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ON THE SYNTAX AND SEMANTICS OF *TENER* AND *HABER*

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ABSTRACT: This paper presents a novel approach on the syntax and semantics of the two Spanish auxiliary verbs *haber* and *tener* and their distributional properties. It is argued that these verbs share key syntactic properties, but denote two different types of semantic relations. While *tener* denotes a property ascribed to the subject, *haber* only introduces the temporal reference of a sentence. This proposal on the semantics of *tener* and *haber* is then inserted in a broader proposal on auxiliary verbs, copulae and their distribution. It is shown that the current proposal can correctly account the distribution of *tener* and *haber*, and be seamlessly integrated with standard approaches to *ser* and *estar*.

KEYWORDS: auxiliary verbs, copulae, lexical aspect, lexical semantics, Spanish.

1. INTRODUCTION¹

The Spanish system of auxiliary verbs includes at least four distinct verbs: the two copulae *ser* and *estar*; and the auxiliary verbs *tener* and *haber*. Several theoretical works have focused on *ser* and *estar* (Maierborn 2005; Camacho 2012; a.o.). Few works, however, have analyzed *haber* and *tener*. Descriptive and formal accounts alike contend that *tener* denotes an essential property of the subject, while *haber* denotes the momentary EXISTENCE of a certain property of the subject (Butt & Benjamin 2004: part 5; Gutiérrez-Rexach 2007; a.o.). Examples (1)-(2) illustrate their distribution:

- (1) *Mario ha ido a la Iglesia*
Mario is-H gone at the church
'Mario has gone to the church'
- (2) **Mario ha en la Iglesia*
Mario is-H in the church
'Mario is in the church'

¹ This paper has benefitted from the generous feedback of an anonymous reviewer, which I gratefully acknowledge, and from various colleagues that offered feedback on preliminary versions of this work. The enduring support of my Princess also guided me through the difficult moments, as always. The usual disclaimer applies.



- (3) *Mario tiene una hermana*
 Mario is-T a sister
 ‘Mario has a sister’
- (4) **Mario esta/ha una hermana*
 Mario is/is-H a sister
 ‘Mario has a sister’

Examples² (1)-(2) show that *haber* can only combine with a VP such as *ido a la iglesia*, but not with a (spatial) PP, *en la iglesia*. Examples (3)-(4) show that *tener*, but not *haber* or *estar*, can combine with an NP³ such as *una hermana*. So, *tener* and *haber* have a rather restricted distribution. Works that study *tener* and *haber* focus on their ability to denote TEMPORARY OR ESSENTIAL relations among individuals (e.g. Gutiérrez-Rexach 2007). However, they do not explain why these auxiliary verbs have specific restrictions in their distribution, or how this distribution is connected with their interpretation, and that of *ser* and *estar*. Therefore, the data in (1)-(4) offer a yet unsolved empirical problem in need of a solution.

The goal of this paper is to offer a semantics of *haber* and *tener* that correctly captures the data in (1)-(4), and that can make general predictions about their distribution. In pursuing this goal, we also pursue a broader goal. We will offer a more general proposal on the distribution of these Spanish auxiliary verbs, including their interaction with the sub-type of copulae (i.e. *ser*, *estar*). So, we will account not only the data in (1)-(4), but also connect them to a line of research in the Spanish language, that on *ser* and *estar*.

This paper is organized as follows. In Section 2 we present the data in detail, outline the *desiderata* for an account of *tener* and *haber*, and explain why previous proposals fall short of offering a correct account. In Section 3 we present a proposal on the syntax and semantics of these two verbs, and explain how we can account for the *desiderata*. Section 4 offers some conclusions to the paper.

2. THE DATA: THE DISTRIBUTION OF *TENER* AND *HABER*

In this section I present the data on the distribution of *tener* and *haber* (Sections 2.1, 2.2). I discuss previous proposals and outline their problems, before moving to our solution (Section 2.3).

² I use the gloss ‘-T’ and ‘-H’ to translate *tener* and *haber*, to represent **these all** auxiliary verbs as specific incarnations of a general auxiliary verb/copula, glossed as ‘be’. I also adapt Maierborn’s (2005) glosses for *ser* and *estar*, respectively ‘-S’ and ‘-E’. Other glosses are: IMPF=imperfective (aspect); FUT=future (tense); IMPS=impersonal (form).

³ Here and in the remainder of the paper I use the more theory-neutral label QUANTIFIED NP to refer to the DPs of generative tradition (Abney 1987; a.o.).

2.1 *Tener* and its distribution

The auxiliary *tener* has a limited syntactic distribution, as it can only take some classes of NPs and PPs as complements. Its semantics, as we discussed in the introduction, seems to capture a necessary condition for the individuation of the subject.⁴ POSSESSION, KINSHIP and OBLIGATION appear to be such types of relationships. Examples are in (5)-(10).

Examples (5)-(6) show that *tener* can combine with a quantified NP, *una manzana* ‘an apple’ or with a bare NP, *prisa* ‘hurry’. In both cases, the combination of *tener* and NP says that Mario, the individual denoted by the subject NP, POSSESSES some other referent in discourse. In the case of (5), Mario owns at least one apple; in the case of (6), Mario has the PROPERTY of being in a hurry, for some unspecified activity. Examples (7)-(8) show that *tener* cannot combine with (spatial) PPs, such as *en la cama*, and APs, such as *gordo*.

- (5) *Mario tiene una manzana*
 Mario is-T one apple
 ‘Mario has an apple’
- (6) *Mario tiene prisa*
 Mario is-T hurry
 ‘Mario is in a hurry’
- (7) **Mario tiene en la Cama*
 Mario is-T in the room
 ‘Mario is in the room’
- (8) **Mario tiene gordo*
 Mario is-T fat
 ‘Mario is fat’

In idiomatic constructions, such as the one in (9), *tener* can combine with PPs, but only if they do *not* convey their literal, spatial meaning. The translation of (9) underlines that the combination of *tener* and *a* should be translated as the English verb *consider* (Gutiérrez-Rexach 2007: 296-297). Example (10) shows that *tener* can only combine with VPs, when the complementizer *que* introduces the infinitival form of the verb. In this case, the intended meaning of *tener* is different. It denotes that the subject *must* perform a certain action, in this case eating an apple. Direct combination with VPs is not possible. Overall, *tener* can only take two syntactic categories, in its complement position. One is that of NPs denoting properties ascribed to the subject NP. The other is that of PPs, when they denote

⁴ I thank an anonymous reviewer for suggesting this definition of the semantics of *tener*. I discuss a similar definition found in the literature (Gutiérrez-Rexach 2007) in Section 2.3.

non-spatial meanings.⁵

- (9) *Mario tiene a Juan como un amigo de verdad*
 Mario is-T at Juan as a friend of truth
 ‘Mario considers Juan as a true friend’
- (10) *Mario tiene que/*∅ comer una manzana*
 Mario is-T that/*∅ eat an apple
 ‘Mario has to eat an apple’

The following examples shed more light on these NP sub-classes and their interaction with *tener*:

- (11) *Mario tiene cuidado*
 Mario is-T careful
 ‘Mario is careful’
- (12) *Mario tiene éxito*
 Mario is-T success
 ‘Mario is successful’
- (13) *Mario tiene razón*
 Mario is-T reason
 ‘Mario is right’
- (14) *Mario no tiene razón*
 Mario no is-T reason
 ‘Mario is wrong’
- (15) *Mario tiene cuatro años*
 Mario is-T cuatro years
 ‘Mario is four years old’
- (16) *Mario tiene muchos amigos*
 Mario is-T many friends
 ‘Mario has many friends’
- (17) *Mario tiene la culpa*
 Mario is-T the guilt
 ‘Mario is guilty’

Examples (11)-(13) show that *tener* can take bare NPs as its complements, which can be in turn deadjectival or deverbal nouns (respectively *cuidado* ‘alerted’ and *éxito* ‘result, success’).⁶ When *tener* takes pure bare

⁵ I follow Emonds (1985) in assuming that *que* and other complementizers are members of the category C, but also that this category is a sub-category of P, the category of Prepositions.

