De re and De dicto Modality in Islamic Traditional Logic

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Abstract:

In Islamic traditional textbooks modal operators sometimes come before propositions, sometimes before the predicates and sometimes at the end of propositions. This makes the interpretation of modality in each case as de re or de dicto difficult. Given Ibn Sīnā's discussion of and sensitivity to this distinction, in this paper by examining the position of modality in the contradictories and converses of modal categorical propositions as well as their positions in modal syllogisms I will try to find a reasonable answer to this important issue.

Key Terms: Ibn Sīnā, Khūnajī, modality de re, modality de dicto, traditional logic, conversion, syllogism, contradiction.

A-Introduction

Let "Wx" stand for "x is a writer", "◊" for "possibly" and "(x)" for "every human being". Now let us compare the following two sentences:

1-(x) ◊Wx

2-◊(x) Wx

(1) says: Every human being x, possibly (x is a writer). This is a true sentence. **Every human being *can be a*** writer.

(2) says: Possibly every human being x, x is a writer. According to this sentence **all human beings can** be writers at once. The least can be said about the truth of this sentence is that it is doubtful.

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To the best of my knowledge, in the history of logic it was Ibn Sīnā (980-1037) who for the first time discovered this distinction and in *Kitāb al-'ibāra of al-Shifā* (1, 114-115) and in *al-Qiyās* (2, pp.125-150) concerning the function of the modal operators in modal sentences named cases like (1) and (2) "the mode of predication" (jahat al-haml) and "the mode of quantification" (jahat al-sour) respectively. In fact (1) and (2) are my symbolizations of the very sentences Ibn Sīnā mentions in *Kitāb al-ibāra*. He also observes that (2) implies (1) not vice versa. This distinction is now called "de re" and "de dicto" for (1) and (2) respectively (see my paper:"Ibn-Sina's Anticipation of the Formulas of Buridan and Barcan" 5, pp. 248-255).

In the mode of predication modal operators qualify predicates containing free variables referring to objects (de re) and in the mode of quantification modal operators qualify sentences (de dicto) which contain no free variables. This is how this distinction is now defined.

Given Ibn Sīnā's awareness of the sensitivity of the meaning and semantics of modal propositions to the position of modal operators in propositions, it is surprising that he carelessly puts modality some times at the beginning, some times in the middle and some times at the end of a proposition. And our other traditional logicians following him also do the same. Of course natural language has a big part in giving way to such inaccuracies.

B-Modality de re and de dicto

When in a traditional logic book by Ibn Sīnā and his followers we read;

Every A is a B necessarily

or:

Every A is necessarily a B

or:

Necessarily every A is a B

how are we to understand modality? All these forms are frequently used interchangeably by traditional logicians and it is within the context of their use that you may find out which of them is meant. To see more clearly what the question is about let me translate the universal categorical 'every A is a B' into modern symbolism:

$$(x)(Ax \rightarrow Bx)$$

Here there are three positions for modal operator: before the quantifier, after the first 'x' and before the consequent. This analysis of the universal categorical was perfectly known to the traditionalist and in particular the analysis has the authority of Ibn Sīnā himself (see my paper, 6, pp. 5-19). He even gives the condition under which a conditional can be paraphrased as categorical because he also knows that not every conditional can be reduced to the universal categorical. Here is what he says:

[T]he connective in which the antecedent and the consequent share one part can be reduced to predicative propositions, as when you say, "If a line falling on two lines makes the two angles on one side so and so, the lines are parallel", this is equivalent in force (fi quwwati), to your saying,

"Every two lines on which another lines falls in such and such a way, are parallel". (2, P. 256, 11-15)

Now given the fact that traditionalists usually put modalities before or after propositions it is highly important to know which of the three positions they have in mind for the modalities. But before going further some points are worth mentioning:

1-I confine my discussion to alethic modality and mainly universal propositions. The result can be easily applied with a few modifications to other modalities and propositions.

2-Fārābī's modality for the subject and Suhrawardī's different approach to modality of the predicate, though interesting, are views in which I am not interested in this paper which is devoted to the common practice of Islamic logicians.

Where are we to put modality in the general conditional? There are at least three ways to find an answer to this question: we have to carefully examine:

a-the position of modalities in the contradictory of modal propositions;

b-the position of modalities in the converse of modal propositions;

c-the position of modalities in the premises of modal syllogisms.

