Establishing relations

1. Introduction

In the literature, it has become standard to assume that there are relational and non-relational nouns. This is typically implemented as distinguishing between nouns that are lexically of type <e,t> and those that are of type <e,<e,t>> (see e.g. Löbner 1985, 2011, De Bruin & Scha 1988, Dekker 1993). A noun like *hand* would e.g. not have a semantics like the one in (1) but rather something along the lines of (2). We will refer to this view as the *relational view*.

(1) $\lambda x(\text{hand}(x))$

(2) $\lambda y \lambda x(H(y)(x))$
where H is the relation that holds between a hand and its inalienable possessor

The analysis in (2) immediately raises a number of issues that could be dealt with but – to our knowledge – have not received the amount of attention they might have. First, if nouns like *hand* were indeed to receive the same kind of analysis as transitive verbs, we would need an explanation for why transitive verbs in general require their internal argument to be realised whereas relational nouns in general don't seem to come with such a requirement. We can e.g. say that *we have seen a mother*, *an uncle*, *a hand*, *a finger*, *a corner* without having the feeling that there's something missing.

Second, even though relational interpretations of nouns like *hand* seem intuitive, it is unclear what kind of linguistic test we would propose to check whether they actually exist and are – at the least – different from non-relational nouns. Suggestions in the literature include the Hebrew construct state and English post-nominal *of* that both are considered by some to only combine with lexical relational nouns (see e.g. Doron 2012 for Hebrew and Barker 2011 for English). The facts are less clear-cut than one would want them to be though. For English e.g. one finds clear contrasts between some nouns that are intuitively relational and some nouns that are not (see (3)) but one also finds that nouns like *café* and *church* that are intuitively non-relational pattern with relational nouns (see (4)).

(3) a day (*of someone) vs. a birthday of someone
a person (*of someone) vs. a child of someone

(4) a. the church of the monastery of Asteri
b. the cafe of the old harbour.

Third, relational nouns can sometimes be used without there being any possessor. The French sculptor Rodin e.g. made a number of sculptures that can readily be described as hands without belonging to anyone. In order to derive the felicity of these descriptions, one would want to get rid of the relational component in (2). The standard way to do so is to existentially bind the internal argument of the noun. In the Rodin case this would however not do the job as it would still entail the existence of a possessor.

Problems like the above have led us to reconsider the relational view and to explore what we will refer to as the *non-relational view* in which the lexical entries of relational nouns are non-relational, i.e. of type <e,t> instead of type <e,<e,t>>. We sketch this view in section 2 and investigate how it relates to the relational view in sections 3 to 5. Section 6 concludes and sets out lines for further research.

2. Establishing relations

In this section we sketch a tentative analysis of relational nouns within the non-relational view. We build it up in three steps.

Step 1

The first step is to grant that the lexical entry of relational nouns is a non-relational one. It would be leading us beyond the scope of this paper to provide a non-relational semantics for all relational nouns but we will however illustrate how we think this can be done.

The simplest cases are those nouns that are sometimes used with a non-relational interpretation. One of them is *hand*: a hand is an object consisting of a palm and five fingers. This is the interpretation we find in sentences like *Rodin sculpted many hands*.

The less straightforward cases are nouns like *mother* or *daughter* that are – to our knowledge – never used with a non-relational interpretation. For these nouns, we propose that their lexical semantics is of type <e,t> but goes back to an <e,<e,t>> interpretation with an existentially closed internal argument. The lexical semantics of *mother* and *daughter* would consequently be as follows:

(5) $[[\text{mother}]] = \lambda x \exists y(M(y)(x))$
where M represents the relation that holds between a mother and her child
$[[\text{daughter}]] = \lambda x \exists y(D(y)(x))$
where D represents the relation that holds between a female child and her parent

Note that the entries in (5) contain all relevant relational information but are not – *an sich* – relational. They identify sets of individuals, not of couples.

Step 2

For nouns like *mother* and *daughter* the lexical entry contains all the information necessary to reconstruct the relational interpretation. This is however not the case for nouns like *hand*. For these nouns we propose to encode this information in meaning postulates like the one in (6):

(6) $\forall x(\text{hand}(x) > \exists y(H(y)(x)))$
where H stands for the relation holding between a hand and its inalienable possessor

Note that we use commonsense entailment (Asher & Morreau 1991) instead of standard implication. This means we allow for models in which not all objects consisting of five fingers and a palm are in a relation with an inalienable possessor. This is exactly what we need to account for the Rodin example.

Step 3

The next step is to specify the different uses of the relational information in the lexical entries and meaning postulates.

For nouns like *mother* and *daughter*, the lexical entries in general suffice to get the right readings. For (7) e.g. a simple derivation tells us that there is an individual that is a mother to someone and that this individual was seen by John.

(7) John saw a mother.
$\exists x(\exists y(M(y)(x))\&see(x)(j))$

For nouns like *hand* the story is a bit more complicated. In the Rodin case the lexical entry in (1) suffices but for an example like (8a) we would want to be more specific about the relation between John and the hand:

(8) a. John lost a hand (in the war).
b. $\exists x(hand(x)\&lose(x)(j))$
c. $\exists x(hand(x)\&lose(x)(j)\&\exists y(H(y)(x)))$
d. $\exists x(hand(x)\&lose(x)(j)\&\exists y(H(y)(x)\&j=y))$

Our proposal is that in these cases the relational information encoded in the meaning postulate of *hand* is put to work in pragmatics. Given that it's likely for palms with five fingers to stand in the hand relation to an individual, we are entitled to make the defeasible assumption that (8a) is not simply about a palm with five fingers but rather about a palm with five fingers that stands in the hand relation to someone. (8b) contains the semantics we propose for (8a), (8c) its pragmatically enriched interpretation. Note that (8c) doesn't specify whose hand John lost. This is as desired given that it could be John's but it could also be a hand that John surgically removed and subsequently misplaced. (8d) spells out an additional step of pragmatic enrichment that further restricts the relation between John and the object he lost. This step from alienable to inalienable possession is analysed as an R implicature in Horn (2004).

