AN OBJECT-BASED TRUTHMAKER SEMANTICS FOR MODALS

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1. Introduction

Possible worlds semantics is an extremely well-established approach to the semantics of modals, but it faces a range of difficulties for at least certain types of modals, especially deontic modals with their distinction between heavy and light permissions and obligations. This paper outlines a new semantics of modals that aims to overcome some of those difficulties. This semantics is based on an a novel ontology of modal objects, entities like obligations, permissions, needs, epistemic states, abilities, and essences. Moreover, it is based on truthmaking, more precisely the notion of exact truthmaking, in the sense of Fine's (2014, 2017a, to appear a, b) recent truthmaker semantics. Unlike in Fine's truthmaker semantics, the notion of exact truthmaking (or satisfaction) is taken to apply not only to sentences, but also to modal objects. Thus, situations or actions may be (exact) truthmakers (or satisfiers) not only of sentences, but also of entities like obligations, permissions, and essences. I will call this *object-based truthmaker semantics*. Object-based truthmaker semantics applies particularly well to deontic modals, which this paper will focus on. But it is meant to apply to all modals, and it will be indicated how it can generalize. The paper will in particular suggest an application of object-based truthmaker semantics to metaphysical modality based on essences as modal objects.

Object-based truthmaker semantics is based on a range of intuitions that are particularly well-reflected in natural language. First, modal objects as such are, at least to an extent, well-reflected in nominalizations of modal predicates such as *need, permission, obligation*. The semantic behavior of such nominalizations reflects the properties that characterize modal objects as a type of entity of its own distinct from more familiar types of entities such as propositions and states, most importantly the properties of having

satisfaction conditions, of having a part structure strictly based on partial content, and of entering similarity relations based on shared content only. Second, the involvement of modal objects and the distinction between heavy and light permissions is reflected in the presence of complex modal predicates in natural language, such as *have a need* or *have permission*.

Modal objects come with a set of actions or situations that are their satisfiers and some (modal objects of necessity) also come with violators. Object-based truthmaker semantics treats modality locally, tying the truth of a modal statement just to a particular modal object with its satisfiers and perhaps violators. Some modal objects, though, may be modal states displaying a greater range of satisfiers and being constituted in relation to other modal states that act as their duals.

The object-based truthmaker semantics outlined in this paper aims to account for inferences recognized as valid in standard deontic modal logic as well as inferences that are intuitively valid or invalid, but do not come out as such in standard deontic logic. There are a range of similarities with Fine's (to appear b) sentence-based truthmaker semantics of deontic modals, and a comparison of the two approaches will be given at the end.

2. Outline of a Semantics of Modals Based on Modal Objects

I will start with a few remarks regarding the syntax of modals. In logic, modals are generally treated as operators, applying to sentences. Standard possible-worlds-based modal logic treats modals as operators with an in-terpretation as quantifying over possible worlds that act as parameters of evaluation for the scope of the modal, as below:

(1) a. John needs to leave.
    b. $\forall w'(w' \in f(w) \rightarrow [John\ leave]^{w'} = true)$
(2) a. John is allowed to leave.
    b. $\exists w'(w' \in f(w)\ \&\ [John\ leave]^{w'} = true)$

Different modals involve different sets of worlds, depending for the most part on the context of use. The contextually given function *f* maps the world *w* at which the entire sentence is evaluated to the relevant set of worlds, the modal base.

Modals in natural language, in contrast to standard modal logic, come in different syntactic categories. They may take the form of modal auxil-iaries (*may, must, could, should*), of modal full verbs (*need, is obliged to, is permitted/allowed to*), of modal adjectives (*possible, necessary, obligatory, op-tional*), of adverbs (*possibly, necessarily, perhaps, certainly*), and of nouns (*need, possibility, necessity, permission, obligation*). In addition, there are agentive verb that may have a modal component (*allow, forbid, promise,*

offer, order). Modals in natural language thus do not obviously classify as operators. Setting a linguistic discussion of different semantic roles of modals aside, I will treat modals rather differently than as operators, namely as predicates of modal objects, entities like obligations, permissions, needs, epistemic states, abilities, and essences. Modal predicates of the various sorts then take modal objects as implicit arguments, just as action verbs take events as implicit arguments on the Davidsonian view (Davidson 1967). Moreover, the interpretation of modal predicates in a sentence will go along with existential quantification over modal objects, just as the interpretation of action verbs goes along with existential quantification over events on the Davidsonian view. What modal object a modal describes depends on the use of the modal, and thus the choice of a modal object in a given context roughly matches the context-dependent choice of a modal base on the standard account of modals (Kratzer 1977).

Whereas on the standard view, modals come with a sentential scope, modals as predicates of modal objects come with what I will call a *clausal predicate*. The clausal predicate of a modal is a sentential unit that is associated with the modal and acts semantically as a predicate of the modal object argument of the modal. A clausal predicate may take the form of a sentential subject (for modal predicates like *is necessary* or *is permitted*), a clausal complement (for modal predicates like *is allowed* or *need*), a prejacent (for modal auxiliaries), the scope of an adverbial (*necessarily, essentially*), and a modifier of a noun (*obligation, permission, need*). The clausal predicate will generally serve to specify the satisfaction conditions of the modal object.

Crucially, modals of necessity and of possibility lead to the very same logical form, with the modal and the sentential predicate both predicated of a modal object. Thus, (3a) and (4a) will have the logical forms in (3b) and (4b) respectively:

(3) a. John is obliged to leave.
    b. $\exists d$(is obliged(d) & [John to leave](d))
(4) a. John is permitted to leave.
    b. $\exists d$(is permitted(d) & [John to leave](d))

The clausal predicate *John to leave* acts as a predicate of a modal object that is an obligation in (3a) and of a modal object that is a permission in (4a), giving satisfaction conditions of the need and of the permission respectively. The differences between the two modal forces will now entirely reside in the ontology of modal objects, more precisely in their satisfaction and violation conditions, which will later be spelled out in terms of truthmaker theory.

There is substantial linguistic support for the analysis of modals in (3, 4) and that is that modal predicates may take the form of complex-predicate constructions containing a nominal that makes explicit reference to a modal object:

(5) a. need—have a / the need
     b. be able—have the ability
     c. be permitted—have permission

Sometimes only the complex predicate is available, for example in French (*avoir besoin*) and Italian (*avere bisogno*).[1] In addition, the new logical form of modal sentences has a range of philosophical and logical motivations and applications, as this paper tries to show.

3. Heavy and Light Permissions

One central feature of the present approach is that modality is tied to particular modal objects. In the deontic case, this means that the truth of statements of obligations and permissions are based just on the satisfaction conditions of particular obligations or permissions. What is important is that there are different sorts of modal objects. Obligations and permissions may just be the products of particular norm-giving acts. But there are also deontic states, which may guide a greater range of actions. Modal objects as such are independent of each other, though particular conditions may obtain regarding the relations they bear to one another. Thus in the case of deontic modals, unlike in standard logic deontic logic, modality is tied to permissions or obligations resulting from particular acts. This means that permissions are independent of obligations. Moreover, obligations may be independent of each other, as may be permissions. Yet there are normative conditions that may drive the productions of permissions and obligations as well as the relation among deontic states. In any case, the present approach provides a great amount of flexibility, depending on the context and the nature of the modality involved.

Being based on different sorts of modal objects, the approach has a range of philosophical applications and advantages, in particular regarding the possibility of contradictory obligations, the difference between weak and strong permissions and obligations, and the difference between *must* and *ought*. The involvement of different modal objects, though, has also a particularly good reflection in natural language, and not just in the presence of complex modal predicates involving explicit reference to modal objects.

One particularly good linguistic reflection concerns the distinction between heavy and light (or explicit and implicit) permissions (von Wright 1963). Thus, simple predicates as in (6a) display the light reading (as well as a heavy one), whereas complex predicates as in (6b) and (6c) (verb + nominal) display only the heavy reading:

(6) a. Mary *is permitted to* to leave.
     b. Mary *has permission* to leave.

    c. John *gave permission* for Mary to leave.

    d. Mary *obtained permission* to leave.

The complex predicates in (6a, b) involve explicit reference to a modal object described as a 'permission', the (non-enduring) product of an act of permission, a notion I will discuss shortly. By contrast, (6a) contains a stative predicate *is permitted to,* describing a deontic state rather than the product of an act. The clausal predicate in both cases gives the satisfaction conditions of the modal object.