⁶ I note that, when *tener* combines with deverbal adjectives and nouns denoting eventive predicates, its syntactic properties appear closer to those of *haber*. For instance, it can

NPs, these NPs denote abstract properties, such as being right or wrong. When *tener* combines with complex NPs, as in (14)-(17), these NPs can denote various types of properties, as age, guilt, or having many friends. Modifiers can intervene, with all of these NPs: we may have *mucha razón* ‘much reason’ or *mucho éxito* ‘much success’. Some important data sets that involve *ser*, and that are seldom discussed in the literature, shed more light on this copula and its distribution. The copula *ser* can combine with complex NPs, but the type of NPs that combine with *ser* is semantically distinct from those that combine with *tener*. Also, *ser* may combine with NPs that denote abstract properties, and overlap with *tener*:

- (18) *Mario es bombero*
 Mario is-S fireman
 ‘Mario is a firefighter’
- (19) *Mario es un hombre maduro*
 Mario is-S a man mature
 ‘Mario is a mature man’
- (20) *La mesa es de madera*
 The table is-S of wood
 ‘The table is of wood’
- (21) **Mario tiene bombero*
 Mario is-T fireman
 ‘Mario is a firefighter’
- (22) **Mario tiene un hombre maduro*
 Mario is-T a man mature
 ‘Mario is a mature man’
- (23) **La mesa tiene de madera*
 The table is-T of wood
 ‘The table is of wood’
- (24) *Mario es la razón (encarnada)*
 Mario is the reason (incarnated)
 ‘Mario is reason (incarnate)’

Examples (18)-(19) show that *ser* can combine with NPs denoting professions or classes, such as *bombero* or *un hombre maduro*. These are known as CAPACITY-denoting NPs (de Swart et al. 2007; a.o.). The copula *ser* can also combine with the preposition *de* ‘of’, and express the MATERIAL of an object, as example (20) shows. These capacity-denoting NPs cannot

combine with other auxiliary verbs (e.g. *esta teniendo cuidado*). Although the theory I will propose can potentially handle these cases, I will not investigate them further, as they would lead us too far afield. Again, I thank an anonymous reviewer for raising this issue.

combine with *tener*, as bare NPs or via the mediation of prepositions. This is shown in examples (21)-(23). Non-literal meanings, such as Mario being a personification of Reason in (24), can be expressed via the combination of NPs normally occurring with *tener* (e.g. *razón*).

Overall, these data suggest that *tener* can combine with NPs that introduce abstract properties, conceived as special types of referents, one example being ‘reason’. As individual-like referents, properties can combine with determiners and NumberPs, but also with adjectives (*la razón, una razón, una razón*). Also, *tener* can combine with PPs that introduce a state or event, in which Mario has a certain property, e.g. that of eating an apple (*comer una manzana*). NPs and PPs that denote or introduce *kinds* combine with *ser*, which denotes a relation between an individual and a *kind*, the (mereological) sum of individuals sharing a property (Chierchia 1998; a.o.). So, an accurate Semantics of *tener* must treat this auxiliary verb as denoting a relation between individuals, whether they are ABSTRACT (properties) or CONCRETE (individuals), and which is different from the one denoted by *ser*.

2.2 Haber and its distribution

Descriptive grammars of Spanish observe that *haber* mostly occurs as an auxiliary verb in compound tenses. Its semantic function is that of denoting temporal and aspectual information, and to capture the EXISTENCE of a given state of affairs (Butt & Benjamin 2004: part 5). Examples are:

- (25) *Mario ha comido una manzana*
 Mario is-H eaten an apple
 ‘Mario has eaten an apple’
- (26) *Mario había comido una manzana*
 Mario is-H-IMPF eaten an apple
 ‘Mario had eaten an apple’
- (27) *Mario habrá comido una manzana*
 Mario is/H-FUT eaten an apple
 ‘Mario will have eaten an apple’
- (28) *Mario ha ido a la escuela*
 Mario is-H gone to the school
 ‘Mario has gone to the school’

Examples (25)-(28) show that *haber* occurs in compound tenses in Spanish, inflected for tense and possibly grammatical aspect (imperfective, cf. (25)). The tenses are respectively the *perfecto* ‘present perfect’, *preterito indefinido* ‘past indefinite’, and *futuro perfecto* ‘future perfect’. Example

(28) shows that an unaccusative verb such as *ir* ‘to go’ also combines with *haber*, unlike in languages such as Dutch, which would require *ser* (Sorace 2000; Hale & Keyser 2002: chapter 1; a.o.). One important datum is that *haber*, as a verb that mostly captures temporal information, can combine with the copulae and *tener* in a systematic way. Some examples on the *perfecto* are:

- (29) *Mario ha tenido miedo*
 Mario is-H is-T fear
 ‘Mario has been in fear’
- (30) *Mario ha sido bombero*
 Mario is-H been-S fireman
 ‘Mario has been a fireman’
- (31) *Mario ha sido rubio*
 Mario is-H been-S blonde
 ‘Mario has been blonde’

These examples suggest that *haber* can combine with other auxiliary verbs and, in doing so, it triggers a certain division of labour. While *haber* seems to principally convey temporal information (the time of reference” of a sentence), the other verbs have the task of introducing the property ascribed to Mario. In doing so, they also have to match with the type of property that they combine with (e.g. *tener* with *miedo*, in (29)). So, *haber* can combine with copulae, when they act as property-introducing VPs. Another important set of data about *haber* concerns its ability to appear as an expletive verb in impersonal constructions and in constructions denoting obligation. In the latter case, we have evidence that *haber* can also combine with PPs:

- (32) *Hay una silla en la cocina*
 Is-H-IMPS a chair in the kitchen
 ‘There is a chair in the kitchen’
- (33) *Hay que saltar*
 Is-H-IMPS to jump
 ‘One needs to jump’
- (34) *Mario ha de salir a las tres*
 Mario is-H of leave at the three
 ‘Mario has to leave at three’

In (32), *hay* is a specific inflected form of *haber* that expresses existence, as the English construction *there is* in the glosses. Informally, it absorbs the syntactic and semantic functions of the expletive pro-form *there*, and the copula *to be*, and denotes the existence of a chair in the kitchen. In

(33), this special form combines with *que* ‘to’, to denote a general obligation that individuals may have in a context, e.g. to avoid a small hole in the floor.⁷ In (34), the notion of necessity that is expressed in English by the form *have to* is captured by *haber*, combined with the preposition *de* ‘of’. In this case, *haber de* introduces the necessary action (*salir* ‘leaving’).

These data suggest that *haber* may apparently overlap with other auxiliary verbs, from a distributional perspective. It can express both existence and necessity, apparently overlapping with *ser* and *tener* in its meaning. However, *hay* in its existence meaning can also convey a temporal type of information, as other inflected forms do. In its ability to denote necessity, instead, *haber* seems to rely on the preposition it combines with, the resulting complex verb acting much like an idiomatic phrase. If we have *había de salir* in the verb’s stead, in (33), then the minimal difference in meaning captured by *haber* is that of denoting Mario’s obligation as being past. The examples in (35)-(37) show that *haber* is also limited in its syntactic distribution:

- (35) **Mario ha un coche*
 Mario is-H a car
 ‘Mario has a car’
- (36) **Mario ha abogado*
 Mario is-H a lawyer
 ‘Mario is a lawyer’
- (37) **Mario ha rubio*
 Mario is-H blonde
 ‘Mario is blonde’

These examples show that NPs, whether they denote kinds or abstract properties, cannot combine with *haber*, nor APs can. Since each category denotes a certain specific type of property/kind referent, it must combine with the specific type of auxiliary verb, and not with the GENERIC *haber*. The distribution of these auxiliary verbs appears quite specific.

Overall, the data in this section suggest the following distributional generalizations. First, *haber* can only combine with VPs and PPs that denote some aspectual, temporal information and, in some cases, modal information in the guise of necessity. In the case of VPs, we have seen that most verbs must carry aspectual and temporal morphology (progressive, perfective), while *haber* seems to mostly convey temporal information.⁸ In

⁷ I follow Emonds (1985) in treating *que* a P Head, although it is standardly analysed as a C head, especially when it is considered as Spanish counterpart of *that* (Butt & Benjamin 2004: part 3). This difference is immaterial, here.

⁸ A more complex picture must be entertained when one looks at more complex temporal

the case of PPs, we have seen that the combination of *de* or *que* plus an infinitival form with *haber* can denote the necessity for a certain event/state to hold. Therefore, the role of certain aspectual, temporal modal relations and the VPs and PPs that introduce those relations seems pretty clear.