Up till now we have proposed that lexical information can be used for post-derivational pragmatic enrichment. There is a second use where the same information pragmatically feeds a semantic operation. The operation we are referring to is the type-shifting operation π, also known as the transitivisation operation:

(9) $\pi = \lambda P_{<e,t>}\lambda x_e\lambda y_e(P_{<e,t>}(y_e)\&R_{<e,<e,t>>}(x_e)(y_e))$
where R is a free (pragmatically controlled) variable standing for a relation
(Barker, 2011)

What π does is to take a non-relational expression (type <e,t>) and turn it into a relational one (type <e,<e,t>>). This type of operation could e.g. be used to turn the <e,t> interpretation of *hand* in (1) into the <e,<e,t>> interpretation in (10):

(10) $\lambda y\lambda x(hand(x)\&H(y)(x))$

Even though π would allow us to specify R in several ways, we take the information specified in the meaning postulate to be the pragmatic default as it allows us to create the most likely <e,<e,t>> interpretation for the original <e,t> interpretation of *hand*.

Given that (9) is a general operation, we expect it not only to apply to a noun like *hand* but also to nouns like *mother* and *daughter*. Where for nouns like *hand* we used the relational information of meaning postulates as a pragmatic default, for nouns like *mother* and *daughter* we propose to use the relational information included in their lexical entries. This is spelled out in (11) for *mother*: (11a) presents the lexical entry, (11b) the result of the application of π and (11c) the specification of R as M.

(11) a. $\lambda x_e \exists y_e(M_{<e,<e,t>>}(y_e)(x_e))$
b. $\lambda p_e \lambda q_e(\exists y_e(M_{<e,<e,t>>}(y_e)(q_e))\&R_{<e,<e,t>>}(p_e)(q_e))$
c. $\lambda p_e \lambda q_e(\exists y_e(M_{<e,<e,t>>}(y_e)(q_e))\&M_{<e,<e,t>>}(p_e)(q_e)))$

The motivation for using M as the default specification of R is parallel to the one for nouns like *hand*: the most likely relation that can be picked for elements of the set denoted by (11a) is the relation that underlies their set membership.

We take the use of the operation in (9) – just like all other type-shifting operations – to be available only when there is a type clash to be solved. Given a standard GQT analysis of determiners like *a* and *the*, the application of π is proscribed when we combine these determiners with our non-relational entries. We take there to be a limited set of items though that – instead of taking expressions of type <e,t> as input – select expressions of type <e,<e,t>>. At the level of determiners we take possessives to be of this type. The semantics we propose for them is given in (12):

(12) [[POSSESSIVES]] = $\lambda R_{<e,<e,t>>} \iota x_e(R_{<e,<e,t>>}(\mathbf{k}_e)(x_e))$
Where *k* is a bound variable referring to the speaker for *my*, the interlocutor for *you*, …

In what follows we will use (12) to work out the analysis of the default interpretation of (13) according to which Mary saw her own mother.[1]

(13) Mary saw her mother.
(14) Mary$_i$ saw her$_i$ mother:

[[mother]]= lexical entry: $\lambda x_e \exists z_e(M_{<e,<e,t>>}(z_e)(x_e))$

[[her$_i$]]= $\lambda R_{<e,<e,t>>} \iota p_e(R_{<e,<e,t>>}(\mathbf{k}_e)(p_e))$

[[her$_i$ mother]]= $\lambda R_{<e,<e,t>>} \iota p_e(R_{<e,<e,t>>}(\mathbf{k}_e)(p_e))$ $\lambda x_e \exists y_e(M_{<e,<e,t>>}(y_e)(x_e))$

type-clash

$\lambda x_e \lambda y_e(\exists z_e(M_{<e,<e,t>>}(z_e)(y_e))\&M_{<e,<e,t>>}(x_e)(y_e)))$

transitivisation

$\iota p_e(\exists z_e(M_{<e,<e,t>>}(z_e)(p_e))\&M_{<e,<e,t>>}(\mathbf{k}_e)(p_e)))$

[[see]]= $\lambda q_e \lambda r_e(see_{<e,<e,t>>}(q_e)(r_e))$

[[see her$_i$ mother]]= $\lambda q_e \lambda r_e(see_{<e,<e,t>>}(q_e)(r_e))$ $\iota p_e(\exists z_e(M_{<e,<e,t>>}(z_e)(p_e))\&M_{<e,<e,t>>}(\mathbf{k}_e)(p_e)))$

$\lambda r_e(see_{<e,<e,t>>}(\iota p_e(\exists z_e(M_{<e,<e,t>>}(z_e)(p_e))\&M_{<e,<e,t>>}(\mathbf{k}_e)(p_e)))(r_e))$

[[she$_i$ see her$_i$ mother]]= $see_{<e,<e,t>>}(\iota p_e(\exists z_e(M_{<e,<e,t>>}(z_e)(p_e))\&M_{<e,<e,t>>}(\mathbf{k}_e)(p_e)))(\mathbf{k}_e)$

[[Mary]]= $\lambda P_{<e,t>}(P_{<e,t>}(m_e))$

[[Mary$_i$ see her$_i$ mother]]= $\lambda P_{<e,t>}(P_{<e,t>}(m_e))$ $\lambda s_e(see_{<e,<e,t>>}(\iota p_e(\exists z_e(M_{<e,<e,t>>}(z_e)(p_e))\&M_{<e,<e,t>>}(s_e)(p_e)))(s_e))$

$see_{<e,<e,t>>}(\iota p_e(\exists z_e(M_{<e,<e,t>>}(z_e)(p_e))\&M_{<e,<e,t>>}(m_e)(p_e)))(m_e))$

What (14) derives as the meaning for (13) is that Mary saw her own mother – the desired interpretation. Crucial for the derivation is that the relational interpretation of *mother* is triggered by the type-clash between *her* and the non-relational semantics of *mother*. This is in

[1] Note that another interpretation is available as well, *viz.* one in which Mary works in a team hired to guide young mothers through the first steps of being a mother. We get back to this interpretation in section 4.

accordance with the non-relational view according to which relational information is given in the lexicon but relational interpretations have to be established.

In the following sections we show how the non-relational view we propose not only equals the relational view but exceeds it in theoretical elegance and empirical coverage.

3. Binding

In this section, we zoom in on a first prediction that distinguishes the relational from the non-relational view: given that the relational view assumes that there is an extra argument available in the lexical entries of relational nouns, it predicts – everything else being equal – that this argument is available for binding. In a sentence like (15) e.g. *I* should be able to bind the internal argument of *friend*, a prediction that seems to be borne out.

(15) I met a friend.