There is a notorious problem for possible-worlds semantics to account for heavy permissions, as opposed to light permissions. The possible-worlds-based account would give the same semantics to the two sorts of permission sentences: the permission sentences (5a) and (5b) are true just in case the clausal predicate is true in *some* world compatible with the agent's obligations. But having permission means more than that: it means that there was an act whose content is, at least in part, given by the complement clause and whose product, the permission, can be taken up by performing the act described by the complement clause. Moreover, giving or obtaining permission does involve a change, but not, or rather not directly, in the set of worlds compatible what the agent is obliged to do. Rather it more directly involves a change in a set of options to act that are at the agent's disposal.[2]

Deontic states are not just produced by a single illocutionary act, but may have various sources for their obtaining. They generally come with a greater range of satisfiers and violators than permissions or obligations as products of acts. Moreover, states of obligation systematically relate to states of light permission, unlike heavy permissions and obligations. Light permissions display a duality with light obligations (PS $\leftrightarrow \neg 0 \neg$S). But the duality does not obtain for heavy permissions, in one direction. Not being under the obligation not to do X, does not mean having permission to do X.

Heavy permissions and obligations may moreover easily be inconsistent, whereas consistency is a norm for deontic states. While this will be elaborated in greater detail later, for the moment we can state the following generalization: the heavy reading goes along with the compositional semantics of complex predicates as in (6b), involving reference to an entity of the sort of a 'permission', whereas the light or heavy reading goes along with simple stative predicates as in (6b).

Similar semantic differences as with simple and complex predicates for permissions appear to arise with other modals as well. Thus, a similar difference shows up with act-related circumstantial modals as below:

(7) a. It is *possible* to open to open the bottle.

    b. *There is a possibility* of opening the bottle.

In (7b), *possibility* makes reference to particular ways (i.e. particular types of actions) that lead to the satisfaction of the goal, and (7b) suggests that the speaker knows about one such way. By contrast, no reference to a particular action is made in (7b), and the implicature does not hold.[3]

Providing a way of dealing with heavy permissions is important for an adequate account of modality, in particular for the sorts of modalities reflected in natural language. Note that there are verbs such as *offer* and *invite* that can only serve to describe explicit forms of permission.

While heavy permissions do not display the duality with obligations, they do engage in certain types of inferences, as will be discussed in Section 7.1.

4. The Ontology of Modal Objects

4.1. Intuitions about modal objects and they linguistic reflection

Modal objects play a central role in object-based truthmaker semantics, and this section will elaborate further on linguistic reflections and language-independent intuitions for them, as well as on their ontology.

In natural language, modal objects are often, but not always, referents of nominalizations of modal predicates (*possibility, obligation, permission, ability, need*), though not all modal predicates come with nominalizations; in particular modal auxiliaries such as *may* and *must* do not.[4] The existence and semantic involvement of modal objects does not in fact depend on the existence of a corresponding nominalization. Modal objects (even though they are perhaps not part of our reflective ontology) are not language-dependent or language-created objects. There is in fact one sort of modal object about which we have very clear language-independent intuitions, namely laws. Laws are generally *abstract artifacts* in the sense of Thomasson (1999), that is, artifacts that may lack a physical realization. They are artifacts produced by acts of declaring or passing a law. Modal objects that are produced by acts, as laws may be, are *modal products*. Thus permissions are modal products produced by acts of permitting; obligations may be produced by acts of demanding or promising. Permissions and obligations would not exist without the acts that produce them and they may have a limited lifespan. Moreover, they need not have a physical realization and in that sense are abstract.

Not all modal objects are modal products in that sense. Moral obligations need not have been produced by particular acts.[5] Other modal objects that are not modal products include abilities (physical modality) and essences (metaphysical modality).

Illocutionary acts that produce modal objects (acts or permitting, demanding, promising) may at the same time produce other products, *illocutionary products*. An act of permitting may produce a permission, an act of

demanding a demand, and an act of promising a promise. Unlike a deontic modal product, an illocutionary product does not generally endure beyond the act that produces it. The distinction between an illocutionary act and its product as a philosophically important ontological distinction has been made first by Twardowski (1911), who, however, did not recognize modal objects (Moltmann 2014, 2015, 2017a).

Deontic modal products share with illocutionary product their content-related properties and properties of concreteness, but unlike the latter, they may endure past the time of the act that established them. An act of commanding may produce a command, and, under the right circumstances, an obligation on the part of the addressee, and the latter may last longer than the command. An act of promising produces both an illocutionary product that is a promise and a commitment on the part of the speaker (Searle 1969). Also an act of permitting may set up an enduring modal product, namely the permission that the addressee may have for a longer period of time. Similarly, an act of offering creates an enduring product, the offer that may obtain for a period of time beyond the duration of the act. (Note that nominalizations such as *permission* and *offer* are polysemous, permitting reference to both an illocutionary product and a modal product.)

The lifespan of modal products is reflected in the applicability of particular existence predicates that go along with them.[6] In English, such existence predicates are, besides *exist, obtain, hold,* and *be valid*. An obligation that results from an act of demanding may 'hold' or 'obtain', that is, 'exist', for a period of time after the act. Similarly, an offer may 'hold' or 'be valid' for a time past the act of making it and a permission may 'hold' for a time past the act of giving it.

4.2.   Characteristic properties of modal objects

Modal objects have characteristic properties that distinguish them from related types of objects, such as events, acts, and propositions. Most important are their three content-related properties:

[1] Modal objects have satisfaction conditions.
[2] Modal objects enter similarity relations based on shared content only.
[3] Modal objects have a part structure based on partial content.

Like modal objects themselves, those properties are well-reflected in natural language. In addition, we have stable language-independent intuitions about them.

Modal objects of the sort of obligations allow for satisfaction or violation, expressed by various sorts of predicates in natural language, as below:[7]

(8) a. John's need was satisfied.
    b. John fulfilled his obligation to help Bill.
    c. John kept his promise to help Bill.
    d. John ignored his obligation to help Bill.

Modal objects of the sort of permissions, invitations, and offers go along with different predicates of satisfaction, *take up* and *accept*, for example:

(9) a. John took up the permission to leave the room.
    b. John accepted the invitation / offer to use the house.

Modal objects of this sort do not come with violation condition: there is nothing incorrect about doing something instead of taking up a permission or accepting an invitation or offer.

The property of modal objects entering similarity relations just on the basis of a shared content manifests itself in the application condition on *is the same as*:

(10) a. John's and Mary's needs are the same—they both need a good computer.
     b. John's offer is the same as Mary's, they both offered Sue a thousand dollar for the painting.

Is the same as expresses (exact) similarity rather than identity, and it applies to two modal objects just in case they share their content (or types of satisfaction conditions).

The third characteristic of modal objects is that they have a part structure based on partial content. This is linguistically reflected in that the *part of*-construction picks out partial content only when applied to modal objects:

(11) a. Part of John's obligation is to help Bill.
     b. Part of the offer was that Sue could use the house.

Intuitions are very clear that *part of* in (11a, b) could not pick out a temporal part of a state, and so obligations and offers could not be viewed as states with a temporal part structure.

The notion of a partial content of a modal object goes along with the notion of partial satisfaction as in the examples below:

(12) a. Part of John's need was satisfied.
     b. John's need was partly satisfied.
(13) a. Part of the offer was taken up.
     b. The offer was partly taken up.

It is important to emphasize that all modal objects, not only the deontic ones, are characterized by the content-related properties [1]–[3].

Besides the content-related properties [1]–[3], modal objects may also exhibit properties of concreteness. Thus, some modal objects, it seems, may enter causal relations. John's need may have pushed him to act in certain ways, and his medical condition may have been the cause of his need for a certain medicine. In addition, modal objects may be dependent on particular agents (John's need as opposed to Mary's).

To summarize, enduring modal objects, which include laws and rules, are part of our (at least implicitly) accepted ontology, and they are well-reflected in natural language, in the semantic behavior of nominalizations of the sort *commitment, obligation, permission*, and *offer*. Modal products share characteristic properties distinguishing them from other objects, in particular they share the three content-related properties [1]–[3], as well as, at least sometimes, properties of concreteness.

5. Outline of Fine's Sentence-Based Truthmaker Semantics

In what follows, I will give a brief outline of Fine's (2014, 2017a, to appear a, b) truthmaker semantics, which will be the basis for the object-based truthmaker semantics of modal sentences that this paper develops.