Second, in doing so, *haber* denotes the EXISTENCE of a relation between the event(s) or state(s) denoted by the VP/PP and the subject NP. So, it seems to capture a LESS ESSENTIAL relation than *tener* or *ser*, but still a relation involving existence. Hence, *haber* denotes that a relation between subject and eventuality certainly exists, but not much else. Before we offer a formal treatment of the data, we discuss previous syntactic and semantic proposals that attempted to capture the properties of *haber* and *tener*.

2.3 Previous proposals and empirical requirements

Our analysis so far suggests that a proposal covering both auxiliary verbs must have two ingredients. First, the proposal must capture the different SHADES of relations that these verbs denote. Second, the proposal must do so in an integrated system, which appears to be tightly connected to the temporal-aspectual properties of a sentence. Hence, *tener* and *haber* most form an integrated system of auxiliary verb distribution.

Both aspects have been addressed in some detail, although in works that cover related English data. Syntax-wise, it is agreed that the English sentences involving auxiliary *have* correspond to a syntactic (predicative) structure (Hornstein et al. 1995; Hale & Keyser 2002; Mateu 2002; a.o.). Differences among interpretations are generally considered semantic in nature. Consider the example in (38) (see also Gutiérrez-Rexach 2007: ex. (26)):

(38) *My truck has a Ford motor*

The two possible interpretations of (38) are the following. Either the Ford motor is an integral part of my truck, as per company's policies; or, I decided to custom my truck and put a new engine in it. As Massam (2001) also observes, both interpretations involve a form of PSEUDO-INCORPORATION. While verb and NP/PP are syntactically two distinct units (i.e. verb and complement), they seem to denote the complex property 'having a motor as a (inalienable) part'.

Building on these syntactic assumptions, Gutiérrez-Rexach (2007) offers the following analysis of *to have*, when denoting POSSESSION. He sug-

forms. For instance, the *pluscuamperfecto* (pluperfect) form of *ser rubio* is *habia sido rubio*, roughly 'he had been blonde'. In such cases, *haber* also seems to carry aspectual (imperfective) morphology. Importantly, in those cases VPs must carry matching aspectual morphology, too.

gests that *to have* denotes a relation between generalized quantifiers: in (38), the referents denoted by the quantified NPs *my truck* and *a Ford motor*. This relation is restricted to an ESSENTIAL type: here, that a motor is a part of a truck. A truck without a motor would not be a truck but just unusable junk.⁹ Contextual restrictions can also be introduced via modifiers, as in (39)-(40) (from Gutiérrez-Rexach 2007: ex. (75)-(76)):

(39) *Mario has a house in the Bahamas*

(40) *Mario has a penny in his pocket*

In both examples, the dyadic PPs *a house in the Bahamas* and *a penny in his pocket* denote an object which is in an ownership relation with Mario. In our formulation, some of Mario's essential properties are having a house in the Bahamas, or a penny in his pocket. Without these properties, another Mario in discourse would be defined, as a distinct individual from our friend.

This semantics easily captures part-whole relationships among individuals and properties, but fares worse with other ESSENTIAL relations. The properties of Mario described in (12)-(17) are all temporary, hence non-essential. For instance, Mario can be right or in a hurry, in a given context of evaluation, but probably not in all times and contexts. Examples (18)-(20) involve, on the other hand, properties that hold for Mario in (almost) any context, such as being a fireman, or the table being (made) of wood. Intuitively, without these properties, Mario would not be the person he is.

Overall, the key problem with Gutiérrez-Rexach's proposal is that it does not make a distinction between the sorts of individuals involved in these relations. Both *tener* and *ser* denote relations between individuals (i.e. Mario) of various sorts (e.g. fear, lawyers). However, *tener* selects individuals that denote abstract properties of various types, as its complements (e.g. fear, shame, age, etc.). Instead, *haber* establishes the existence of a relation between an individual, and a property of an individual that holds over time (e.g. events, such as going to the church). Furthermore, the copula *ser* seems to only take kind-denoting NPs, such as *abogado* 'lawyer', but not other NPs. This proposal also faces another problem. The semantic distinctions among Copulae are not captured in detail, at least not when *ser* is considered. So, (1)-(4) still present an empirical problem, which I address in thorough detail in the next section.

⁹ The formal definition is: "P is an **essential property** of Q_{NP} ($P \in ES(Q_{NPX})$) iff $P \in Q_{NPX}$ iff $E \in Q_{SNX}$ " (Gutiérrez-Rexach 2007: (71)). If a generalized quantifier is a set of sets, then an essential set is one of the key sets making up the SECOND generalized quantifier in a sentence (roughly, the Ford motor). This set stands in a relation (be part of) with the FIRST generalized quantifier (roughly, the truck). See Gutiérrez-Rexach (2007: 297-299) for discussion.

3. THE PROPOSAL: SYNTAX, SEMANTICS AND ANALYSIS OF THE DATA

In this section we present our solution to the problem. The solution consists of two parts. First, we offer a unified syntactic treatment for *haber*, *tener* and the sentences they occur in (Section 3.1). Second, we offer a unified semantic treatment for these two copulae based on their subtle aspectual differences (Section 3.2). We adopt the Minimalist Programme as our general syntactic framework, and a variant of Situation Semantics as our general semantic framework. We use this combined approach in two phases. We first offer a semantic treatment of *tener* and *haber*, which can predict grammatical and ungrammatical examples (Section 3.3). We then analyze distributional patterns of *tener* and *haber* that also takes in account their alternation with *ser* and *estar* (Section 3.4).

3.1 *The proposal: the syntax*

The data we discussed so far strongly suggest that sentences including our auxiliary verbs share the same underlying structure. Both *tener* and *haber* seem to combine with two other phrases, usually an NP as the SUBJECT and another XP as the OBJECT. The object XPs may have their own internal structure, but at a coarse-grained level they seem to act as argument-like syntactic units.

I choose the Minimalist Program and the Lexical Syntax **proposed by** Hale & Keyser (2002) (henceforth: HK) as our syntactic framework, given **their** focus on structural relations among abstract constituents. I leave aside the discussion of closely related minimalist proposals, and their ability to account these data (den Dikken 2006; a.o.). I show the two key assumptions, for us.



The first assumption is that morpho-syntactic categories do not, and need not to project a single, pre-definite syntactic structure. Depending on which syntactic context they occur in, syntactic constituents may correspond to the abstract types of constituents of heads or arguments/phrases. Conversely, different constituents may correspond to the same syntactic type, when one looks at the role they absolve within syntactic structure. If different XPs act as complement, then they share the same type, at some level of representation (e.g. the NP *rubio* and the VP *sido rubio*).

The second assumption is that there are four types, defined by their ability to merge with zero, one or two syntactic arguments. We show these syntactic types in (41) (HK: chapter 1):

- (41) a. [Head [Complement]] (a-type, 1-argument)
 b. [[Specifier] Head [Complement]] (b-type, 2-argument)
 c. [[Specifier] *Head [Complement]] (c-type, 1-argument)
 d. [Head] (d-type, 0-argument)

The a-type is the type usually attributed to verbs, intended as those elements that only take a complement as their argument. The b-type is that of prepositions, auxiliary verbs and copulae, elements that have an inherently relational role (and semantics) in a sentence. The d-type is that of bare heads, which do not take any arguments (e.g. nouns). We leave aside the c-type, as it corresponds to heads that only take a specifier argument (e.g. attributive adjectives: *rubio*).

Both *haber* and *tener* correspond to b-type abstract units. They take a subject NP as their specifier, which in turn corresponds to a d-type unit. The syntactic differences emerge once we take in consideration their complements. The data in Section 2.1 strongly suggest that *tener* can combine with either bare NPs (e.g. *miedo*), or with units introducing a bare NP (e.g. the P *que*, definite article *la*). Since both morpho-syntactic categories can be assigned one of the four types in (40), I assume that Ps and Ds receive c-type. So, they take a VP in infinitival form or a NP as their bare complement, in turn a d-type unit (e.g. *comer* and *la culpa*, respectively). The data in Section 2.2, instead, strongly suggest that *haber* takes a VP, which in turn introduces another argument in a sentence (e.g. *ido* introducing the PP *a la escuela*, in (28)). Hence, *haber* sentences mostly instantiate the second structure. Subtler cases involve VPs which, in turn, introduce complex complements (e.g. *ido a la escuela*) and the impersonal *hay* cases, which we discuss aside.