As I said before I confine my discussion to alethic universal propositions for (a) and (b) and universal and particulars for (c).

From the following three forms:

1- □(x) (Ax→ Bx)
2- (x) □(Ax→ Bx)
3- (x) (Ax→ □ Bx)

Here we can dispense with (2).There are no cases of natural language propositions syntactically corresponding to (2) in our traditional logic texts. Another point is that when modality comes after a proposition, it should be taken as qualifying the predicate i.e., (3) (4, P.110):

فاذا قلنا كلّ انسان كاتب بالامكان بمعنى انّ نسبة الكتابة الى كلّ واحد واحد ممكنة غيرما ندّعى انّ اجتماع الكلّ على الكتابة امر ممكن.

or in translation,

When we say: "Every human is a writer by possibility", it means that the attribution of writing to every individual [here every man] is a possibility without claiming that it is possible for all to be writers.

This clearly shows that when modality comes after a proposition it is to be understood as de re modality. In this reading Khūnajī and later on Kātibī, whose book *al-Risāla al-shamsiyya* (3) became the text book of logic in the madrasas, follow Ibn Sīnā.

Now let us examine the position of modality in three cases (a), (b) and (c) mentioned above.

(a)-Contradiction.

The negation of:

Necessarily every A is B

or Every A is B by necessity

according to all of our logic texts is

Possibly [in broad sense] some A is not B

or Some A is not B by possibility [in broad sense]

Here, as you see, the ambiguity is translated into ambiguity. If the position of modality in the first sentence is to oscillate between de re and de dicto the same is equally the case for its contradictories.
So both readings are possible as their symbolisms show more clearly:

de dicto $\quad \neg\Box(x)\,(Ax \rightarrow Bx)$
$\Diamond(Ex)\,(Ax \,\&\, \neg Bx)$

de re $\quad \neg\,(x)(Ax \rightarrow \Box\, Bx)$
$(Ex)\,(Ax \,\&\, \Diamond\neg\, Bx)$

To sum up, the negation forms of modal propositions and the wandering position of modalities in them do not show the logical place of modal operators in a proposition.

(b)- Conversion

According to the traditional logic the converse of a proposition is obtained by interchanging the subject term and predicate term while retaining the quality and truth of the proposition. So the converse of

Every A is B by necessity

becomes:

Some B is A by actuality (bi al-fi'l)

Here "actuality" refers to the non-emptiness of the extension of the subject. In symbolism:

de re $\quad (x)\,(Ax \rightarrow \Box Bx)$
$(Ex)\,Ax$

or

de dicto $\quad \Box(x)(Ax \rightarrow Bx)$
$(Ex)Ax$

It is an easy exercise to get from both:

$(Ex)\,(Bx \,\&\, Ax)$

Again here we do not know whether the converse is the converse of the dere or de dicto proposition.

But there is an interesting case from which a definite conclusion can be derived: the converse of the necessary negative universal

proposition. Ibn Sīnā and following him Fakhr al-Rāzi, Naṣīr al-Dīn al-Ṭūsī and Kātibī (in *Ḥikamat al-'ayn*) maintain that the converse of:

Necessarily no A is B

is

Necessarily no B is A

Here again the modality of the proposition to be converted can be taken as de re or de dicto:

$$\Box(x)\ (Ax \rightarrow \neg Bx)$$
$$(x)\ (Ax \rightarrow \Box\neg Bx)$$

But none of them has as the converse the proposition:

$$(x)\ (Bx \rightarrow \Box\neg Ax)$$

And it is only the de dicto one which can be converted to:

$$\Box(x)\ (\ Bx \rightarrow \neg Ax)$$

So in this case we have no ambiguity. Ibn Sīnā in this case puts modality before the proposition (2, p.95). But here there is a subtle point involved. In this de dicto proposition the converse is not really converse. It is contrapositive of the proposition. Khūnajī who takes modality de re rightly does not accept Ibn Sīnā's conversion and later on Kātibi too changes his view in *al-Shamsiyya* (3, 348). This is another reason for de re reading of modal propositions.