Truthmaker semantics involves a domain D of situations or actions containing actual, possible, as well as impossible situations and actions.[8] The relation 'part of' will impose on D a partial order that is closed under fusion. D includes a null action or situation (the fusion of the empty set) and the complete action or situation, an impossible action or situation that is the fusion of the set of all possible actions or situations.

A situation or action s stands in the relation $\Vdash$ of exact truthmaking (or exact satisfaction) to a sentence S just in case s is a truthmaker of S and s is wholly relevant for the truth of S. $\Vdash$ applies to both declarative and imperative sentences: declarative sentences generally are made true by situations that are their exact truthmakers; imperatives generally are complied with by actions that are their exact satisfiers.

The following, fairly standard conditions on the truthmaking of complex sentences then hold:[9]

(14) a. $s \Vdash S$ *and* S' iff for some s' and s'', s = sum(s', s'') and s' $\Vdash$ S and s'' $\Vdash$ S'.

  b. $s \Vdash S$ *or* S' iff $s \Vdash S$ or $s \Vdash S'$.

  c. $s \Vdash \exists x\, S$ iff $s \Vdash S[x/d]$ for some individual d.

  d. $s \Vdash \forall x\, S$ iff for a minimal set X such that for each individual d, there is an $s' \in X$ such that s' $\Vdash S[x/d]$, s = sum(X).

Truthmaker semantics assigns a sentence not only truthmakers or veri-fiers, but also falsifiers, situations or actions that make the sentence false and are wholly relevant for the sentence being false. The notion of a falsifier al-lows a straightforward formulation of the truthmaking conditions of negated sentences: a truthmaker of ¬ S is a falsifier for S. With ⊣ as the relation of (exact) falsification, the condition on the truthmaking of a negated sentence is given below:

(14) e. s ⊩ *not* S iff s ⊣ S.

Also complex sentences are assigned both truthmaking and falsemaking conditions. For conjunctions and disjunctions the falsemaking conditions are those below:

(15) a. s ⊣ S *and* S' iff s ⊣ S or s ⊣ S'.
     b. s ⊣ S *or* S' iff for some s' and s'', s = sum(s', s'') and s' ⊣ S and s'' ⊣ S'.

On Fine's view, a sentence S has as its meaning a pair $<pos(S), neg(S)>$ consisting of a *positive denotation*, the set *pos(S)* of verifiers of S, and a *negative denotation*, the set *neg(S)* of falsifiers of S.

One significant advantage of truthmaker semantics is that it straightfor-wardly provides a notion of partial content, as defined below (Yablo 2015, Fine 2017a):

(16) For sets of situations or actions *A* and *B*, *B* is a *partial content* of *A* iff every satisfier of *A* contains a satisfier of *B* and every satisfier of *B* is contained in a satisfier of *A*.

Partial content provides the basis for a relation of analytic entailment, as distinct from classical entailment. A sentence S_1 *analytically entails* a sentence S_2 iff the content of S_2 is a partial content of the content of S_1.[10] By contrast, of course, S_1 *classically entails* S_2 iff S_2 is true in any model in which S_1 is true.

Imperatives for Fine have the same sort of semantic values as declarative sentences, a pair consisting of a set of satisfiers (verifiers) and a set of violators (falsifiers), the only difference being that the satisfiers and violators of imperatives are actions, whereas the satisfiers and violators of declaratives are situations. Imperatives provide an important application of the notion of partial content, namely to Ross' paradox (with imperative sentences), the intuitive invalidity of the inference below, which is valid given standard deontic logic:

(17) Post the letter!
      Post the letter or burn the house!

Fine explains the invalidity of (17) by taking inferences among imperatives to be based on analytic entailment rather than classical entailment. That is, imperative S_2 follows from imperative S_1 just in case the content of S_2 is a partial content of the content of S_1. (17) then is not valid because there are satisfiers of the conclusion, actions of burning the house, that are not part of a satisfier of the premise, an action of posting the letter. In contrast to imperatives, entailments among declaratives, for Fine, are not based on analytic entailment, but on classical entailment.

Imperatives can be used not only for commands, but also for permissions (*Take an apple!*).[11] No distinction is made on Fine's account between imperatives used to convey permissions and imperatives used to convey orders.[12]

Partial content will also be important for ruling out invalid inferences (Ross' paradox) with the corresponding modal sentences within object-based truthmaker semantics, as we will see. The role of partial content, though, will be different than on Fine's account of the invalidity of (17).

6. Modal Objects and their Truthmakers

Sentence-based truthmaker semantics as outlined in the last section so far applies only to independent (unembedded) sentences and not to sentences (or sentential units) embedded under modals or attitude verbs. Object-based truthmaker semantics addresses specifically the semantics of sentences that are embedded under modal (and attitudinal) predicates. It does so by focusing on the sorts of objects that embedded sentences, acting as clausal predicates, serve to characterize: modal (and attitudinal) objects. Sentences then do not to just stand for sets of truthmakers or rather pairs consisting of a set of truthmakers and a set of falsemakers. Sentences instead have a more derivative meaning, which allows them to semantically act as predicates of modal (and attitudinal) objects. I will take [S] to be the meaning sentence S has when acting as a clausal predicate, that is, [S] is a property of content-bearing objects. As such, recall, [S] plays a role in the logical form of a sentence such as (18a) as in (18b):

(18) a. John needs to leave.
     b. $\exists e$(need(e, John) & [John to leave](e))

When predicated of a modal (or attitudinal) object, a sentence specifies the object's satisfaction conditions, in a way to be spelled out shortly.

Object-based truthmaker semantics applies to attitude reports in a similar manner, by treating sentences embedded under attitude verbs as predicates of the attitudinal object associated with the verb, an illocutionary product (promise, claim, demand), cognitive product (judgment, thought), or mental state (belief, hope, desire). Thus, *that* S below acts as a predicate of the

assumption that is the product of the act e of assuming (Moltmann 2014, 2017a):

(19) a. John assumed that it was raining.
     b. $\exists e(\text{assume}(e, \text{John}) \text{ [that it was raining]}(\text{product}(e)))$

When applied to an attitudinal object, a *that*-clause again specifies the satis-faction conditions of the attitudinal object (Moltmann 2017a).

   Not only can the meaning of embedded sentences be conceived as a property of modal or attitudinal objects. Also the meaning and semantic function of independent sentences can be conceived as that of a sentential predicate standing for a property of modal (or attitudinal) objects. Inde-pendent sentences then act as predicates of the illocutionary product meant to be produced by the utterance of the sentence. Declarative sentences as sentential predicates will apply to illocutionary products of the sort of asser-tions; imperative sentences will apply to illocutionary products of the sort of requests or demands.

   This view can also be applied to independent sentences that involve performative uses of verbs, and performative uses of modals in particular. Deontic modals when used performatively make the same contribution as im-peratives used under certain circumstances, namely setting up an obligation or permission (Lemmon 1962a, Portner 2007, Kaufman 2012):

(20) a. You must leave the room!
     b. You may take an apple!

Whereas imperatives will express properties to be predicated of the illocu-tionary product produced by the sentence, the prejacent of a performative modal will express a property to be predicated of the deontic modal product (obligation or permission) meant to be produced by the utterance of the sentence.

   In object-based truthmaker semantics, the logic of modal sentences cen-ters on modal objects. Object-based truthmaker semantics is based on the view that both modal objects and sentences have truthmakers or satisfiers. That is, not only sentences are associated with a content consisting of a set of truthmakers or satisfiers, but also modal objects. The satisfiers of modal ob-jects may be of different sorts, depending on the modal object itself. Modal objects that are obligations or permissions have actions as satisfiers, and modal objects of epistemic, circumstantial, or metaphysical sorts generally have situations as truthmakers.

   For the relation of exact truthmaking or satisfaction between situations or actions and modal objects I will use the same symbol $\Vdash$ as for the relation between situations or actions and (imperative or declarative) sentences. $\Vdash$

then comprises different sorts of satisfaction relations reflected in the use of different satisfaction predicates in natural language applicable to modal objects. They include the truthmaking, satisfaction, fulfillment, acceptance, and compliance relations. For the relation of exact falsemaking or violation between situations or actions and modal objects, I will again use the same relation ⊣ as for the relation between actions or situations and (imperative or declarative) sentences.