Before we continue, one important observation is in order. Our assumptions about infinitival VPs are consistent with standard approaches to these VPs (e.g. Zucchi 1993; Butt 1995; HK; a.o.). Our assumptions are also consistent with N-to-D analyses of NPs (Chierchia 1998; Shlonsky 2004; a.o.). The assumptions that Vs, Ps and Ds can act as MONADIC operators are perhaps less standard. However, works such as HK (chapter 4) or den Dikken (2006: chapters 2-3) discuss various reasons to treat participial verbs, adjectival modifiers and determiners in this way. So, they indirectly support our treatment of these constituents as a-type units, and the approach we sketch here.

These two assumptions allow capturing the structure of simple sentences easily, as they represent sentences as combinations of different types. One problem is the representation of sentences involving some degree of recursion in phrases. A second problem is the representation of phrases as units with their own types, which seems necessary to capture their status as

complements of copulae. To account these data, we make the following additional assumptions.

First, I assume that ALL XPs correspond to d-type units, i.e. as heads which have no further free argument slots in their structure. So, we assume that d-type units can come in two slightly different forms. They can be heads that do not merge with any arguments, or heads that cannot merge with any further arguments. While in the first case a head lacks any argument slots, in the second case it lacks any FREE argument slots, as it is a full-fledged phrase. In this way, the minimal distinction between the two types of structure is whether the complement XP may have its own internal structure or not.¹⁰ At a coarse-grained level, all our sentences share the same structure.

Second, I make the following assumption about the operation MERGE. We follow Chomsky (1999: 2-4), and assume that the Merge operation is defined as: $Merge(X, Y) = \{X, Y\}$, X and Y being sets. In words, Merge is an operation that forms structure from basic lexical items, recursively.¹¹ We illustrate the resulting structures in (42) and examples instantiating them in (43)-(44):

- (42) a. $[[XP_{d-type}] tener_{b-type} [XP_{d-type}]]$ (SIMPLE *tener*-structure)
 b. $[[XP_{d-type}] tener_{b-type} [XP_{a-type} [XP_{d-type}]]]$ (RECURSIVE *tener*-structure)
 c. $[[XP_{d-type}] tener_{b-type} [XP_{a-type} [XP_{d-type}]]]$ (*haber*-structure)
- (43) a. $[[Mario_{d-type}] tiene_{b-type} [miedo_{d-type}]]$ (=ex. (6))
 b. $[[Mario_{d-type}] tiene_{b-type} [que_{a-type} [comer_{d-type}]]]$ (=ex. (10))
 c. $[[Mario_{d-type}] tiene_{b-type} [muchos_{a-type} [amigos_{d-type}]]]$ (=ex. (16))
 d. $[[Mario_{d-type}] tiene_{b-type} [la_{a-type} [culpa_{d-type}]]]$ (=ex. (17))
- (44) a. $[[Mario_{d-type}] ha_{b-type} [tenido_{a-type} [miedo_{d-type}]]]$ (=ex. (29))
 b. $[[Mario_{d-type}] ha_{b-type} [sido_{a-type} [bombero_{d-type}]]]$ (=ex. (30))
 c. $[[Mario_{d-type}] ha_{b-type} [estado_{a-type} [rubio_{d-type}]]]$ (=ex. (31))
 d. $[[Mario_{d-type}] ha_{b-type} [ido_{a-type} [[a_{d-type}] (P)_{b-type} [la escuela_{d-type}]]]]$ (=ex. (28))
 e. $[[[(XP)_{d-type}] hay_{b-type} [[una silla_{d-type}] en_{b-type} [la cocina_{d-type}]]]]$ (=ex. (31))

The structures in (43) show the standard templates for *tener* and *haber*. In words, they say that *tener* either takes a simple d-type complement, or a complement that has internal structure (i.e. that is recursive). The structures in (44) show that *tener*-sentences with bare NPs instantiate the simple

¹⁰ I do not represent the type “larger” Phrases explicitly, as we would quickly lose readability. So, the structure in (42a) should be read as “[$_{d-type} [XP_{d-type}] tener_{b-type} [XP_{d-type}]]$ ”, i.e. the whole sentence (as a Phrase) is a d-type object.

¹¹ Under this definition, *Merge* is possibly equivalent to *set union*. We leave aside any discussion on whether other instances of *merge* are necessary, and defer the reader to Boeckx (2008) for discussion.

structure types, while the sentences with PPs or complex NPs instantiate the recursive type of structure.

The structures in (45) show that *haber*-sentences correspond to a subset of the *tener*-sentences, they always include recursive complements. The internal structure of this complement, in turn, can vary. When *haber* combines with participial Ps, including other auxiliary verbs (e.g. *tenido* and *sido*), these phrases may have their own structure. Participial Ps include an NP as their argument, but also PPs with their own internal structure (the “P-within-P hypothesis” of HK: chapter 4). For sentences including impersonal *hay*, e.g. (43e), we assume that a phonologically null d-type unit is merged in specifier position. This approach echoes standard ECP-oriented approaches for impersonal constructions (e.g. Haegeman 1994; a.o.). It has the advantage of postulating a homogeneous structure for all our examples, as it offers a parallel between *hay* and the English equivalent construction *there is*.

Overall, our approach **can account most, if not the examples** we have discussed so far, when we look at their STATIC syntactic structures. Our analysis is consistent with HK’s analysis of copular sentences, especially those involving COMPOUND VERBS and participial forms (cf. HK: chapters 2-3). It also allows us to capture the common structural properties of these sentences in a more general form than HK, since we suggest a way to make our syntactic types recursive. This latter innovation has one empirical advantage: it PREDICTS that auxiliary verb sentences can be recursively derived from one basic syntactic template. As we will discuss in the next section, this prediction has also a direct consequence on the semantics of these sentences. Before discussing semantic matters, however, I show a method to syntactic derivations that allows us to directly address compositionality problems. This approach is PARSER IS GRAMMAR, presented in Phillips (2006) (henceforth: PIG). We choose this approach for two reasons which are tightly related to its key assumptions, illustrated below.



The PIG approach is based on two assumptions.

First, PIG assumes that sentence production mirrors sentence comprehension, as in psychologically oriented models of production (e.g. Levelt 1989). So, it assumes that constituents are merged as if they were added LEFT-TO-RIGHT. A sentence such as *Mario loves Peach* involves the merge of the NP *Mario* and the V *loves*, forming a V’ constituent, *Mario loves*. This V’ constituent is merged with the NP *Peach*, the result being the VP *Mario loves Peach*. This simplified treatment captures one intuition: that the driving principle of syntactic processes is MERGE RIGHT, the merging of one constituent to the right of previous material. Therefore, in choosing this approach we can offer a treatment of syntactic derivations which can double as a theory of sentence production, without having additional assumptions.

Second, it assumes that the cyclic Merge of constituents may create temporary constituents, such as the *V'* *Mario loves*. However, cyclic Merge has also the effect of rewriting structure over derivational time. When *Peach* is merged with *Mario loves*, the *V'* constituent becomes *loves Peach*, as per standard assumptions. Importantly, via cyclic Merge we also establish structural relations between syntactic units, which in turn allow us to establish how *haber* and *tener* interact with their complement phrases. Via the combination of PIG and HK's approach to lexical items, we can *derive* the sentences in (42) and (43) incrementally, via recursive MERGE RIGHT.

I add the following formal details. I use elements from an index set *I*, on the left side of derivations, to each step in the derivation (e.g. *t*, *t+1*, etc.). These elements belong to the pre-order $\langle I, + \rangle$, with '+' (also) representing the addition operation. They could be conceived as derivational intervals, discrete steps at which the syntactic engine works on lexical items.