The facts are less clear-cut than they might seem though. Indeed, a sentence like (15) not only allows for a reading according to which the speaker met a friend of her own but also that she met somebody else's friend. At a wedding, one could e.g. imagine the couple having invited family and friends. In that case, a family member could very well utter (15) intending that she had met a friend of the couple. What this shows is that the relational interpretation we get in (15) needn't be the consequence of binding but might simply be due to the fact that the use of the noun *friend* implies that we're talking about the friend of someone. This someone might then be the couple but also the speaker. The reading in which the friend turns out to be the friend of the speaker can consequently not be used as an argument in favour of the relational view.

Next, we turn to sentences like (16):

(16) I met the mother.

Intuitions about (16) strongly indicate that *the mother* cannot refer to the mother of the speaker and that the correct way to obtain this interpretation would be (17):

(17) I met my mother.

Where (15) seemed to be an argument in favour of the relational view, (16) would seem to be an argument against it. Indeed, everything else being equal, the relational view predicts the internal argument of relational nouns to be available for binding. The fact that (16) doesn't allow for the same interpretation as (17) seems to indicate that this prediction is too strong. In what follows we will however sketch the beginnings of an analysis that can be implemented both in the relational and the non-relational view.

The most likely analysis to pursue to obtain the contrast between (16) and (17) is one in which we take *his* and *the* to form a Horn scale where *his* is the stronger member of the scale. Once we assume this Horn scale, the story for (16) would be as follows. Given that we had the choice between using *my* – that would force a relational interpretation – and *the* – that would allow but not enforce it – we should have picked (17) if we had wanted to convey a relational interpretation. Given that we picked (16) instead, the hearer is entitled to assume that we didn't intend a relational interpretation.

The analysis we have just sketched is a pragmatic one and can be made to work both on the relational and the non-relational view. In both the relational and the non-relational view the Horn scale can be made to block an otherwise available reading.

In this section we have established that binding facts don't allow us to prefer the relational view over the non-relational one nor vice versa. In the next sections we will however argue that the non-relational view comes both with a theoretical and an empirical advantage.

4. Type-shifting

In the type-shifting literature, a standard assumption is that type-shifts need to be triggered. In this section we argue that – even for fairly simple examples – the relational view has to give up this assumption.

The running example in this section is the following:

(18) [Context: Mary and Jane work in a team hired to guide young mothers through the first steps of being a mother]
Mary to Jane: Have you already taken care of your mother today?

What Mary asks here is arguably not whether Jane has taken care of her own mother but whether she has taken care of the mother she was hired to take care of.

We first work out the analysis of (18) in the relational view and show how we would have to go against the standard assumption that type-shifts need to be triggered. Afterwards we show how the non-relational view allows us to maintain this assumption.

The challenge the relational view faces is that it starts with a relational interpretation of *mother* that would lead *your mother* to refer to Jane's own mother. This is shown in (19):

(19) your mother (where the variable in *your* is bound by Jane)
[[mother]]= $\lambda y_e \lambda x_e(M_{<e,<e,t>>}(y_e)(x_e))$
[[your]]= $\lambda R_{<e,<e,t>>} \iota x_e(R_{<e,<e,t>>}(j_e)(x_e))$
[[your mother]]= $\iota x_e(M_{<e,<e,t>>}(j_e)(x_e))$

The only way the relational view can make sure that *your mother* does not refer to Jane's own mother is to turn the relational semantics of *mother* into a non-relational one. This is standardly done by the detransitivisation operator Ex defined in (17):

(20) $Ex=\lambda R_{<e,<e,t>>} \lambda x_e \exists y_e(R_{<e,<e,t>>}(y_e)(x_e))$
(adapted from Barker, 2011)

What this operator does is to existentially bind the internal argument of relational expressions, thus paving the way for a subsequent application of the transitivisation operator π allowing for a new relation to be established between Jane and the mother. We work this out in (18):

(21) [[mother]]= $\lambda y_e \lambda x_e(M_{<e,<e,t>>}(y_e)(x_e))$
$\lambda x_e \exists y_e(M(y_e)(x_e))$
detransitivisation
$\lambda z_e \lambda x_e \exists y_e(M(y_e)(x_e) \& contractual\_caree\_of_{<e,<e,t>>}(z_e)(x_e))$

transitivisation

[[your]]= $\lambda R_{<e,<e,t>>}\iota x_e(R_{<e,<e,t>>}(j_e)(x_e))$

[[your mother]]= $\iota x_e(\exists y_e(M(y_e)(x_e)\&contractual\_caree\_of(j_e)(x_e))$

(21) correctly derives the desired interpretation of (18) according to which Jane took care of someone else's mother. The cost is quite high though: the only way this derivation can work is to allow for the application of the detransitivisation operator – a type-shifter – without this application being triggered by anything but the need to get to the right interpretation. Indeed, there is no reason to expect a type-clash between *your* – taking <e,<e,t>> complements – and the <e,<e,t>> semantics of *mother*. The relational view consequently has to go against the standard assumption that type-shifts have to be triggered.

In order to show that the non-relational view doesn't run into the same problem as the relational view, we work out the analysis of (18):

(22) [[mother]]= lexical entry: $\lambda x_e(mother_{<e,t>}(x_e))$
where *mother* is shorthand for $\lambda z\exists y(M(y)(z))$

[[your]]= $\lambda R_{<e,<e,t>>}\iota x_e(R_{<e,<e,t>>}(j_e)(x_e))$

[[your mother]]= $\lambda R_{<e,<e,t>>}\iota x_e(R_{<e,<e,t>>}(j_e)(x_e))$
$\lambda x_e(mother_{<e,t>}(x_e))$

type-clash

$\lambda y_e\lambda x_e(mother_{<e,t>}(x_e)\&contractual\_caree\_of_{<e,<e,t>>}(y_e)(x_e))$

transitivisation

$\iota x_e(mother_{<e,t>}(x_e)\&contractual\_caree\_of_{<e,<e,t>>}(j_e)(x_e))$

Two points about (22) deserve special attention. The first is that the only type-shifting operation we built in is motivated by a type-clash. The second is that the application of the transitivisation operation – as we indicated in section 2 – is flexible. The default relation it establishes is one in which the relational information from the lexical entry is put to work but nothing prevents other pragmatically inferred relations like the *contractual_caree_of* relation to be established.