Fine takes situations to be truthmakers of declarative sentences, and actions to be satisfiers of imperative sentences. As such, situations and actions satisfy the very same truthmaking or satisfaction conditions of complex sentences and play the very same roles within truthmaker semantics. The present approach differs in what determines the types of satisfiers or violators involved in the semantics of a sentence. On object-based truthmaker-semantics, deontic modal objects take actions as satisfiers, whereas modal objects of, for example, epistemic and metaphysical sorts take situations as satisfiers. Sentences (and sentential units), regardless of what they may be embedded under, have satisfaction conditions that can be fulfilled by both actions and situations. Different types of sentences may impose certain conditions on their satisfiers (the distinction between imperatives and declaratives). But it is the modal object that determines what exactly its satisfiers are; the clausal predicate will give only a partial characterization of them.[13]

An important question for object-based truthmaker semantics is: what distinguishes modal objects of possibility and modal objects of necessity? The difference between the two modal forces, on the present approach, is not a matter of logical form, or even of sentence meaning. Moreover, it is not the kinds of satisfiers that distinguish modal objects of possibility and modal objects of necessity. For example, the permission for Mary to enter the house has the same satisfiers as the obligation for Mary to enter the house. What distinguishes a permission from an obligation rather is that a permission only allows for actions (those it permits), whereas an obligations not only allows for actions (those that comply with it), but also excludes actions, those that violate it. The permission for Mary to enter the house allows for actions of Mary entering the house, but does not exclude other actions. By contrast, the obligation for Mary to enter the house allows for actions of Mary entering the house and excludes actions of Mary's not doing so. This means that permissions have only satisfiers, whereas obligations have both satisfiers and violators.[14] A modal object d is associated with a set of satisfiers $sat(d)$ and an (empty or nonempty) set of violators $neg(d)$, just like (declarative and imperative) sentences on sentence-based truthmaker semantics.

Whether a modal object has violators or not is reflected in the sorts of satisfaction predicates applicable to the modal object. For example, the predicates *satisfy, fulfil* and *comply with* are applicable only to modal objects that have satisfiers as well as violators. By contrast, *take up* and *accept* as satisfaction predicates are applicable only to modal objects that fail to have

violators. The choice of satisfaction predicates thus is another reflection of object-based truthmaker semantics in natural language.

7. Heavy Permissions and Obligations

Unlike the possible-worlds-based account of modals, object-based truth-maker semantics applies to heavy permissions and obligations. If the object d to which a clause S applies is a permission, then S will specify which sorts of actions will be exact satisfiers of d; S will not just say what is true in some world in which d is satisfied. If d is an obligation, then a clause S applying to it will specify what sorts of actions fulfill d and what sorts of actions violate it; S will not just say what is true in all worlds in which d is fulfilled (which may not content-wise relate to the fulfillment of d).

As products of acts, heavy permissions and heavy obligations are entirely independent of each other, unlike in standard deontic logic. This, unlike in standard deontic logic, allows obligations to be incompatible with each other, as well as an obligation to be incompatible with a permission. Of course, there is a normative condition for obligations to be compatible in a given legislative context, but this is a condition on the production of certain modal objects in a given context, not on the ontology and satisfiability of modal objects as such. It is generally only modal states (which are not the products of illocutionary acts) that are constituted by normative conditions, see Section 9.2.

A normative condition on the production of deontic modal objects in a given context should be that no violator of an obligation be a satisfier of a permission. This should be part of a more general condition on modal objects, namely that in a given context no violator of a modal object of necessity should be a truthmaker of a modal object of possibility:

(21) For a modal object of necessity d_1 in a context C, for any s such that $s \dashv\!\!\parallel d_1$, there is no modal object d_2 of possibility in C such that $s \parallel\!\!- d_2$.

(21) would account for validity of OS $\rightarrow \neg$P $\neg$S. The other direction does not obtain, though, at least not for heavy obligations and permissions (Section 7.1.), which means that heavy obligations and permissions are not duals.

8. Conditions on Modal Objects

There are plausible conditions that hold for modal objects in general. One general condition that seems to be right is that every modal object should

have at least one satisfier or violator. Thus, a modal object of possibility should have at least one satisfier, and a modal object of necessity such as a command should have at least one satisfier or violator. Moreover, no satisfier of a modal object may also be a violator of that modal object. That is, the set of satisfiers and violators of a modal object may not overlap. Also convexity obtains, that is, if for actions or situations s_1 and s_2 that are satisfiers of a modal object d, and for an action or situation s, $s_1 < s < s_2$, then s is also a satisfier of d.[15] A modal object may have only an impossible situation or action as satisfier, namely if it has a contradictory content.[16]

The set of satisfiers of a modal object is not generally closed under fusion or 'part of'. The fusion of a situation of John's winning and a situation of Mary's winning is no longer a satisfier of a modal object whose complete content is given by *John won or Mary won*, and the situation of lighting the gas is not a satisfier of the modal object whose complete content is given by *John lit the gas and turned on the stove*.

The notion of a partial content applies not only to sentences, but also to modal objects, as we have seen, which is reflected in the applicability of *part of* and *partially* to modal and attitudinal objects. The notion of partial content of a modal object can now be defined as below:

(22) <u>Partial content of modal objects</u>
For a modal object d, a set C' is a *partial content* of d if for the content C of d, C' is a partial content of C.

The part-relation among modal objects, we have seen, is based on partial content. That is, a modal object d_2 is a part of a modal object d_1 only if d_2's content is a partial content of d_1's content:

(23) <u>Condition on the part-relation among modal objects</u>
For modal objects d_1 and d_2, if d_2 is *part of* d_1, then d_2's content is a partial content of d_1's content.

The other direction does not hold, since modal objects are not just individuated by their content, but are subject to various conditions of concreteness, origin, and agent-dependence.

The notion of partial content is central for the relation between clausal predicates and the modal (or attitudinal) objects of which they may hold, as we will see in the next section.

It is plausible that for any partial content of a modal object there is a part of that modal object with that partial content as its content. This is captured by the following condition on extraction:

(24) Extraction of modal objects
For a modal object d_1 and a partial content C of d_1, there is unique modal object d_2 with C as its content so that d_2 is part of d_1.

There are also conditions on the fusion of modal objects. The fusion of modal objects is not as intuitive as with objects that are not content-bearers, having to do with the fact that a description of such a fusion is not always straightforwardly available.

The fusion of modal objects of the same modal flavor and the same force, involving the same agent is unproblematic.[17] The fusion of John's obligation to work and his obligation to pay taxes, referring to the plurality of two modal objects, is John's obligation to do work and pay taxes, a single modal object with a conjunctive clausal predicate. Let us then consider two modal objects (with the same modal flavor and the same force) that have different agents and involve the same sorts of actions on the part of the agents as satisfiers, for example John's obligation to work in the evening and Mary's obligation to work in the evening. The fusion of those two modal objects can be described as the obligation for John and Mary to work in the evening. The satisfiers of that fusion will be actions of John and Mary working in the evening distributively understood, that is, actions that would be sums $s_1 \vee s_2$ of an action s_1 of John working in the evening and an action s_2 of Mary working in the evening. Given Extraction, it suffices to characterize the fusion of two modal objects in terms of its content (based on the contents of d_1 and d_2) and the condition that it contains d_1 and d_2 as parts:

(25) Fusion of modal objects
For modal objects d_1 and d_2 of the same modal flavor, of the same force, with nonoverlapping sets of satisfiers and violators,
the fusion d_1 and d_2, $d_1 \odot d_2 =$ the modal object d with d_1 and d_2 as parts and $\mathrm{pos}(d) = \{s_1 \vee s_2 \mid s_1 \in \mathrm{pos}(d_1) \,\&\, s_2 \in \mathrm{pos}(d_2)\}$ and $\mathrm{neg}(d) = \{s \mid s \dashv d_1 \text{ v s} \dashv d_2\}$

(25) rules out fusions for modal objects that would result in violating the conditions on modal objects of not having overlapping sets of violators and satisfiers. This will be relevant for inferences with modals discussed in Section 9.1.