I then represent two operations: Lexical Selection and Merge Introduction, which respectively introduce a new syntactic unit in a derivation, and merge two syntactic units into a new unit. In this way, we define a very simple logical syntax, akin to standard natural deduction systems in Logic (Landman 1991: chapters 2-3; a.o.). I also represent Merge as '+', as it should be clear when this symbol represents the simpler operation of addition (for indexes), instead. Since we rely on syntactic types to represent our lexical items, all derivations include the bare items, with their syntactic type as a sub-script (cf. Chomsky 1995; a.o.). So, we remain agnostic on whether the units in our derivations correspond to CPs, VPs, or other fixed syntactic positions. Some examples of this simple syntactic calculus are:

- (45) *t*. [Mario_{d-type}] (Lexical Selection)
t+1. [tiene_{b-type}] (Lexical Selection)
t+2. [[Mario_{d-type}]+[tiene_{b-type}]]= [[Mario_{d-type}] tiene_{b-type}] (Merge introduction)
t+3. [prisa_{d-type}] (Lexical Selection)
t+4. [[Mario_{d-type}] tiene_{b-type}]+[prisa_{d-type}]=
 [[Mario_{d-type}] tiene_{b-type} [prisa_{d-type}]] (Merge Introduction)
- (46) *t*. [Mario_{d-type}] (Lexical Selection)
t+1. [tiene_{b-type}] (Lexical Selection)
t+2. [[Mario_{d-type}]+[tiene_{b-type}]]= [[Mario_{d-type}] tiene_{b-type}] (Merge Introduction)
t+3. [que_{a-type}] (Lexical Selection)
t+4. [[Mario_{d-type}] tiene_{b-type}]+[que_{a-type}]=
 [[Mario_{d-type}] tiene_{b-type} [que_{a-type}]] (Merge Introduction)
t+5. [comer_{d-type}] (Lexical Selection)
t+6. [[Mario_{d-type}] tiene_{b-type} [que_{a-type}]+[comer_{d-type}]=
 [[Mario_{d-type}] tiene_{b-type} [que_{a-type} [comer_{d-type}]]] (Merge Introduction)

- (47) t . [Mario_{d-type}] (Lexical Selection)
 $t+1$. [ha_{b-type}] (Lexical Selection)
 $t+2$. [[Mario_{d-type}]+[ha_{b-type}]]=[[Mario_{d-type}] ha_{b-type}] (Merge Introduction)
 $t+3$. [estado_{a-type}] (Lexical Selection)
 $t+4$. [[Mario_{d-type}] ha_{b-type}]+[estado_{a-type}]=
[[Mario_{d-type}] ha_{b-type} [estado_{a-type}]] (Merge Introduction)
 $t+5$. [rubio_{d-type}] (Lexical Selection)
 $t+6$. [[Mario_{d-type}] ha_{b-type} [estado_{a-type}]+[rubio_{d-type}]=
[[Mario_{d-type}] ha_{b-type} [estado_{a-type} [rubio_{d-type}]]] (Merge Introduction)

The derivations in (45)-(47) show how the structures in (43a), (43b) and (44c) are derived. The derivation in (45) shows that the structure corresponding to a sentence such as *Mario tiene prisa*, our original example (6), involves a head that merges with two arguments. The derivations in (46)-(47) show how the more (structurally) complex examples (10) and (31) are derived. At a certain step in the derivation (i.e. $t+4$), *Mario tiene que* and *Mario ha estado* form temporary units. Once *comer* and *rubio* are merged with these temporary units, respectively the correct structure is derived. The unit *que comer* becomes the complement of *tener*; the unit *estado rubio* becomes the complement of *haber*. In (46)-(47), the steps $t+4$ to $t+6$ show how this new structure is derived.

So, these derivations display how the general structures for our examples emerge over the derivational time, and what are the minimal structural distinctions that differentiate sentences. Sentences involving *tener* and bare NP arguments correspond to certain types of minimal clauses that include two arguments and a head. All the other sentences involve slightly more complex structures, as e.g. complement VPs have its own internal structure. This difference in size is not crucial, as both syntactic types play the role of arguments to the main head. We can easily capture the structural parallels across sentences, which is a welcome result. We still cannot capture, however, the different semantic properties of these sentences, and account why some sentences are ungrammatical. This is the topic of the next section.

3.2 The proposal: the semantics

Our syntactic analysis strongly suggests that, if we want to capture the differences in distribution between *haber* and *tener*, then we need to capture the distinct types of relations they denote. At the same time, they suggest that our semantic approach can, and should, offer a unified treatment of the four syntactic types we have discussed so far. For this reason, I adopt a simple variant of Situation Semantics. Our semantic proposal is based on the following assumptions.

First, I follow the literature on Situation Semantics, and assume that all our syntactic types find their denotation in a domain of SITUATIONS. I assume that situations can be seen as possible worlds, or parts thereof. As possible worlds, situations may be in the denotation of expressions denoting necessity or possibility. As parts of possible worlds, they may be in the denotation of expressions denoting individuals (kinds, properties) or eventualities, such as states and events.

So, by having a single, but multi-sorted domain, I can easily assign a uniform interpretation to all of our syntactic-types. This is consistent with several universal approaches to ontology in Situation Semantics (e.g. Barwise & Etchemendy 1990; Barwise & Seligman 1997; Kratzer 2007; a.o.). The domain of situations S is defined as an INFINITELY DENUMERABLE set $S = \{\emptyset, s, r, q, \dots, \{s, r\}, \dots, \{s, r, q\}\}$. This set includes both atomic situations such as s , and non-atomic or structured situations such as $\{s, r\}$, i.e. situations which have smaller parts in them.

The structure of this domain corresponds to a full Boolean algebra, a partially ordered set that includes the empty set (cf. Keenan & Faltz 1985; Landman 1991: chapter 2-4; Landman 2004). We use Quine's innovation and treat all individuals (e.g. a) as singleton sets (Schwarzschild 1996; a.o.). So, our situations can be seen as both sets and individual entities in discourse. For reasons of clarity, we drop brackets for singletons, and represent them in the usual way (i.e. a instead of $\{a\}$).

I now define the structure of this domain. The part-of relation, ' \leq ', defines how the elements in this set are ordered. If $a \leq b$, then the following holds: $a \cup b = b$ and $a \cap b = a$. In words, if a is part of b , then the (set) union of the first set with the second set will give us the bigger set, while their intersection will give us the smaller set. So, situations may include other situations, as their distinct parts. This aspect will play a key role in our semantic treatment. The semantic type of this set is the set $TYPE = \{<s>\}$, which says that all elements are situations, in S . From this basic type, we can define more complex types, via these recursive definitions:

- (48)
1. $<s>$ is a type (Lexical Type)
 2. If $<a>$ is a type and $$ is a type, then $<a, b>$ is a type (Functional type)
 3. If $<a, b>$ is a type and $<a>$ is a type, then $<a, b>/<a> = $ (f. applicat.)
 4. Nothing else is a type (Closure property)

Our definitions in (48) allow us to define functions and relations over S as complex (model-theoretic) objects. A FUNCTION is a mapping from one situation to another situation, i.e. $<s, s>$. A RELATION is a mapping that takes another mapping as one of its arguments, i.e. $<s, <s, s>>$. In words, a function takes one situation as an argument and returns another situation as an output. A relation takes two situations and takes returns a STRUCTURED SITUA-

TION as an output. Nothing else can be an output of these rules. As a result, the closure set of our types is $TYPE = \{ \langle s \rangle, \langle s, s \rangle, \langle s, \langle s, s \rangle \rangle \}$. I also use the notion of sub-type, in an informal way. Under our definitions, all entities in discourse are situations. However, we will still talk about INDIVIDUALS, KINDS OF PROPERTIES, and other sub-types, sub-sets of situations. This choice should make the presentation of the arguments clearer.