The crucial difference between the relational and the non-relational view is that the former comes with a fixed relational interpretation whereas the latter establishes relational interpretations in the course of the derivation. This means that the non-relational view can easily accommodate different relational interpretations whereas the relational view would have to make a detour via an unwarranted application of Ex. We take this to be a strong argument in favour of the non-relational view – be it a theory internal one.

5. Existential *have*

5.1. Introduction

In this section we zoom in on a second prediction that distinguishes the relational and the non-relational view. It is concerned with the way the relational interpretation of a noun is obtained.

In the relational view, the relational interpretation of nouns is given in the lexicon. In the non-relational view, it is 'established' on demand in the course of the derivation: type clashes force an enrichment of the <e,t> semantics of the noun to an <e,<e,t>> semantics based on the relational information in the lexical entry or in a corresponding meaning postulate. We worked this out most explicitly in (14) where the lexical entry of *mother* was enriched so that it could combine with *her*.

These two different ways of obtaining relational interpretations have consequences for the semantic operations that are available at different points in the derivation. To see this, let's compare the lexical entries of *mother* under the non-relational and the relational view:

(23) $\lambda x_e(\exists y(M_{<e,<e,t>>}(y_e)(x_e)))$
(24) $\lambda y_e \lambda x_e(M_{<e,<e,t>>}(y_e)(x_e))$

The crucial difference between (23) and (24) is that *y* in the former is bound by an existential quantifier. The consequence of this is that *y* will not become available for application under the non-relational view. In this section, we will argue that this unavailability, combined with our assumption that type-shifts have to be triggered, leads to an empirical advantage of the non-relational over the relational view in the domain of existential *have*.

We start by giving an overview of a number of foundational papers (5.2. to 5.5) and argue that the fact that they take the relational view for granted leads them to make wrong predictions (5.6). The papers we will look into are Landman & Partee (1987), Partee (1999), Landman (2004) and Saebo (2009). In our overview, we zoom in on the two challenges that have been at the heart of these papers.

The first challenge is the following: in a compositional analysis of (25) that assumes *sister* to be relational in the lexicon, we would want it to combine with *Mary* before it combines with *a* and with *has*.

(25) Mary has a sister.

The challenge for an analysis of (25) then is to by-pass the intervening verb and determiner. We will refer to this challenge as the *compositionality challenge*.

The second challenge that is treated in the literature is what we will call the *definiteness challenge*: the fact that definites on some of their readings cannot combine with existential *have*. This is illustrated in (26):

(26) ?Mary has the mother.

Even if Mary only has one mother, (26) still turns out to be infelicitous if the intended reading is that Mary stands in a daughter relation to someone.
The problem we will find back in all approaches to existential *have* is that – in final analysis – they take *a* to combine with a version of *sister* in which the internal argument is specified as *Mary*. Even though this works fine for (25), it fails for sentences like (27).

(27) Mary has the only mother who goes to church.

On the analyses we will treat, in as far as they succeed in accounting for the difference between (26) and (27), the reading they derive for (27) is 'Mary only has a mother who goes to church' whereas the real interpretation is 'Mary is the only one who has a mother who goes to church'.[2] The availability of the former interpretation is crucially linked to *y*'s availability for abstraction in (24).

5.2. Landman & Partee (1987)

We treat Landman & Partee (1987) mainly for historical reasons. Both Landman and Partee have since revised their answer to the challenges in 4.1. but the paper is still a good starting point for understanding the challenge and the solutions that have been proposed.

In Landman & Partee (1987), determiners are enriched in such a way that they cannot only combine with expressions of type <e,t> but also with relations of type <e,<e,t>>. The relational version of the indefinite article is as follows:

(28) $$[[a]] = \lambda R_{\langle e,\langle e,t\rangle\rangle}\lambda P_{\langle e,t\rangle}\lambda y_e(\exists x_e(R_{\langle e,\langle e,t\rangle\rangle}(y_e)(x_e)\&P_{\langle e,t\rangle}(x_e)))$$

The result of combining (28) with a relation is an expression of type <<e,t>,<e,t>> that can then combine with a verb. This combination will still require an extra argument – the subject – that will be specified as the first argument of the relation. This is worked out for *sister* in (29):

(29)
$$[[sister]] = \lambda v_e\lambda w_e(sister\_of_{\langle e,\langle e,t\rangle\rangle}(v_e)(w_e))$$
$$[[a\ sister]] = \lambda R_{\langle e,\langle e,t\rangle\rangle}\lambda P_{\langle e,t\rangle}\lambda y_e(\exists x_e(R_{\langle e,\langle e,t\rangle\rangle}(y_e)(x_e)\&P_{\langle e,t\rangle}(x_e)))\ \ \lambda v_e\lambda w_e(sister\_of_{\langle e,\langle e,t\rangle\rangle}(v_e)(w_e))$$
$$= \lambda P_{\langle e,t\rangle}\lambda y_e(\exists x_e(\lambda v_e\lambda w_e(sister\_of_{\langle e,\langle e,t\rangle\rangle}(v_e)(w_e))(y_e)(x_e)\&P_{\langle e,t\rangle}(x_e)))$$
$$= \lambda P_{\langle e,t\rangle}\lambda y_e(\exists x_e(sister\_of_{\langle e,\langle e,t\rangle\rangle}(y_e)(x_e)\&P_{\langle e,t\rangle}(x_e)))$$

The semantics Landman & Partee (1987) adopt for *have* is as follows:

(30) $$have = \lambda Z_{\langle\langle e,t\rangle,\langle e,t\rangle\rangle}(Z_{\langle\langle e,t\rangle,\langle e,t\rangle\rangle}(exist_{\langle e,t\rangle}))$$
where *exist* is $\lambda z(z=z)$

Exist is a predicate taken from Keenan (1987) that holds of every entity in the domain and leads to a tautology when the object is headed by a positive strong determiner – a property that Keenan exploited to derive definiteness effects for the existential construction. In (31), we work out the combination of *have* with *a sister*.