Can modal objects of different forces have a fusion, say an obligation and a permission? How would such a modal object look like? A modal object of this sort should have as satisfiers sums of a satisfier of the obligation and a satisfier of the permission. Its violators would simply be the violators of the obligation. Thus the violators would violate just part of the content of such a fusion. For the fusion of two modal objects with the same flavor, but different modal forces the very same definition in (25) is in fact applicable.[18]

Fusions of modal objects will play a crucial role when recasting object-based truthmaker semantics within a dynamic semantic perspective. A discourse context for modals of a particular type can conceived as a modal object itself. For example a to-do list in the sense of Portner (2007) would itself be a deontic modal object. Updating would then mean fusion of the described or produced modal object with the relevant background modal object. Just as there are separate lists for different sorts of modals, there will be separate fusions for the associated modal objects.

9. The Relation of Modal Objects to their Clausal Predicates

When sentences apply to modal objects as, again, in the logical forms of (26a) and (27a) in (26b) and (27b), they will express a property regarding the satisfiers and violators of the modal objects:

(26) a. John needs to leave.
     b. $\exists d(\text{need}(d) \,\&\, [\textit{John to leave}](d))$
(27) a. John is permitted to leave.
     b. $\exists d(\text{is permitted}(d) \,\&\, [\textit{John to leave}](d))$

What exactly is the property of modal objects that sentences express? For formulating that property, let us note that sentences may underspecify the satisfaction conditions of a modal object. Consider:

(28) John needs to write a book (in order to get tenure).

The need described by (28) is not simply satisfied if John writes some book or other.[19] It is satisfied only when he writes a book in his field that gets published by a sufficiently good publisher. This means that in a need report, the clausal complement of *need* may give only necessary, not sufficient conditions on the satisfaction of the reported need. As a first proposal, one may then take a sentence S to have as its meaning the property of modal objects in (29) (as in Moltmann 2015, 2017a):

(29) $[S] = \lambda d[\forall s(s \Vdash d \rightarrow s \Vdash S) \,\&\, \forall s(s \dashv\!\!\vdash d \rightarrow s \dashv\!\!\vdash S)]$

Here $\Vdash$ is the relation of exact truthmaking now holding between situations or actions s and modal objects d. $\Vdash$ is the relation of inexact truthmaking, that is, the relation that holds between a situation s and a modal object d in case s has a part s' that is an exact truthmaker of S. A sentence S thus expresses the property that holds of a modal or attitudinal object d just in case every exact satisfier of d is a (possibly inexact) truthmaker of S and every exact violator of d is a (possibly inexact) falsifier of S. In the

case of permissions, which lack violators, the second condition is of course vacuously fulfilled.

However, (29) cannot be correct. First, the condition (29) imposes on satisfiers of the modal object cannot be correct. (29) makes (30) follow from (28) (on the relevant narrow-scope reading of the disjunction):

(30) John needs to write a book or a letter.

This, it appears, is the very same problem as with entailments among imperatives.

Second, the condition that (29) imposes on violators of the modal object cannot be right. If an exact violator *s* of the need described in (28) just has to be an inexact falsifier of the sentential unit *John to write a book*, then *s* may violate the need in ways that are irrelevant to the content of *John to write the book*.

The first problem is avoided by making use of the notion of partial content, requiring that the positive content of the clause be a partial content of the modal object. Given (28), the positive content of the clause in (30) is not a partial content of the need. In order to account for the second problem, it should be required that any exact falsifier of the clause also be an exact violator of the modal object. Thus (28) says that any action of John just violating the book-writing condition also violates the more specific book-writing condition imposed by the need. (Recall from (15a) that an exact falsifier of a conjunct S is also an exact falsifier of a conjunction S & S'.) However, not every exact violator of the modal object needs to be a falsifier of the clause. In (28) an exact violator of the need may be an action of John writing a book that is unpublishable, a situation that does not falsify *John to write a book*.

Thus the meaning of a sentence as a property of modal objects should be formulated as below, making use of the notion of partial content:

(31) $[S] = \lambda d[\text{pos}(S)$ is a partial content of $\text{pos}(d)$ & $\forall s(s \Vdash S \rightarrow s \Vdash d)$, in case $\text{neg}(d) \neq \varnothing]$

The second conjunct in (31) is relevant, of course, only for modal objects of obligation. (31) as such applies to modal objects of necessity and of possibility.

(31) also takes into account clausal predicates with negation. Modal objects themselves, being objects, cannot be negated; only their clausal predicates can. A negated clausal predicate will give a partial characterization of the satisfiers of a modal object in terms of the falsifiers of the clause. Consider (32):

(32) You must not open the window or the door.

According to (31), any satisfier of the obligation described in (32) is part of an action that falsifies *you open the window or the door*, and thus, given (15b), violates both *you open the window* and *you open the door*. In addition, every action falsifying *you open the window or the door* should contain an action satisfying the obligation. This means that a satisfier of the modal object would be an action of opening the window or else of opening the door.

A negative clause specifies the satisfiers of a modal object that is a permission in, of course, the very same way:

(33) You may not open the window or the door.

Having given the content of clausal predicates of modal objects in terms of truthmaker theory, the next task now is to account for the inferences that deontic logic has traditionally dealt with.

10. Inferences with Deontic Modal Sentences

10.1. Inferences with heavy permissions and obligations

There are a number of inference patterns that standard deontic modals validates, but that are not intuitively valid, and some that are intuitively valid, but not validated by standard deontic logic. Within object-based truthmaker semantics, the validity or invalidity of inferences is not just based on the truth conditions of sentences. Rather they can be traced to the following different factors:

    [1] the truth-maker-based content of modal objects and their clausal predicates
    [2] the nature of the satisfiers of modal objects
    [3] the ontology of modal objects
    [4] general conditions on generating modal objects, and in particular modal states.

First, as already mentioned, there is no duality between heavy permissions and heavy obligations. While OS implies ¬P¬S (Condition (21)), ¬P¬S does not imply OS. The reason is that the absence of a modal object does not entail the presence of any other modal object whatsoever.

Just as Fine's sentence-based semantics of imperatives provides a straightforward account of Ross' paradox involving imperatives, object-based truthmaker semantics provides a straightforward, if somewhat different, account of Ross' paradox with deontic modals as below:

(35) You may take an apple.
      You may take an apple or burn the house.

The invalidity of (35) (on the free-choice reading) follows from the partial-content relation between a clausal predicate and a modal object. The content of the permission described by the conclusion of (35) need not be a partial content of the modal object that is described by the premise.

The corresponding inference with statements of obligation appears similarly invalid, though it is valid in standard logic (and Fine's sentence-based truthmaker semantics, see Section 7.3.):

(36) You must post the letter.
      You must post the letter or burn it.

The explanation of the invalidity of (36) is the same. The very same partial-content relation obtains between a clausal predicate and a modal object of possibility and a clausal predicate and a modal object of necessity.

The mereology of modal objects is the ground for the validity of the inference below:

(37) You must drink the tea and you must take the pill.
      You must drink the tea and take the pill.

The two modal objects d_1 and d_2 described by the premise (the implicit arguments of the two occurrences of *must*) are of the same kind, involving the same agent, and thus have a fusion d. d will have as its satisfiers sums of a satisfier of d_1 and a satisfier of d_2 (which as mentioned, can be impossible actions). The conclusion of (37) may involve d as the implicit argument of the one occurrence of *must*.

Unlike in standard deontic logic, the corresponding inference for permissions also comes out valid:

(38) You may take an apple, and you may take a pear.
      You may take an apple and take a pear.

Given standard deontic logic, there may not be a deontically possible world in which the two prejacents in the premise are both true, in which case the conclusion does not hold. But on the present view, there will be a modal object that is the fusion of the two permissions described in the premise and that thus can serve as the implicit argument of *may* in the conclusion.

While the inference in (38) appears valid, there is in fact one type of circumstance in which it is not valid, namely in which the permissions cannot both be taken up. Thus, there is no contradiction saying *you may take and apple and you may take a pear, but not both*. What appears to go on in such

cases is that there are no simple permissions given, but rather permissions that also incorporate a proscription (to take up the other permission) (that is, fusions of a permission and a proscription). The permission to take an apple thus is in fact a modal object that has both satisfiers (actions of taking an apple) and violators (actions of taking the pear). It is not described that way, but that is because there are no straightforward terms for such modal objects in English and the construction for simple permissions is used to described the more complex modal object. The two permission-proscription modal objects do not have a fusion because the fusion would have the same satisfiers and violators (actions of taking an apple and a pear), violating the precondition on fusions in (25)

Two permissions may have inconsistent contents (*I may stay and I may leave*). If they are just permissions, they would then have a fusion with an inconsistent content, validating the inference to *I may stay and leave*. This inference can be considered valid despite the fact that the permission described by the conclusion has only impossible satisfiers. (Thus the following reasoning does not seem faulty: If I am permitted to stay and I am permitted to leave, then I am also permitted to stay and leave, even though this will be impossible for me to do.)