Via these definitions, we can now offer a semantic treatment for all of our sentences. We define an isomorphism between syntactic and semantic types: for each syntactic type, there is a corresponding semantic type. The intuition behind this isomorphism is simple. I treat ALL syntactic units that act as arguments of a head as denoting situations, semantic arguments in relations. I treat ALL syntactic units that act as 2-argument heads as denoting part-of relations among situations. I treat ALL 1-argument syntactic units as denoting functions. This isomorphism is an instance of the Curry-Howard Isomorphism, which is a standard theoretical notion in categorical grammars and type-logical syntactic models (e.g. Steedman 2000; Jäger 2005; a.o.). In our approach, it captures the intuition that there is a one-to-one match between syntactic and semantic types. This mapping is shown in (49), in which we represent open formulae via standard λ -calculus based terms. The mapping in (49) says that a-type objects (e.g. past participle verbs) denote functions, b-type objects (e.g. *haber*, *tener*) denote part-of relations, while d-type objects denote situations. Since d-type objects can be either bare heads (e.g. NPs) but also full phrases, they may denote different sorts of situations. We assume that bare NPs, for instance, denote non-logical constants: situations such as *s* or *m* (for *Mario*). Full XPs, such as VPs or full sentences (respectively *sido rubio*, *Mario tiene miedo*) denote these types of structured situations. These functions can then act as further arguments of other functions or relations, recursively.¹² That is, both simple and structured situations fall within the domain of situations, $\langle s \rangle$, since they denote atomic or complex elements in S .¹³

(49)	SYNTAX	\Rightarrow	SEMANTICS	\Rightarrow	INTERPRETATION
	<i>a-type</i>	\Rightarrow	$\langle s, s \rangle$	\Rightarrow	$\lambda x. s : (x)$
	<i>b-type</i>	\Rightarrow	$\langle s \langle s, s \rangle \rangle$	\Rightarrow	$\lambda x. \lambda y. s : (x \leq y)$
	<i>d-type</i>	\Rightarrow	$\langle s \rangle$	\Rightarrow	$s, s : (x), s : (x \leq y)$

¹² Our approach to structured situations is also in line with other universal approaches to ontology. Examples are structured meanings (Cresswell 1985; Winter 1995) and property theory (Chierchia & Turner 1988; Morzycki 2005).

¹³ The observant reader will have noticed that syntactic types can be now defined via the combinatorial principles of categorial and type-logical grammars (as in e.g. Steedman 2000; Jäger 2005; a.o.). In this way, the logic of syntactic types would mirror that of semantic types. We leave aside a full treatment of this parallel for future works.

The strong intuition behind our approach is that sentences combine together situations and relations (or functions) on relations, to describe a certain state of affairs (i.e. a situation). So, if a PP can be the argument of *tener*, like a proper or common noun (i.e. an NP), then it will denote the same type of object. It is the lexical content of words that captures their interpretive difference.

I make precise this intuition by offering the interpretation of *tener* and *haber*. We assume that both verbs denote a part-relation, plus a further restriction on this relation. The literature on the closely related *ser* and *estar* assumes that these copulae denote temporal or aspectual features, such as genericity, imperfectivity, etc. (Maierborn 2005; Arche 2006; Camacho in press; a.o.). So, I assume that these features act as aspectual/temporal restrictions on the underlying part-of relation, as we tacitly assumed when we used the glosses ‘-H’, ‘-T’. We offer the interpretation of *tener* and *haber* and explain this proposal in detail:

- (50) a. $[[\textit{tener}]]:=\lambda x.\lambda y.[\neg s\leq_{tr}:(x\leq y)]=\lambda x.\lambda y.[s\leq_{tr}:(y\leq x)]$
 b. $[[\textit{haber}]]:=\lambda x.\lambda y.[\forall s\leq_{tr}:(x\leq y)]$

The interpretation function is marked as ‘[[.]]’. In words, *tener* denotes a relation between situations in which the two arguments stand in the inverse part-of relation. The property denoted by the complement is a part of the properties that make up the specifier. The use of negation as an aspectual-like operator expresses this intuition. It reverses the relation between the two individuals,¹⁴ so it captures the intuition that the second individual is an essential part of the first. If Mario is the sum of a given set of properties such as fear, then a Mario lacking fear will not be our Mario anymore. Mario is at least the sum of all his (characteristic) properties, and possibly more than just this sum.

Furthermore, *tener* usually is inflected for tense and aspect (e.g. past, imperfective form: *tenía* ‘(he) had-IMPF’), we add a coarse-grained representation of these inflected features. This representation is the structured situation ‘ $s\leq_{tr}$ ’. In words, both *tener* and *haber* denote a set of situations s which may overlap with a situation that acts as the reference time, t_{tr} . Since situations can denote eventualities conceived as spatio-temporal referents, the outer layer of this relation captures the temporal and aspectual components of these verbs.¹⁵ This is a simplified treatment of temporal and as-

¹⁴ Since we are reasoning with full Boolean Algebras, rather than dense linear orders, identity between referents is maintained under negation. So, the application of negation to a part-of relation denotes the corresponding inverse relation (e.g. ‘ y is constituted by x ’, informally), rather than a proper part-of relation (i.e. $x < y$). This fact allows us to treat some data we discuss in the main text.

¹⁵ Our treatment is coarse-grained because temporal relations among situations should be

pectual phenomena. However, it captures the standard intuition of temporal relations as being (anaphoric) relations between intervals of time, temporal situations in our account. Furthermore, our approach is consistent with standard proposals on this topic (cf. Parsons 1990; Maierborn 2005; Kamp et al. 2005: chapter 4; Borik 2008; Ramchand 2008; a.o).

I return to this topic when we will discuss *haber* cases. Note that our notation follows DRT's notation for eventualities: I represent situations as referents that instantiate certain properties or relations. For instance, the structured situation ' $s:(x \leq y)$ ' reads: the situation s in which x is part of y . We differ from DRT, however, in representing quantification over situations in a more standard format, rather than via DRT's duplex conditions.

The semantics of *haber* has a similar rationale. As Gutiérrez-Rexach (2007: 294-295) observes, *haber* denotes the existence of a certain relation between referents. When a relation has this property, then it holds true in every case or situation under discussion. Classic, descriptive analyses make the same point (e.g. Butt & Benjamin 2004: part 5; a.o.). Both Generalized Quantifier Theory and DRT define EXIST operators, which enforce the existence condition on the predicates they combine with, in an equivalent format (Keenan 1987; Kamp et al. 2005: 240-244). So, to capture this descriptive notion we just need to import this operator/condition in our account. The intuition behind the existence condition is this. If Mario is a lawyer during a situation that spans a certain interval of time, then he is a lawyer for smaller intervals/situations as well. His membership of to the kind of lawyers is not subject to changes or partial interruptions: it just exists. The structured situation ' $\forall s \leq t_{tr}$ ' denotes precisely this piece of information. It says that all sub-situations that are part of a large enough time (situation) of reference involve this relation between Mario and the lawyers' class, without any relevant changes or interruptions. So, we represent existence as the CERTAINTY that a relation holds, during the reference situation.

Overall, we are able to capture the semantics of *tener* and *haber* as a distinction in the type of relation they denote. Informally, *tener* denotes a relation in which the object turns out to be a part of the subject, such as fear being one of Mario's defining characteristics. On the other hand, *haber* denotes a relation that holds for each situation under up to the situation of evaluation. Both verbs denote relations over situations. Therefore, their ability to denote temporal, aspectual and modal relations is a side-effect of their ability to merge with VPs and PPs having a more restricted interpreta-

represented as distinct from the relations they instantiate, as in DRT (e.g. we should write $[\neg s:(y \leq x), s \leq t_{tr}]$). Also, we should explicitly distinguish among temporal relations, rather than use our underspecified part-of relation as a temporal relation (cf. DRT's ' ρ ' relation, Kamp et al. 2005: chapter 2). Luckily, this lack of precision does not play a role in our discussion.

tion (as in the case of *de*).¹⁶ With their semantics in place, I can now give an integrated syntax-semantics analysis of our examples.

3.3 *The data: the contribution of tener and haber to sentences*

The semantics of *tener* and *haber* in (49) allows us, now, to develop a full solution to our semantic problems. We start from one simple sentence, *Mario tiene prisa* from example (6). I offer a derivation focused only on the semantics of sentence, and write types on the right:

- (51) t . [[Mario]]:= m (type $\langle s \rangle$)
 $t+1$. [[tiene]]:= $\lambda x.\lambda y.[\neg s \leq t_{tr}:(x \leq y)]$ (type $\langle s, \langle s, s \rangle \rangle$)
 $t+2$. ([[Mario]])[[tiene]]= $(m)\lambda x.\lambda y.[\neg s \leq t_{tr}:(x \leq y)] = \lambda y.[\neg s \leq t_{tr}:(m \leq y)]$ (type $\langle s, s \rangle$)
 $t+3$. [[prisa]]:= pr (type $\langle s \rangle$)
 $t+4$. [[Mario tiene]]([[prisa]]) = $\lambda y.[\neg s \leq t_{tr}:(m \leq y)](pr) = [\neg s \leq t_{tr}:(m \leq pr)] = [s \leq t_{ev}:(pr \leq m)]$ (type $\langle s \rangle$)

The derivation in (51) says that one of Mario's properties is that of being in a hurry, during the situation of reference. So, *prisa* and other similar NPs denote properties as ABSTRACT individuals that can be ascribed to what we could call CONCRETE individuals, such as Mario (cf. also Chierchia & Turner 1988). This is also reflected by our notation, since both NPs are interpreted as denoting non-logical constants (i.e. m and pr , for *Mario* and *prisa*). If we have a quantified NP, such as *un coche*, then the relevant property ascribed to Mario is that of having a car. While not inalienable in nature, this relation of possession is akin to saying that the car is a part of Mario, at some abstract level of representation. As the denotation shows, a sort of SEMANTIC INCORPORATION occurs, in case we take in consideration the operator-less interpretation (cf. Gutiérrez-Rexach 2007: 298-300; a.o.). While at a semantic level the direct object may be interpreted as within the relation denoted by the predicate, its superficial (syntactic) position does not change. Our semantics of *tener* makes this explicit, as shown in the final step of (51).