(31)
$$[[have\ a\ sister]] = \lambda Z_{\langle\langle e,t\rangle,\langle e,t\rangle\rangle}(Z_{\langle\langle e,t\rangle,\langle e,t\rangle\rangle}(exist_{\langle e,t\rangle}))\ \lambda P_{\langle e,t\rangle}\lambda y_e(\exists x_e(sister\_of_{\langle e,\langle e,t\rangle\rangle}(y_e)(x_e)\&P_{\langle e,t\rangle}(x_e)))$$
$$= \lambda P_{\langle e,t\rangle}\lambda y_e(\exists x_e(sister\_of_{\langle e,\langle e,t\rangle\rangle}(y_e)(x_e)\&P_{\langle e,t\rangle}(x_e)))(exist_{\langle e,t\rangle})$$
$$= \lambda y_e(\exists x_e(sister\_of_{\langle e,\langle e,t\rangle\rangle}(y_e)(x_e)\&exist_{\langle e,t\rangle}(x_e)]]$$

The result in (31) can now straightforwardly be combined with a subject like *Mary*. This yields the result in (32).

(32) $$[[Mary\ have\ a\ sister]] = \exists x_e(sister\_of_{\langle e,\langle e,t\rangle\rangle}(m_e)(x_e)\&exist_{\langle e,t\rangle}(x_e))$$

[2] A question one might ask on the basis of the competition analysis we briefly presented in section 4 is why the possessive is not preferred over the definite in (27). The answer lies in the semantics of *have* that we will work out in 5.6.: *have* is similar to possessives in enforcing an <e,<e,t>> interpretation of its complement and the speaker consequently doesn't have to resort to possessives to enforce a relational interpretation.

As noted by Partee (1999), this analysis covers the data but leaves some questions unanswered. The two most puzzling ones are what kind of independent motivation can be found for the type of the object (<<e,t>,<e,t>>) and the type of the verb (<<<e,t>,<e,t>>,<e,t>>).

5.3. Partee (1999)

Partee (1999) takes another look at the analysis of Landman & Partee (1987) in the light of Szabolcsi (1994). Szabolcsi argues that the Hungarian counterpart of *Mary has a sister* is as in (33):

(33) [To Mary]$_i$ is sister t$_i$.

Two properties of (33) stand out. The first is that Hungarian doesn't use *have* in this construction but *be*. This is nice support for giving *have* in English the semantics of *exist*. The second is that *Mary* is base generated in a position where it can combine with *sister* before it combines with a determiner and then moves to the subject position. Partee (1999) notes that this process of possessor raising can actually be read into the semantics Landman & Partee (1987) proposed. The analysis Partee (1999) has in mind is something along the lines of (34).

(34)
a. [[a]] $= \lambda P_{<e,t>}\lambda Q_{<e,t>}\exists x_e(P_{<e,t>}(x_e)\&Q_{<e,t>}(x_e))$
b. [[sister_of]] $= \lambda v_e\lambda w_e(\text{sister\_of}_{<e,<e,t>>}(v_e)(w_e))$
c. [[sister_of]] $= \lambda w_e(\text{sister\_of}_{<e,<e,t>>}(\mathbf{k}_e)(w_e))$
d. [[a sister_of]] $= \lambda Q_{<e,t>}\exists w_e(\text{sister\_of}_{<e,<e,t>>}(\mathbf{k}_e)(w_e)\&Q_{<e,t>}(w_e))$
e. [[have]] $= \lambda S_{<<e,t>,t>}(S_{<<e,t>,t>}(\text{exist}_{<e,t>}))$
f. [[have a sister_of]] $= \exists w_e(\text{sister\_of}_{<e,<e,t>>}(\mathbf{k}_e)(w_e)\&\text{exist}_{<e,t>}(w_e))$
g. [[have a sister_of]] $= \lambda x\exists w_e(\text{sister\_of}_{<e,<e,t>>}(x_e)(w_e)\&\text{exist}_{<e,t>}(w_e))$
h. [[Mary]] $= \lambda P_{<e,t>}(P_{<e,t>}(m_e))$
i. [[Mary have a sister_of]] $= \exists w_e(\text{sister\_of}_{<e,<e,t>>}(m_e)(w_e)\&\text{exist}_{<e,t>}(w_e))$

The crucial bits of (34) are (c) and (g-i): the former prepares the quantifying-in operation in the latter. Partee (1999) proposes quantifying-in as the semantic alternative to syntactic possessor raising and points out that: (i) the λy in the translation of *a sister* in (29) should be seen as reflecting the place where *Mary* must end up having its scope in the possessive construction and (ii) the λy in the translation of *have a sister* in (31) should be seen as the abstractor that accompanies a quantifying-in rule.

The conclusion Partee arrives at is that the analysis Landman & Partee (1987) proposed was on the right track and that the somewhat weird types they proposed can be understood 'by saying it is "as if" the subject of the *have*-sentence is a moved instance of a quantified-in possessor' (Partee 1999:7).

5.4. Saebo (2009)

Saebo adds an extra challenge to the list presented in 5.1., *viz.* to offer a unified semantics for *have*. The starting point of his analysis is the structure exemplified in (35) where the indefinite occurs in a small clause, a structure Saebo generalizes to all occurrences of *have*.

(35) I had a gun pointing at me.

Saebo proposes to derive the different interpretations of *have* on the basis of the contents of the overt or covert small clause verb. For the possessive use of *have* he takes this to be something along the lines of *at one's disposal*, *in one's possession* or *as part of one*. For the relational use of *have* he takes this to be the predicate *exist*. In what follows, we work this out for *Mary has a sister*.[3]

In (36) the content of the small clause *a sister* with the covert predicate *exist* is spelled out:

(36) a. [[sister]] $= \lambda x_e(\text{sister}_{<e,<e,t>>}(\mathbf{k_e})(x_e))$
b. [[a sister]] $= \lambda P_{<e,t>}\exists x_e(\text{sister}_{<e,t>}(\mathbf{k}_e)(x_e)\&P_{<e,t>}(x_e))$
c. [[exist_{covert}]] $= \lambda y_e(\text{exist}_{<e,t>}(y_e))$
d. [[a sister exist_{covert}]] $= \exists x_e(\text{sister}_{<e,<e,t>>}(\mathbf{k}_e)(x_e)\&\text{exist}_{<e,t>}(x_e))$

Note that this analysis is close to that of Partee (1999) in the sense that it assumes an <e,t> interpretation of *sister* before the noun combines with the indefinite article. Saebo's analysis differs from Partee's in two respects. First, Saebo doesn't take the predicate *exist* to be the semantics of *have* but builds this predicate into the small clause. Second, he proposes a unified semantics for *have* in terms of abstraction, letting the small clause take care of the different meaning nuances *have* can take. (37) sketches the rest of the derivation as proposed in Saebo (2009):

(37) a. [[have]] $= \lambda\phi_t\lambda y_e\phi$
b. [[have a sister exist_{covert}]] $= \lambda y_e\exists x_e(\text{sister}_{<e,<e,t>>}(y_e)(x_e)\&\text{exist}_{<e,t>}(x_e))$
c. [[Mary]] $= m_e$
d. [[Mary has a sister exist_{covert}]] $= \exists x_e(\text{sister}_{<e,<e,t>>}(m_e)(x_e)\&\text{exist}_{<e,t>}(x_e))$

5.5. Landman (2004)

Simplifying a bit, the gist of Landman's analysis is that *has* and *a* in *Mary has a sister* are void in meaning and that *Mary* can directly combine with *sister* which he assumes is of type <e,<e,t>>.[4] We look into the semantic contribution of *a*, into that of *has* and go through the derivation.