The partial-content relation between clausal predicate and modal object also accounts for the validity of the inference below:

(39)   <u>You must drink the tea and take the pill.</u>
       You must drink the tea, and you must take the pill.

The conjuncts in the premise give each a partial content of the same modal object *d* (the implicit argument of *must* in the premise), and *d* is also a modal object that the two conjunct sentences in the conclusion may be taken to describe (so that *d* would be an implicit argument of both occurrences of *must* in the conclusion). Alternatively, the validity of the inference in (39) could be due to Extraction. Extraction means that for a modal object *d* with distinct conjunctive contents C_1 and C_2, there will be two modal objects d_1 and d_2 whose content is partially given by C_1 and C_2 respectively.

Deontic modals cannot be stacked or iterated, that is PP(S) and OO(S) are impossible, as is PO(d). Similarly as in Fine (to appear b), this follows from the requirement that the clausal predicate of a modal characterize actions. On the present view (on which P(S) is to be understood as $\exists d(P(d) \ \& \ S(d))$), the modal object (introduced by PP(S)) would require actions as satisfiers. But the satisfiers of deontic modal sentences are certainly not actions, but entities of a different type. They are entities closely related to the modal objects deontic sentences quantify over, say states of a modal object meeting the conditions specified by the sentence. (I will come back to that in Section 10.) This means that $\exists d(P(d) \ \& \ S(d))$ could not serve to specify satisfiers of the modal object that would be introduced by PP(S).

The nature of actions as truthmakers can also account for the invalidity of the inference below, the well-known puzzle of the Good Samaritan (McNamara 2014):

(40) <u>It ought to be the case that Jones helps Smith who has been robbed.</u>
       It ought to be the case that Smith has been robbed.

The actions that are satisfiers of the obligations described by the premise of (40) need to be understood against the background of a man being injured. Actions, by nature, carry presuppositions, and it will be the modal object itself that imposes them as preconditions on its satisfiers and violators.

As in standard logic, inferences from *John must pay taxes* or *John may pay taxes* to *John pays taxes* are not valid since *John pays taxes* may be false in a model in which John's permission or John's obligation to pay taxes exists, but in which there are no actual truthmakers for that permission or obligation. Also, that John pays taxes won't be a partial content of *John must pay taxes* or *John may pay taxes*. Given object-based truthmaker semantics, truthmakers of modal sentences are best taken to be modal objects themselves, or at least entities closely related to them or definable in terms of them (states of modal objects being valid, say). Clearly, then, the content of *John must pay taxes* or *John may pay taxes* does not have *John pays taxes* as a partial content, since the latter consists in actions and the former in modal objects and actions cannot be part of modal objects (but only satisfiers of modal objects). That is, a truthmaker for the premises, a modal object, cannot have as part a truthmaker for the conclusion, a satisfier of the modal object.

10.2. Light permissions and obligations

Unlike in standard deontic logic, in object-based truthmaker semantics there are no inferential connections between heavy permissions and heavy obligations. A heavy permission simply is the product of an illocutionary act and its content need not relate to any obligation, and vice versa for a heavy obligation. But this is not so for light permissions and light obligations. Light permissions and obligations on the present approach are conceived as modal states that are not (just) the result of particular acts, but may be constituted in other ways and as such are subject to conditions relating states of permission and states of obligation to each other within a coherent moral system.

How should such states be understood? Roughly, the maximal modal state of light permission can be understood as consisting of the conjunction of everything that is (just) permitted, in the sense of not being a violator of an obligation (or being a satisfier of a proscription). When predicated of such

a state, the clausal predicate need not list all that is permitted, but rather gives only a partial content of the content of the modal state. Extraction, a general condition on modal objects, also holds for modal states. That is, for a modal state d_1 and a partial content C of d_1, there is a modal state d_2 that is part of d_1 and whose content is C. The maximal modal state of permission is satisfied only by action (perhaps only impossible ones) that up all that is permitted. Smaller actions may also count as taking up what is lightly permitted, in the sense of satisfying states that are parts of the maximal modal state of permission.

Also the maximal modal state of obligation can be understood as consisting of the conjunctions of all that is obligatory. Again that state will have only actions as satisfiers that satisfy all that is obligatory. Extraction also obtains for modal states of obligation, just as it does for modal states of permission.

Not violating a (modal state of) light obligation now is a condition constitutive of a modal state of light permission, defining its satisfiers. The condition is given below, where $<$ is the part-of relation between actions as well as between modal objects:

(41) Condition on light obligation
      In a given context C, for the maximal modal state d_2 of light obligation in C and the maximal modal state d_1 of light permission in C, and any action s:

$$(\neg \exists s'(s' < s \ \& \ s' \Vdash d_2)) \rightarrow s \Vdash d_1.$$

That is, any action that contains no exact violator of the obligation state is lightly permitted. Given the earlier condition (21), (41) establishes the duality between light permission and light obligation.

Speaking of a single maximal state of permission or obligation is in fact not entirely correct. There may be different maximal states belonging to different modal systems or contexts. Moreover, for a given context, there may be different states of the same force at once, for example a 'must-state' and an 'ought-state', with only the former involving a duality to permissions (*John ought to do X* does not imply *John is not permitted to not do X*).

11. Comparison with Fine (to appear b)

Fine (to appear b) gives an account of deontic modals within sentence-based truthmaker semantics. That account is not based on an ontology of modal objects with their truthmakers or satisfiers, yet it shares significant similarities with the present approach.

For Fine the semantics of deontic modals is based on the notion of a *code of conduct*. A code of conduct is a (contextually given) set of actions *a* with the following properties: *a* discharges all the obligations and *a* is permitted. Each action in the code of conduct is called an *ideal course of action*. The semantics of deontic modal statements involves the part-of relation among actions and is based on the following notions:

(42) For prescriptive contents (i.e. sets of actions) *X* and *Y*,
    a. *X subsumes Y* if every action in compliance with *X* contains an action in compliance with *Y*.
    b. *Y subserves X* if every action in compliance with *Y* is contained in an action in compliance with *X*.

Thus, *X* subsumes *Y* and *Y* subserves *X* just in case *Y* has a content that is a partial content of the content of *X*. The conditions for the truth of permission statements and obligation statements are then as follows:

(43) For a code of conduct C,
    a. O(X) is true iff *C* subsumes *X*, that is, if every ideal course of action in *C* contains an action in compliance with *X*.
    b. P(X) is true iff *X* subserves *C*, that is, if every course of action in compliance with *X* is contained in an ideal course of action in *C*.

That is, all the ideal courses of actions must contain some action satisfying a given obligation, and all satisfiers of a given permissions must be part of some ideal course of action.

Fine's notion of a code of conduct is closely related to the notion of the set of satisfiers of a modal object. In fact, a code of conduct would be the set of satisfiers of the fusion of all permissions and all obligations. While such fusions are permitted on the present approach, they could not play the semantic role modal objects are supposed to play. That is because a clausal predicate of a modal object that is a fusion of a permission and an obligation could not serve to convey the content of what is permitted, but only of what is obligatory, given that the clausal predicate conveys a partial content of the modal object. The satisfiers of a fusion *d* of a permission and an obligation would consist of actions that take up the permission and satisfy the obligation. But for a permission statement *P(S)* be true, every satisfier of the permission content (clausal complement) *S* would have to be part of a satisfier of *d*, and every satisfier of *d* would have to contain a part that satisfies *S*. This, however, is not generally the case: *d* may have satisfiers that do not have parts that satisfy *S*. Take *d* to be the fusion of John's obligation to work all day and his permission to drink and to smoke. A satisfier of *d* would be the action *s* of John working and John smoking. But *s* would not contain a part that satisfies *John drinks*, and thus *John drinks* could not give

a partial content of d. This is different if S is the content of an obligation, say the content of *John works*. Then every satisfier of S is part of a satisfier of d and also every satisfier of d has a part that satisfies S. Thus, for obligations Fine's account basically coincides with the present one on which the clausal complement gives a partial content of the modal object (code of conduct), but not so for permissions.