We now turn to syntactically complex examples. I treat example (9) first, *Mario tiene que comer*. As we have discussed in Section 2.1, *tener* can combine with *que* and other non-spatial Ps, insofar as it denotes necessity or an idiomatic reading, respectively. I capture this shade of meaning by assuming that *que* denotes an operator with a modal nature, necessity,

¹⁶ This is also consistent with approaches such as Klein (1994), which assume that PPs, morpho-syntactic and abstract alike, always find their denotation at an aspectual-temporal level. The next section expands this point.

represented as a universal quantifier over possible worlds (Kratzer 1977; Portner 2010; a.o.). Since *que* has syntactic a-type, it denotes a one-place necessity predicate, $\lambda x. \forall s[s:(x)]$ or just $\lambda x. \forall s(x)$, type $\langle s, s \rangle$. In words, it denotes a property that has to hold for every situation taken under consideration. An interesting problem arises when it is merged in a derivation, as we show in (52):

- (52) t . [[Mario]]:=m (type $\langle s \rangle$)
 $t+1$. [[tiene]]:= $\lambda x. \lambda y. [s \leq t_{tr}:(y \leq x)]$ (type $\langle s, \langle s, s \rangle \rangle$)
 $t+2$. ([[Mario]])[[tiene]]= $(m) \lambda x. \lambda y. [s \leq t_{tr}:(y \leq x)] = \lambda y. [s \leq t_{tr}:(y \leq m)]$ (type $\langle s, s \rangle$)
 $t+3$. [que]:= $\lambda y. \forall s:(y)$ (type $\langle s, s \rangle$)
 $t+4$. ([[Mario tiene]])([que])= $\lambda y. [s \leq t_{tr}:(y \leq m)] \circ \lambda y. \forall s:(y) = \lambda y. [\forall s \leq t_{tr}:(y \leq m)]$ (type $\langle s, s \rangle$)
 $t+5$. [[comer]]:=cm (type $\langle s \rangle$)
 $t+6$. [[Mario tiene que]]([[comer]])= $\lambda y. [\forall s \leq t_{tr}:(y \leq m)](cm) = [\forall s \leq t_{tr}:(cm \leq m)]$ (type $\langle s \rangle$)

The derivation in (52) says that one of Mario's necessary properties, at least in the present or immediate future, is that of eating (something). The compositional effect of *que* is that interpreting as necessary this relation between Mario and a certain type of event, in this case eating. Intuitively, it also selects *comer* as nominal-like counterpart of this event, the property of Mario performing an event of eating. Since we treat infinitival forms as nominal-like constituents denoting properties, we are consistent with the literature on this topic (cf. Chierchia & Turner 1988; Zucchi 1993; a.o.). The formal details of our derivation require some discussion, especially step $t+4$.

When *Mario tiene* merges with *que*, both constituents are of type $\langle s, s \rangle$. Function application, in this case, cannot occur, as we have a type mismatch: $\langle s, s \rangle$ cannot be the type of input selected by $\langle s, s \rangle$. So, we must define another operation that allows the derivation to continue: FUNCTION COMPOSITION. Function composition is informally defined as the merging of functions into one complex function, which is then applied to an argument. Formally, if $\lambda x.f(x)$ and $\lambda x.g(x)$ are two functions, their composition is written as: $\lambda x.f \circ g(x)$, the composition of f over g , with respect to x .

Type-wise, since functions involve the mapping from situations to situations, their composition amounts to the compression of their types, which we represent as $\langle s, s \rangle \circ \langle s, s \rangle = \langle s, s \rangle$.¹⁷ In our case, functions represent unsaturated structured situations, i.e. situations in which we still have to plug in one argument (the denotation of *comer*, here). Their composition amounts

¹⁷ More accurate definitions of function composition are in Landman (1991: chapter 2); Morzycki (2005: chapter 1), among others.

to adding some further operator on a function which has already been introduced in the derivation. So, if *tener* denotes a situation in which a property and an individual are related, *que* further restricts this relation to one in which this situation is a necessary one. Other restrictions are possible, as *tener* can combine with other Ps to denote various idiomatic readings (e.g. *tener a Mario* ‘to consider Mario’). We leave them aside for the time being, and make some considerations.

This treatment of the relation between auxiliary verb/copula and a matching VP is not new. For instance, categorical approaches to syntax suggest precisely this analysis for auxiliary verbs in English, including the combination of, e.g., modal *must* with infinitival forms (Steedman 2000; a.o.). Approaches to the fine-grained semantics of stacked morphology features suggest that function composition may be the main form of interpretation (Morzycki 2005; a.o.). Intuitively, if in some cases (auxiliary) verb and preposition form a covert morpho-syntactic unit, then their semantics amounts to form of semantic incorporation.¹⁸ Our analysis seems consistent with the literature.

A more thorough exploration of this topic would lead us off-topic, in the realm of idiomatic verbs; we therefore leave the discussion aside. We turn our attention to *haber* data, as we have all the tools in place to analyze these data accurately. I offer a derivation for (30), *Mario ha sido rubio*. We first clarify our semantics of *rubio*. As a non-gradable adjective, *rubio* can be treated as denoting the kind of individuals which have a certain property (Chierchia 1998; a.o.). This simplified treatment allows us to represent the denotation of *rubio* as R , the set of blonde individuals taken as a single individual (e.g. $R = \{m, l, p\}$, with m =Mario, l =Luigi, p =Peach).

The missing piece is then *sido*. We employ a slightly modified (and compressed) form of Maierborn’s semantics for *ser* (Maierborn 2005; see also Ursini 2011). I assume that *ser* denotes a situation in which some property holds, with respect to the larger reference situation/time, but may not hold at other times. Perfect morphology, instead, denotes that a certain situation is related to the situations it brings about in discourse, its results (Parsons 1990; Kratzer 2003; a.o.). Intuitively, *estado rubio* denotes a situation in which Mario is not blonde anymore, as a result of some unspecified event. Another example is *ido a la iglesia* ‘gone to the church’, in which the perfect form denotes that Mario reached the church, as a result of going to the church. The intuition should be clear: participial VPs extend the temporal/aspectual structure by also including the result situation under discussion. I represent this as the function ‘ $\lambda y. t_{tt} \leq \exists r:(y)$ ’, with r being the result

¹⁸ If this hypothesis is on the right track, it seems that the phenomenon of CONFLATION, the fusion of two constituents into a phonological unit, partially mirrors function composition. See HK (chapters 2-4) for a more thorough discussion.

situation. I show its interpretive effect via the derivation in (53):

- (53) t . [[Mario]]:=m (type $\langle s \rangle$)
 $t+1$. [[ha]]:= $\lambda x.\lambda y.[\forall s \leq t_r : (x \leq y)]$ (type $\langle s, \langle s, s \rangle \rangle$)
 $t+2$. ([[Mario]])[[ha]]= $(m)\lambda x.\lambda y.[\forall s \leq t_r : (x \leq y)] = \lambda y.[\forall s \leq t_r : (m \leq y)]$ (type $\langle s, s \rangle$)
 $t+3$. [sido]:= $\lambda y.t_r \leq \mathbf{Idr} : (y)$ (type $\langle s, s \rangle$)
 $t+4$. ([[Mario ha]])([sido]) = $\lambda y.[\forall s \leq t_r : (m \leq y)] \circ \lambda y.t_r \leq \mathbf{Idr} : (y) = \lambda y.[\forall s \leq t_r \leq \mathbf{Idr} : (m \leq y)]$ (type $\langle s, s \rangle$)
 $t+5$. [[rubio]]:=R (type $\langle s \rangle$)
 $t+6$. [[Mario ha sido]]([[rubio]]) = $\lambda y.[\forall s \leq t_r \leq \mathbf{Idr} : (m \leq y)](R) = [\forall s \leq t_r \leq \mathbf{Idr} : (m \leq R)]$ (type $\langle s \rangle$)

In words, (52) says that Mario has recently stopped being part to the set of blond people, during the situation that acts as a reference time. While he was part of it until a still accessible interval in time, some unspecified event (say, a sudden case of baldness) turned him into a former blonde person. The operator **Id** represents this situation as the specific interval of time/situation in which this property held (state, in Maierborn's terms). So, the compositional merge of *haber* and *sido*, but also other verbs in perfect form, has the effect of outlining the temporal and aspectual structure of a sentence. This is also consistent with several approaches to this topic we previously mentioned. Therefore, we capture key assumptions about tense and aspect, but in a compositional way (e.g. Parsons 1990; Kratzer 2003; Kamp et al. 2005; Borik 2008; a.o.). Furthermore, we do so by tightly integrating our semantic approach and syntactic analysis, via the Isomorphism assumption.