Landman's analysis is embedded in his adjectival analysis of indefinites according to which indefinite DPs – and only indefinite DPs – are generated as type <e,t> expressions – or type <e,<e,t>> for indefinite DPs with relational nouns. As indefinites function as predicate modifiers, it seems straightforward to assume that the <<e,<e,t>>,<e,<e,t>>> type should be available to them.
In Landman's analysis, the meaning of 'relational' *have* is derived from the meaning of 'possessive' *have* by stripping the latter of its ability to assign the thematic roles *possessor* and *possessed theme*. This interpretation is given in (38):

(38) $\lambda y\lambda x\lambda s(s\in S\&x\in D\&y\in D)$
where S is the set of all states and D the set of all individuals

[3] We will ignore tense and aspect as they are not relevant for our discussion.
[4] Landman (2004) uses 'e' to refer to eventualities and 'd' to refer to individuals. We will however continue to use 'e' for individuals and distinguish it from eventualities by referring to the latter with '*e*'.

As for the derivation, Landman presents it as a process of incorporation where the relation denoted by the object is incorporated into the verb. The derivation of *Mary has a sister* starts with 'scope linking' *sister*, an operation that takes the <e,<e,t>> interpretation of *sister* and turns it into an interpretation of type <e,<e,<*e*,t>>> where *e* stands for *eventuality*. Scope linking is characterized in (39) and is constrained by the correspondence principle in (40):

(39) Scope linking operation [ ]:
$[\ ]: \langle e^n,t\rangle \rightarrow \langle e^n, \langle e,t\rangle\rangle$

(40) Correspondence principle:
for every n-place relation R, and individuals $e_1, \ldots, e_n$:
$R(e_1, \ldots, e_n)$ iff $\exists s \in [R]$: $A_1(s)=e_1 \& \ldots\ A_n(s)=d_n$

For *a sister*, the result of applying scope linking is as follows:

(41) $\lambda y\lambda x\lambda s(s\in[SISTER]\ \&\ A_1(s)=x\ \&\ A_2(s)=y)$

The next step is the thematicization of the relational noun, an operation that turns it into a predicate that comes with a theta grid:

(42) $\lambda y\lambda x\lambda s(s\in[SISTER]\ \&\ A_1(s)=x\ \&\ A_2(s)=y)$
$\langle A_2,A_1\rangle$

At this point, *a sister* can combine with *have* through intersection. The result is identical to (42):

(43) $\lambda y\lambda x\lambda s(s\in[SISTER]\ \&\ A_1(s)=x\ \&\ A_2(s)=y) \cap$ $\lambda y\lambda x\lambda s(s\in S \& x\in D \& y\in D)$
$\langle A_2,A_1\rangle$ **<-,->**

$= \lambda y\lambda x\lambda s(s\in[SISTER]\ \&\ A_1(s)=x\ \&\ A_2(s)=y)$
$\langle A_2,A_1\rangle$

What we have now is a predicate that still requires two arguments from the domain of individuals. The argument corresponding to A_2 would normally come from the object but given that the object is turned into the predicate, this is no longer possible. In order to remedy, Landman proposes to 'passivize' the predicate *have a sister*: we remove the subject role from the theta grid, existentially close it and take A_2 to be the only role that is left to assign. The result of these operations is spelled out in (44):

(44) $\lambda y\lambda s(s\in[SISTER]\ \&\ \exists x(A_1(s)=x)\ \&\ A_2(s)=y)$
$\langle A_2\rangle$

At this point *have a sister* is ready to combine with *Mary*, giving rise to (45):

(45) $\lambda s(s\in[SISTER]\ \&\ \exists x(A_1(s)=x)\ \&\ A_2(s)=Mary)$

After existential closure of *s*, we end up with (46a), which is identical to (46b) and – on the basis of the correspondence principle – to (46c):

(46) a. $\exists s(s\in[SISTER]\ \&\ \exists x(A_1(s)=x)\ \&\ A_2(s)=Mary)$
b. $\exists x\exists s(s\in[SISTER]\ \&\ A_1(s)=x\ \&\ A_2(s)=Mary)$

c. $\exists$x(SISTER(x,Mary))

Let's summarize. The two crucial ingredients of Landman's analysis are (a) that the indefinite is a predicate modifier and has no effect on the type of the noun and (b) that *have* incorporates the semantics of its relational object. (a) and (b) taken together boil down to combining the object directly with the subject. The definiteness restriction – Landman claims – is derived through a constraint on scope linking:

We predict the definiteness effects, because the semantic incorporation process relies crucially on the possibility to shift the relational indefinite […] *from type* [<e,<e,t>> to type <e,<e,<*e*,t>>>], *the same type as the interpretation of dethematicized* have*: it is because the interpretation of the relational indefinite is born as a relation of type* [<e,<e,t>>] *that the incorporation works. Since definites and quantificational noun phrases based on a relational noun are not born at type* [<e,<e,t>>]*, they cannot be incorporated. Since non-relational noun phrases are not of the relational type either, they cannot be incorporated either.*

5.6. The non-relational view and existential *have*

In 5.2. tot 5.5. we presented four analyses of existential *have* that – taken together – can be considered to make up the state of the art. All of them follow the relational view. In this section we will argue that the non-relational view can account for the same data but comes with an empirical bonus. Note that we will focus on the compositionality challenge, leaving the question how the definiteness challenge can best be dealt with for further research. Given that it would in principle suffice to build in a covert *exist* into the semantics of *have* this seems like a justifiable move.

