quantifier, but no significant values to report. However, the mean ratings indicate that there seems to be a Function effect on the Universal quantifier*below negation conditions, in favor of object function (1.33 vs. 3.73).

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Discussion

There is an interaction between Scope and Function regardless of whether Q-float applied or not, but the effect is more significant with the Subject function. Speakers gave a higher rating of sentences that involved Q-float in a subject when the context is biased to a reading where the quantifier takes a higher scope (mean rating = 3.26), than when the context is biased to a reading in which the quantifier takes a lower scope (mean rating = 1.9), contrary to what is predicted by previous studies (e.g., Jenks 2013) which claim that Q-float with subjects lowers the scope of the quantifier with respect to negation. This result shows the opposite; speakers do not prefer a low scope reading of the quantifier when Q-float applies. Furthermore, the fact that the ratings of cases of Q-float with object NPs where the context is biased to a scope above negation are higher (mean rating = 3.32) than those with a context biased to a scope below negation (mean rating = 1.9) leads to a relevant conclusion: it is not true that Q-float raises the scope of the object above negation.

Additionally, the generalization that the scope of FQs is restricted to their surface scope position does not apply to Arabic. In the Q-float condition, speakers prefer an inverse scope reading (mean rating = 3.26) over a surface scope reading (mean rating = 1.9) for subjects. For objects, speakers do not show a significant preference for a surface reading (mean rating = 2.57) over an inverse scope reading (mean rating = 2.32).

4 Conclusion

The results of the study reveal the following facts. (i) Q-float does not lower the scope of the subject with respect to negation, nor does it raise the scope of the object with respect to it. (ii) The scope of a FQ is not restricted to its surface scope.

It is beyond the scope of this paper to provide an analysis of the facts. However, the results suggest that Q-float cannot be analyzed as a case of overt Q-raising, as claimed by Jenks, given that the main fact this analysis hinges on turns out to be debatable, namely that the scope in Q-float constructions is based solely on surface structure. More work needs to be done to spell out an analysis that captures the findings of this paper.

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