The difficulty with conversion is that our logicians want the very subject terms and predicate terms interchanged without letting modality before the predicate terms change its place. That is why when modality is taken de dicto the definition seems to work but in de re readings it fails. But when we come to possibility cases even the de dicto reading fails. Let us see how. Suppose we have the following general possible proposition:

Possibly every A is B

This can be read as de dicto:

$$\Diamond(x)(Ax \rightarrow Bx)$$

or as de re:

$$(x)(Ax \rightarrow \Diamond Bx)$$

The first can not be converted without negating the subject and predicate terms. But by definition this is not allowed. The second can be converted but only to:

$$(Ex)(Ax \& \Diamond Bx)$$

But by definition we want it to be:

$$(Ex)(Bx\&\Diamond Ax)$$

which is impossible. Here Kātibī following Khūnajī is right in rejecting this conversion. In fact Kātibī suspends his judgment by saying that I have no justification for it (3, p. 359) .

Another example closely similar to what just mentioned which shows modality in modal propositions is de re is controversies over the converse of particular possible positive propositions. If we take modality as de dicto then it does have a converse:

$$\Diamond(Ex)(Jx\&Bx)$$

Implies:

$$\Diamond(Ex)(Bx\&Jx)$$

But if we take it as de re it does not because:

$$(Ex)(Jx\&\Diamond Bx)$$

does not imply

$$(Ex)(Bx\&\Diamond Jx)$$

and Kātibī here again following Khūnajī is right to reject it (3,p. 359).

(c)-Syllogism

Finaly let us examine the position of modality in syllogisms. One of the interesting cases is the first mood of the first figure with possible premises. This is Ibn Sīnā's words:

فالضرب الاول من الشكل الاول منه: كلّ ج ب بالامكان وكلّ ب ا بالامكان فتبيّن انّ كلّ ج ا بالامكان.

or in translation:

> One of the first moods of the first figure is:
> Every J is a B possibly, and every B is an A possibly,
> then it is obvious that
> Every J is an A possibly. (2, p. 181)

Then he adds that this is a valid (kāmil) syllogism. Here it is obvious that if we take modality de dicto i.e. put it before each of the premises no conclusion in any system of modal logics can be validly derived. Here the only position available to the modal operator '◊' is

before the predicate or equally before the consequent of the corresponding conditional. Now we have a derivation which has been the centre of controversies. The derivation is carried out in a system now called S4.In fact, as I have shown in my paper: "Ibn Sīnā's anticipation of Barcan and Buridan's Formulas"(5) Ibn Sīnā's modal logic is S5. In this derivation, constructed out of his argument, apart from an unjustified principle used in line 4 to get line 5, he uses the axiom now called the axiom 4 in modern modal logic. He explicitly says in different places that the possibly possible is possible (2, p.183, 2-3) and this is the principle he uses in the line 7 to get the line 8 of the following proof:

1- (x)(Ax→ ◊Bx)	Assumption
2- (x) (Bx→ ◊Cx)	Assumption
3- Ax→◊Bx	2,UE
4- BX→◊Cx	3,UE
5- ◊Bx→◊◊CX	?
6- Ax→◊◊Cx	1, 5, PL
7- ◊◊Cx→◊Cx	6, Axiom4
8- Ax→◊Cx	6, 7 PL
9- (x) (Ax→◊Cx)	8, UI

Whether this modal syllogism and those like it with two possibility premises are valid or justified is not my concern in this paper. One can see Paul Thom and Tony Street's papers on this subject (8). Here I only mention in passing that Khūnajī and following him Kātibī and in fact many other traditional logicians were right to reject such modal syllogisms as invalid. And it seems to me that Paul Thom's embedding such de re modality within a de dicto necessity modality, though very interesting, has no textual support. Also Tony Street's interpretation of modality in the manner of Suhrawardī's *Philosophy of Illumination* is misleading. There is a great difference between taking modality as a sentence operator and taking it, like Suhrawardī, as a part of predicate. Suhrawardī's view should not be attributed to Ibn Sīnā and his followers.

Conclusion

What emerges from my discussion in this paper is the fact that in all modal syllogisms, valid or invalid, modality qualifies predicates i.e., it is modality de re. In fact, apart from certain few cases where Ibn Sīnā and following him other logicians use de re/de dicto distinction to show the difference of meaning between certain propositions, in almost all other cases they take all modalities as de re. In fact according to Ibn Sīnā:

> [T]he proper place for a modal word is to attach to the copula; this is so because it generally qualifies the relation of the predicates to the subject (1, 114-115).

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