To show that the non-relational view can deal with the compositionality challenge, we work out the analysis of *Mary has a sister*. In order to do so, we need to make explicit the semantics we assume for *have* and *a* as well as define the BE type-shift we will be using in the course of the derivation. The semantics we assume for *have* is given in (47):

(47) $[[\text{have}]] = \lambda R_{<e,<e,t>>}\lambda y_e \exists x_e(R_{<e,<e,t>>}(y_e)(x_e))$

This semantics is inspired by Landman's: *have* selects a relation and takes over its semantics while applying existential closure to their internal argument. For *a* we assume its standard GQT analysis:

(48) $[[\text{a}]] = \lambda P_{<e,t>}\lambda Q_{<e,t>}\exists x_e(P_{<e,t>}(x_e) \& Q_{<e,t>}(x_e))$

Finally, we also define the type-shift BE that takes expressions of type <<e,t>,t> and turns them into expressions of type <e,t>:

(49) $\lambda \wp_{<<e,t>,t>}(\lambda x_e(\{x_e\} \in \wp_{<<e,t>,t>}))$

Partee (1987)

In the derivation we will make a combination of BE and π but for transparency's sake we will spell them out separately.

With the above assumptions in place we can work out the derivation for *Mary has a sister*:[5]

(49) Mary has a sister:

[[sister]]=	lexical entry: $\lambda x \exists y(S(y)(x))$ where S is the relation that holds between a sister and the individual she is a sister of
[[a]]=	$\lambda P_{<e,t>} \lambda Q_{<e,t>} \exists z_e(P_{<e,t>}(z_e) \& Q_{<e,t>}(z_e))$
[[a sister]]=	$\lambda Q_{<e,t>} \exists z_e(\exists y_e(S_{<e,<e,t>>}(y_e)(z_e)) \& Q_{<e,t>}(z_e))$
[[have]]=	$\lambda R_{<e,<e,t>>} \lambda p_e \exists q_e(R_{<e,<e,t>>}(q_e)(p_e))$
[[have a sister]]=	$\lambda R_{<e,<e,t>>} \lambda p_e \exists q_e(R_{<e,<e,t>>}(q_e)(p_e)) \quad \lambda Q_{<e,t>} \exists z_e(\exists y_e(S_{<e,<e,t>>}(y_e)(z_e)) \& Q_{<e,t>}(z_e))$
	type-clash
	$\lambda z_e(\exists y_e(S_{<e,<e,t>>}(y_e)(z_e)))$
	application of BE
	$\lambda r_e \lambda z_e(\exists y_e(S_{<e,<e,t>>}(y_e)(z_e)) \& S_{<e,<e,t>>}(r_e)(z_e))$
	transitivisation
	$\lambda p_e \exists q_e(\exists y_e(S_{<e,<e,t>>}(y_e)(p_e)) \& S_{<e,<e,t>>}(q_e)(p_e))$
[[Mary]] =	m_e
[[Mary have a sister]]=	$\exists q_e(\exists y_e(S_{<e,<e,t>>}(y_e)(m_e)) \& S_{<e,<e,t>>}(q_e)(m_e))$

The interpretation we end up with is that there is an individual who stands in the sister relation to Mary. This is exactly the interpretation we were after. We can consequently conclude that the non-relational view is at least empirically as adequate as the relational view.

In what follows, we want to take another look at (26), repeated below as (50):

(50) Mary has the only mother who goes to church.

The only interpretation (50) has is that Mary is the only child whose mother goes to church. In what follows, we argue that the relational analyses that are able to derive a reading for (50) predict that the sentence will be true even if Mary's mother is not the only mother who goes to church – an unwelcome prediction. Afterwards we will show how the relational view does derive the correct interpretation.

The first point to be noted about (50) is that it differs from sentences like (25) (repeated below as (51)) in that the presence of *only* imposes a quantificational rather than the stronger presuppositional reading of the definite article (see also McNally 2008).

(51) ?Mary has the mother.

Landman & Partee (1987), Partee (1999) and Saebo (2009) straightforwardly account for the difference between (51) and (50) because the predicate *exist* they build into their respective analyses is only incompatible with positive strong determiners – excluding presuppositional *the* but not its quantificational version. For Landman (2004) we don't see how he could derive the difference under his current assumptions.

[5] Note that we will only spell out the derivation that leads to the interpretation according to which there is an individual that stands in the sister relation to Mary. For completeness, we note that this is not the only interpretation. Another interpretation is available in a context in which Mary is part of a group of social workers who has to take care of girls who have been causing a lot of trouble to their sisters. When assigning sisters to workers one could felicitously say 'Mary (already) has a sister'.

Next, we demonstrate that the relational analyses that are left arrive at the wrong interpretation of (51). This is not difficult because each of them is set up in such a way that the definite article will end up taking scope over the relational predicate with the internal argument being specified as Mary – i.e. instead of having scope over *mother*, it scopes over *mother of Mary*. (51) would consequently mean ‘There is a single individual who stands in a mother relation to Mary and who goes to church’. This means that the sentence can still be true if someone else also has a mother who goes to church. We show this for a reduced version of (51) on the basis of Partee (1999):

(52) a. [[the only]] $= \lambda P_{<e,t>}\lambda Q_{<e,t>}\exists x_e(P_{<e,t>}(x_e)\&\forall y_e(P(y_e)\rightarrow y_e=x_e)\&Q_{<e,t>}(x_e))$

b. [[mother]] $= \lambda v_e\lambda w_e(M_{<e,<e,t>>}(v_e)(w_e))$

c. [[mother]] $= \lambda w_e(M_{<e,<e,t>>}(\mathbf{k}_e)(w_e))$

d. [[the only mother]] =

$\lambda Q_{<e,t>}\exists x_e(M_{<e,<e,t>>}(\mathbf{k}_e)(x_e)\&\forall y_e(M_{<e,<e,t>>}(\mathbf{k}_e)(y_e)\rightarrow y_e=x_e)\&Q_{<e,t>}(x_e))$

e. [[have]] $= \lambda S_{<<e,t>,t>}(S_{<<e,t>,t>}(exist_{<e,t>}))$

f. [[have the only mother]] =

$\exists x_e(M_{<e,<e,t>>}(\mathbf{k}_e)(x_e)\&\forall y_e(M_{<e,<e,t>>}(\mathbf{k}_e)(y_e)\rightarrow y_e=x_e)\&exist_{<e,t>}(x_e))$

g. [[have the only mother]]=

$\lambda z_e\exists x_e(M_{<e,<e,t>>}(z_e)(x_e)\&\forall y_e(M_{<e,<e,t>>}(z_e)(y_e)\rightarrow y_e=x_e)\&exist_{<e,t>}(x_e))$

h. [[Mary]] $= \lambda P_{<e,t>}(P_{<e,t>}(m_e))$

i. [[Mary have the only mother_of]] =

$\exists x_e(M_{<e,<e,t>>}(m_e)(x_e)\&\forall y_e(M_{<e,<e,t>>}(m_e)(y_e)\rightarrow y_e=x_e)\&exist_{<e,t>}(x_e))$