I see two issues with Fine's notion of a code of conduct. The first is a locality issue, the second is an identification issue. For Fine, deontic modal statements are interpreted relative to a set of actions fulfilling all that is obligatory and all that is permitted. However, particular modal statements may just involve something that is permitted or something that is obligatory in a strictly local fashion. For example actions of making an offer or giving a permission may just license certain actions regardless of what else is permitted or obligatory. A promise may lead to an obligation whose fulfillment just depends on what has been promised and nothing else. Satisfying such modal products may go against given obligations. The satisfaction conditions of a modal product need not relate to anything beyond the modal product itself, and in particular it need not relate to given obligations or permissions. Of course the code of conduct may be conceived as being strictly local itself and just identified with the set of satisfiers of a given modal product, but this would require separating obligations and permission.

Fine's account also raises issues if it were to serve as a semantics for the purpose of understanding and communication, namely of how to identify and to convey a code of conduct. For a speaker to understand and communicate that John need to publish a book does not require knowing what sort of book exactly John need to publish and what else John is obliged or permitted to do. For communicating that Bill is allowed to park the car it is not necessary to know about other actions Bill is obliged or permitted to undertake except parking the car, and even for that it is not necessary to know the details, for example for how long he may park it.

The present approach does not raise the two issues because of its focus on modal objects. For the truth of a deontic statement it is entirely sufficient to take into account the set of satisfiers (and perhaps violators) of the modal object in question. Modal objects of course may differ in 'size', and modal states may be satisfied by a much greater range of actions than modal objects that are products of illocutionary acts. Fine imposes separate conditions involving what is permitted and what is obligatory, unlike standard deontic logic, but still permissions and obligations act together to define a single set that is the basis for the interpretation of both statements of permissions and statements of obligations. On the present approach, permissions are in principle entirely separate from obligations, though they may be jointly constitutive of certain modal states (Section 9.2).

For understanding and knowing the truth conditions of a particular permission or obligation statement, the speaker need not know what exactly

the satisfiers of the modal object in question are, but only that the clausal predicate gives a partial characterization of whatever the content of the modal object is.

There are also specific differences between Fine's account and the present one regarding the treatment of particular inferences. One of them concerns the paradox of permission (von Wright 1968, Kamp 1973). Fine's sentence-based truthmaker semantics accounts for the failure of the inference below straightforwardly:

(44) John may leave the room.
      John may leave the room or stay.

If the premise of (44) is true relative to a code of conduct C, then every action satisfying *John leaves the room* is part of an action in C; but not every action satisfying *John leaves the room or stays* may then be part of an action in C, so the conclusion is not true relative to C.

Fine's semantics, however, does not apply to the failure of the same type of inference with modals of necessity (McNamara 2014):

(45) John must leave the room.
      John must leave the room or stay.

If the premise of (45) is true relative to a code of conduct C, then every action in C contains an action satisfying John leaves the room as part. But then also every action in C contains as part an action satisfying John leaves the rom or stays. Fine in fact considers the inference valid on one reading and distinguishes that reading (what he calls 'bounded obligation') from free-choice obligation Op, giving a distinct semantics for the latter as follows:

(46) Op(X) is true relative to a code of conduct C if C subsumes X and if
      X subserves C, that is, if every ideal course of action in C contains
      an action in compliance with X and every action in compliance
      with X is contained in an ideal course of action in C.

Fine here imposes the condition that X be a partial content of C, which is just what the present approach does with respect to the content of both modal objects of obligation and modal objects of permission.

I disagree with Fine that modals of obligation may fail to display a free-choice reading. For me, the conclusion in (45) has just a single reading, on which John can discharge the obligation either by leaving or staying. There is no difference in intuition between (44) and (45). Object-based truthmaker semantics treats disjunctive permissions and obligations in the very same way: the inferences in (44) and (45) are both excluded because the clausal

predicate in the conclusion does not give the partial content of the modal object that the premise is most likely about. Fine could not carry over such a simple partial-content condition to permission sentences since codes of conducts are restricted to actions satisfying what is obligatory.

Another difference to Fine's account concerns conjunctive clausal predicates, that is, the inference in (47):

(47) You may take an apple and eat it.
      You may take an apple.

There is a sense in which the inference below is intuitively not valid:

(48) You must turn on the gas and lit the stove.
      You must turn on the gas.

As with imperatives (as was mentioned), such inferences are not unproblematic. While for Fine the inference is simply valid, on the present approach there is a pragmatic explanation available while the inference in (48) is not that good. Given object-based truthmaker semantics, the conjunctive clausal predicate gives a more complete characterization of the modal object than the simple clausal predicate in the conclusion. It is a plausible pragmatic principle that a clausal predicate be used that gives a sufficiently full description of the modal object.

There is one further respect in which the present approach and Fine's are similar, and that concerns the truthmakers of deontic modal statements. For Fine, the truthmakers of deontic modal statements are closely related to codes of conduct as follows: 'Each code of conduct C is understood to be the state that consists in its members c_1, c_2, ... being all and only the ideal courses of action. We might say, in this case, the code C *prevails*; and so the code is, in effect, being identified with the state that it prevails. [..]' (Fine, to appear b). The following conditions then are imposed on when an atomic deontic statement X is verified or falsified by a code of conduct C:

(49) a. C verifies O(X) iff C subsumes X.
      b. C falsifies O(X) iff C does not subsume X.
(50) a. C verifies P(X) iff X subserves C.
      b. C falsifies P(X) iff X does not subserve C.

In object-based truthmaker semantics, a modal statement about a modal object d, would be of the form P(d) & S(d) (for a permission statement) or O(d) & S(d) (for an obligation statement), with S representing the content of the clausal predicate. Such a statement should have as truthmakers situations of P and S holding of d or of O and s holding of d. The same conditions

will then obtain for verifying a modal statement of permission and a modal statement of obligation, along the lines of the following:

(51) a. A situation s verifies P(d) & S(d) / O(d) & S(d) iff the content from which the property S is derived is a partial content of the sentence object that s is about.

   b. A situation s falsifies P(d) & S(d) / O(d) & S(d) iff the content of the sentence from which the property S is derived is not a partial content of the modal object s is about.

In object-based truthmaker semantics, the difference between obligations and permissions resides entirely in the satisfaction conditions of the corresponding modal objects, with modal objects of necessity having both satisfiers and violators and modal objects of possibility having only satisfiers.

12. Other Modals

Object-based truthmaker semantics is meant to apply to modals other than deontic modals as well. In fact, it should apply with the very same semantics to other sorts of modals, the only difference being the modal objects involved. Identifying the modal objects for different sorts of modals is not always straightforward, though. It is straightforward when modal predicates come with nominalizations, in which case the ontology of the modal objects can be read off the semantic behavior of the nominalizations. This is what we had with deontic modals. However, modal predicates need not come with nominalizations, in which case the modal object needs to be identified by semantic and ontological considerations only. In all cases, though, modal objects should have the characteristic properties of modal objects: having satisfaction conditions, having a part structure based on partial content, and entering similarity relations based on shared content (Moltmann 2017b). In what follows, I will not attempt an exhaustive overview of the various modal objects for the different sorts of modals and their uses, but rather restrict myself to pointing out some core features of different kinds of modal objects.

Modals expressing physical possibility involve modal objects of the sort of abilities, modal objects for which there is a nominalization in English (*ability*). Abilities certainly are not modal products, yet they have the characteristic properties of modal objects (Moltmann 2017b). Abilities have satisfaction conditions in the sense of manifestation conditions. They have a part structure based on share content and enter similarity relations strictly on the basis of being the same in content, properties displayed by the applicability of *part of* and *is the same as* to abilities (*part of John's ability, John's ability is the same as Mary's*).[20]

Other modal objects may be generated by particular conditions, in particular the modal objects involved in teleological uses of modals as below:

(52) In order to travel to Russia, John must get a visa.

Here the modal object is generated by the condition given by the *in order*-clause and the modal object has satisfaction conditions that are met by actions that a necessary for S to be in place. Such a modal object is not the product of an act or based on physical conditions, but rather it is ontologically derivative, based on conditions for a state of affairs to obtain or an action to be possible.

Epistemic modals may involve modal objects of different sorts, and they appear to display be a parallel distinction to that between heavy and light permissions and obligations (Przyjemski 2017). 'Heayy' uses of epistemic modals may involve a modal object that is, for example generated by piece of evidence, permitting or requiring particular sorts of situations, which would be their satisfiers. Epistemic modal objects of necessity permit situations and rule out situations; epistemic modal objects of possibility only permit situations. 'Light' uses of epistemic modals would involve as modal objects states for which the duality of necessity and possibility is constitutive, just as in the case of light permissions and obligations.

13. Metaphysical Modality

In this last section I would like to suggest an application of object-based truthmaker semantics to metaphysical modality. This application relates to Fine's work on essentialism and draws a connection between truthmaker semantics and Fine's logic of essence.

Fine (1994, 1995) argued that metaphysical necessity should be understood as essentiality. That is, (53a), on one reading, should be understood as in (53b):

(53) a. Socrates is necessarily a man.
     b. Socrates is essentially a man.

Fine proposed an essentiality operator O_F for individuals that are F, so that O_F S is understood as '*S* is true in virtue of the nature of thing that are *F*'. Fine makes two assumptions about O_F.
[1] S in O_F S can only be about objects that bear on the essence of objects that are F. This explains the contrast below, where only (54b), not (54a) is intuitively true:

(54) a. Socrates is essentially a member of the singleton Socrates.
     b. Singleton Socrates essentially contains Socrates as a member.

[2] O_F is closed under logically consequences as long as the consequences are about objects that pertain to the essence of objects that are F.

Object-based truthmaker semantics allows for a new perspective on statements of essence. This will involve conceiving of an essence as an object separate from the individual bearer (a view that can be traced to Aristotle). An essence is thus a modal object with its characteristic properties: having satisfaction conditions, having a part structure based on partial content, and entering similarity relations based on shared content. In particular, a modal object as an essence has satisfiers, situations that obtain in virtue the object's essence, as well as violators, situations that would falsify the object's essence.[21]

English *essentially* then is to be considered a predicate of essences, more precisely a predicate that expresses a relation between essences and their bearers. The logical form of (55a) will thus be as in (55b):

(55) a. Socrates is essentially a man.
     b. ∃d(essentially(d, Socrates) & [Socrates is a man](d))

In order for (55a) to be true then, the same condition should hold as for all modal sentences: the content of the clausal predicate (here the sentential unit *Socrates is a man*) needs to be a partial content of the content of the modal object, Socrates' essence.

The partial-content condition allows deriving condition [1] imposed by Fine on the essentiality operator, namely that the scope only be about objects that pertain to the essence in question. Partial content preserves aboutness and thus is tailored to capturing that condition.

The condition [2] on closure under logical consequence as long as the same relevant objects are involved does not come out on this account, though. The partial-content condition captures only analytic entailment, not classical entailment restricted to the same objects. However, [2] does not seem quite right in fact. Given [2], (55a) should imply (56a) as well as (56b), which both seem counterintuitive:

(56) a. Socrates is essentially a man and influential or not influential.
     b. Socrates is essentially a man or a tiger.

For (56a) and (56b), the partial-content condition does not obtain since not every satisfier of the clause (a situations of Socrates not being influential, a situation of Socrates' being a tiger) is contained in a satisfier of Socrates' essence. This appears the right result.

In this way then, the semantics of the essentialist operator O_F, suitably understood and reconceived as a predicate of essences, can be subsumed under the general object-based truthmaker semantics of modals.

Fine (1995) also proposes an essentialist conception of metaphysical necessity, on which metaphysically necessary truths are true in virtue of the essence of all objects. Given the present approach, this would mean that metaphysical truths are partial contents of the content of the modal object that is the essence of all things. That modal object would have as its satisfiers situations reflecting everything that is essential to some object or other.

14. Conclusion

This paper has outlined a novel semantics of modal sentences, object-based truthmaher semantics, based on a novel ontology of modal objects and their truthmakers. In object-based truthmaker-semantics, importantly, not only sentences, but also modal objects are considered bearers of truthmakers or satisfiers. This paper has focused on applying object-based truthmaker semantics to deontic modals. In addition it has indicated a particularly interesting application to metaphysical modality. Object-based truthmaker semantics thus has advantages beyond that of giving a more adequate account of the inferential behavior of deontic modals than standard deontic logic.

What is also very important about this approach is that it is motivated by linguistic data that are not generally taken into account. These are in particular, nominalizations of modal predicates and the semantically reflected properties of the objects they stand for, that is, modal objects. Particularly significant is the fact that modal predicates may take the form of simple predicates and of complex modal predicates containing a nominal standing for a modal object, a contrast that at least sometimes goes along with heavy and light interpretations of the modal.

Acknowledgment

Notes

1. According to Harves and Kayne (2012), the English verb *need* is itself derived syntactically from an underlying complex predicate *have need,* an analysis that could not carry over to cases such as *be permitted- have permission*, *be able – have the ability*, since *permission* and *ability* are derived from *permit* and *able* respectively. Moreover, as we will see in the next section, there is an important semantic difference between *be permitted* and *have permission to*.
2. Similar issues arise for epistemic modals (and epistemic or doxastic attitude verbs), which arguably display the same sort of distinction between light and heavy readings (Przyjemski 2017). See Section 8.

3. The same semantic effect is not associated with *possibility* when used with circumstantial modals that are not action-directed, as in *There is a possibility that it rains tomorrow* (thanks to Kit Fine for pointing this out to me).

4. For an extensive discussion of nominalizations of modal predicates see Moltmann (to appear).

5. There are also views, though, according to which moral obligations and permissions are created by acts of god, as Kit Fine pointed out to me.

6. See Moltmann (2018) for the notion of an existence predicate.

7. In general, the modal product produced by an illocutionary act *e* shares its satisfaction conditions with the illocutionary product produced by *e*. But unlike illocutionary products, enduring modal products do not require subsequent sustaining actions ensuring their persistence; they only require the initial act establishing them. See Moltmann (2017a) for further discussion.

8. It should be emphasized that truthmaker semantics, unlike what the name may suggest, does not pursue the philosophical interest of grounding the truth of a sentence in actual objects. Rather the interest of truthmaker semantics is semantic only, involving 'shallow metaphysics' or 'naïve metaphysics', rather than 'foundational metaphysics', as Fine (2017b) would put it.

9. The truthmaking conditions for sentences with existential and universal quantification are ultimately not correct, they are just meant to serve the current purpose of indicating that truthmaker semantics is meant to apply to all types of sentences.

10. Strictly speaking, this is in fact analytic containment, see Fine (2015) for discussion.

11. There are particular contexts required for an imperative to be used in the weaker way. See von Fintel and Iatridou (2017) for discussion.

12. More precisely, Fine (to appear a) suggests a different logical form for imperatives of permission, T v P rather than P!, where T is the formula made true by all situations or actions.

13. Fine (to appear a, b) takes deontic modals to apply to imperatives, sentences that have only actions as truthmakers. Such an assumption is avoided on the present approach. That deontic modals apply to imperative sentences in some form is implausible linguistically since there is nothing imperative-like about the prejacent of a deontic modal. Fine makes that assumption, though, for the sake of convenience only.

14. Also illocutionary are distinguished in terms of having violators or not. An offer or an invitation has only satisfiers, but no violators. By contrast, a request or an order has both satisfiers and violators.

15. The conditions on modal objects are similar to those imposed by Fine (to appear b) on codes of conduct, which play a similar role in Fine's account of deontic modals as the satisfiers of modal objects in object-based truthmaker semantics. See Section 10.

16. Also a modal object may have all possible situations or actions as satisfiers and thus lack violators, for example the largest modal object of metaphysical possibility. The modal object whose content is the negation of that modal object then would have no satisfiers and all possible situations as violators.

17. Modal flavors distinguish deontic modal objects (of a certain strength), epistemic modal objects, circumstantial modal objects etc. The two modal forces are necessity and possibility.
18. If the condition on such fusions is imposed that any satisfier of the permission contain a part that is a satisfier of the obligation, then this would be a modal object that has as its satisfiers the ideal courses of actions that form the basis of Fine's semantics of deontic sentences. See Section 10.
19. Such underspecification has recently been discussed by Fara Graff (2013) in the context of desire reports
20. For a treatment of abilities and dispositions as something like modal objects, see also Vetter (2015).
21. Essences display only correlates of obligations, not permissions. There is only an essence-related modal operator of necessity, not of possibility.

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