A perhaps even more important question is whether we can ever avoid deriving the wrong interpretation on the relational view. The answer is negative: once we assume the relational view and allow for abstraction, the interpretation according to which we’re talking about the only mother of Mary’s automatically becomes available.

We now turn to the non-relational analysis and show how it does get the right interpretation for (51):

(53) Mary has the only mother who goes to church:

[[mother]]=

lexical entry: $\lambda x_e\exists z_e(M_{<e,<e,t>>}(z_e)(x_e))$

[[mother who goes to church]]=

$\lambda x_e(\exists z_e(M_{<e,<e,t>>}(z_e)(x_e))\&church\_going(x_e))$

$=_{shorthand} \lambda x_e(MC(x_e))$

[[the only]]=

$\lambda P_{<e,t>}\lambda Q_{<e,t>}\exists y_e(P_{<e,t>}(y_e)\&\forall p_e(P(p_e)\rightarrow p_e=y_e)\&Q_{<e,t>}(y_e))$

[[the only mother who goes to church]]=

$\lambda Q_{<e,t>}\exists y_e(MC_{<e,t>}(y_e))\&\forall p_e(MC_{<e,t>}(p_e)\rightarrow p_e=y_e)\&Q_{<e,t>}(y_e))$

[[have]]=

$\lambda R_{<e,<e,t>>}\lambda q_e\exists r_e(R_{<e,<e,t>>}(q_e)(r_e))$

[[have the only mother who goes to church]]=

$\lambda R_{<e,<e,t>>}\lambda q_e\exists r_e(R_{<e,<e,t>>}(q_e)(r_e))$

$\lambda Q_{<e,t>}\exists y_e(MC_{<e,t>}(y_e))\&\forall p_e(MC_{<e,t>}(p_e)\rightarrow p_e=y_e)\&Q_{<e,t>}(y_e))$

type-clash

$\lambda y_e(\exists z_e(MC_{<e,t>}(y_e))\&\forall p_e(MC_{<e,t>}(p_e)\rightarrow p_e=y_e))$

application of BE

$\lambda s_e\lambda y_e(\exists z_e(MC_{<e,t>}(y_e))\&\forall p_e(MC_{<e,t>}(p_e)\rightarrow p_e=y_e)\&M(s_e)(y_e))$

transitivisation

$\lambda q_e\exists r_e(\exists z_e(MC_{<e,t>}(r_e))\&\forall p_e(MC_{<e,t>}(p_e)\rightarrow p_e=r_e)\&M(q_e)(r_e))$

[[Mary]] =
m_e

[[Mary have the only mother who goes to church]]=
$\exists r_e(\exists z_e(MC_{<e,t>}(r_e))\&\forall p_e(\exists s_e(MC_{<e,t>}(p_e)\rightarrow p_e=r_e)\&M(m_e)(r_e))$
$=_{\text{without shorthand}}\exists r_e(\exists z_e(M_{<e,<e,t>>}(z_e)(r_e))\&church\_going(r_e))\&\forall p_e(\exists s_e(M_{<e,<e,t>>}(s_e)(p_e)\& church\_going(p_e) \rightarrow p_e=r_e)\&M(m_e)(r_e))$

The only interpretation the non-relational view derives is one in which there is a single mother who goes to church and that this mother is Mary's. This is due to the fact that the definite article can only scope over an interpretation of *mother* in which the internal argument is existentially closed.

On the basis of the preceding we conclude that the non-relational view is not merely equal in empirical adequacy to the relational view but exceeds it.

6. Conclusions and further research

The main goal of this paper was to argue that relational nouns should not be lexically specified as such and that the relations they seem to denote should be established in the course or at the end of the derivation as part of semantics or pragmatics. In order to do so we worked out a tentative analysis of relational nouns that takes them to be uniformly of type <e,t>. We showed how this analysis solves both theoretical and empirical problems spanning both syntax and semantics.

The work reported in this paper is part of two bigger research enterprises. The first explores the link between relationality and the availability of bare nominal arguments, the second the semantics of definites and possessives. The link between relationality and possessives makes sense at an intuitive level but the link between relationality and bare nominal arguments might be less straightforward. In the remainder of this concluding section, we briefly sketch how we explore it in XXXX (2013, in preparation).

In the recent semantics literature it has been noted that *have* verbs are special in that they cannot only take full DP arguments but also bare singular nouns. We illustrate in (54) for Spanish but the same holds for a number of other languages like Norwegian, Catalan, Greek … (see e.g. Borthen 2003, Dobrovie-Sorin, Bleam & Espinal 2006, Espinal & McNally 2011, Lazaridou-Chatzigoga & Alexandropoulou *forthcoming*).

(54) Tengo un coche. SPANISH
I-have a car
Tengo coche. SPANISH
I-have car
'I have a car'

Several analyses of this phenomenon have been proposed but no attempt has been undertaken to answer the question why *have* verbs behave in this particular way. The answer we propose lies in the semantic nature of *have* verbs as verbs that don't select regular arguments but (relational) predicates that need the subject of *have* as their first argument. Because of the flexible nature of type-shifting the adding of an indefinite article doesn't pose a problem but doesn't add anything to the semantics either. The distinction between a language like English and a language like Spanish would then lie in the syntax in that all direct objects are required to come with some functional projection in the former but not in the latter.

In XXXX (2013, in preparation) we further explore the availability of bare nominals in *a room with shower*, *a lady in evening dress* and the relation between PPs with a full DP like English *at the office* and their bare counterparts like Dutch *op kantoor* (literally 'on office').

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