The semantic derivations we have offered so far suggest that our approach can account for all the grammatical data we discussed so far, via a modest set of assumptions. We give an account of impersonal *hay*, to show that this is indeed the case. Intuitively, if *hay* takes a silent NP as its specifier (what we could call a *pro* subject), then this subject may denote any element in the denotation of the complement NP. The whole sentence, then, could simply state the existence of an individual which is part of this set. I offer example (32) repeated as (54), to illustrate this point:

- (54) a. *Hay una silla en la cocina*
 b. $t+n$. [[Hay una silla en la cocina]]= $[\forall s \leq t_r \leq \exists r : (x \leq \exists y[\mathbf{chair}'(y)])]$ ($\langle s \rangle$)

The logical formula in (54b) is a rough simplification of the interpretation assigned to (43a). I translate the *pro*-like NP as a free variable, and the NP *una silla en la cocina* as a partial predicate.¹⁹ In trading accuracy with

¹⁹ Recall that in this analysis, I also implicitly take that *hay* is a b-type unit that conflates

simplicity, we however capture the key datum: that (54) captures the existence of an individual, defined as a chair in the kitchen. Our approach seems to easily capture how impersonal *hay* can capture the notion of existence, in the Spanish equivalent of existential *there*-sentences. So, our proposal seems to capture all the relevant data under one unified approach. One remaining question is whether our approach can also **account** the ungrammaticality of several examples discussed in Section 2. Recall, *tener* only combines with NPs denoting properties:

- (55) a. **Mario tiene en la Cama* (=ex. (7))
 b. **Mario tiene gordo* (=ex. (8))
 c. *Mario tiene que/*Ø comer una manzana* (=ex. (10))
 d. **Mario tiene bombero* (=ex. (21))
 e. **La mesa tiene de madera* (=ex. (23))

I suggest the following answer. I assume that spatial PPs denote relations between (spatial) situations, and that contribute to the lexical aspect of a sentence (Zwarts 2005; a.o.). Since they denote a structured situation, at some derivational step the denotation of (55a) would include the relation $[s \leq t_r : ((en \leq c) \leq m)]$. In words, the internal part of the room (denoted by *en*) would be a property of Mario, as well as being a property of the room. Since Mario and the room are distinct entities, this logical form can only be considered as paradoxical, or at most incorrect.

For (55b) we note that, if *gordo* denotes the set G of all fat men including Mario, then we would have extraneous elements (e.g. Luigi and John) being part of this set as well (e.g. we would have $G = \{m, l, j\} \leq m$). So, when *tener* combines with bare NPs, its interpretation leads to paradoxical or at most incorrect logical forms, as in the case of *en la cama*. With minor *provisos*, the same reasoning(s) can be applied to (55c)-(55e), examples that end up denoting paradoxical or incorrect logical forms. So, *tener* can only combine with certain NPs because of its interpretation. When it combines with the wrong type of NP, the emergent paradoxical meaning rules the sentence out, as its interpretation cannot be part of our model of discourse.

Our proposal indirectly suggests that the semantics of *haber* may account why some sentences are ruled out. We repeat the un-translated versions of (35)-(37) in (56) to show this:

- (56) a. **Mario ha un coche* (=ex. (35))
 b. **Mario ha abogado* (=ex. (37))
 c. **Mario ha rubio* (=ex. (56))

with the morpheme denoting its impersonal argument (i.e. that *ha-* conflates with *-y*). See again example (44e) and discussion.

We start from (56b), for the sake of simplicity. According to our approach, *haber* merges with *Mario* and *abogado*. The resulting (simplified) logical form is $[\forall s \leq t_{\text{ff}} : (m \leq L)]$. This logical form says something paradoxical as well: that Mario has always been a lawyer, not only within the reference situation, but in any other situation related to it. For instance, it says that Mario would have been a lawyer even before doing the barrister exam. This cannot be the case, regardless of the model of discourse we choose, since one cannot be a lawyer before doing the opportune exam. More accurately, an individual cannot have one property, but lack those properties that act as lexical presuppositions to this property. The same considerations can be extended to (56c) and (56a), with the *proviso* that (54a) denotes a situation in which Mario has always been a car (*coche*).

Overall, our approach seems to be successful in two key aspects. First, it offers a unified syntax and semantics of *tener* and *haber*, which can capture via a modest set of assumptions the properties of our two auxiliary verbs. Second, it offers a principled way to determine which sentences are ruled out as ungrammatical or, more accurately, as being un-interpretable in a model of discourse. In other words, our simple logical calculus can generate and interpret all and only the grammatical sentences involving *tener* and *haber*. We now turn to our final set of data: those involving the distribution of *tener* and *haber* with respect to the two copulae, *ser* and *estar*.

3.4 Haber, tener and their interaction with ser and estar

The distributive properties have *tener* and *haber* interact with those of *ser* and *estar* in subtle ways, which are based on the semantic properties of these verbs, as well. It is generally acknowledged that *ser* and *estar* denote relations between individuals or eventualities that differ in their aspectual and temporal import. While *ser* denotes a set of situations which are BOUNDED or complete, (i.e. it has perfective aspect), *estar* denotes an UNBOUNDED set of situations (i.e. it has imperfective aspect). The exact details vary from theory to theory, but an aspectual alternation is assumed in each proposal (Maierborn 2005; Arche 2006; Camacho 2012; Gumiel-Molina & Pérez-Giménez 2012). This fact suggests that, if one can capture the correct relations between aspectual features, then one can correctly capture the distribution of these auxiliary verbs. I sketch a two-steps analysis, which extends an equivalent analysis offered for *ser* and *estar*, found in Ursini (2011) (see also Maierborn 2005; Camacho 2012). The two steps behind this analysis are defined as follows.

First, I observe that *ser*, *estar*, *haber* and *tener* are related via complementary distribution when they share the status of auxiliary verbs, i.e. of main heads in a sentence. In this syntactic context, they all denote a re-

lation between situations, in turn mapped onto a general situation (KIMIAN STATES, in Maierborn's work). This situation, in turn, can be bound by some operator, such as the existential quantifier or a λ -operator. So, the general template for the interpretation of auxiliary verbs is $\mathbf{Ops}(x \leq y)$. In words, \mathbf{Op} is an operator that binds the situation variable, which in turn denotes the type of relation at hand, as a structured model-theoretic object.

Second, I assume that each auxiliary verb is sensible to the aspectual value of its complement. Each complement XP introduces a structured situation in a derivation, which is in turn bound by an aspectual operator. For VPs and PPs, this is a standard assumption; for APs and (common noun) NPs, Camacho (2012) and Gumiel-Molina & Pérez-Giménez (2012) offer relevant evidence. If auxiliary verb and XP do not match in aspect, then a sentence becomes un-interpretable. From a formal perspective, this binding mismatch is sketched in (57):

$$(57) \quad \mathbf{Ops}(x \leq (\mathbf{Op}'s:y)) = *$$

In words, the operator that denotes the aspectual value of the copula, \mathbf{Op} , is in conflict with the operator denoting the aspectual operator of the complement XP, \mathbf{Op}' . Since the aspectual values don't match (or agree, in minimalist terms),²⁰ the derivation crashes, as shown in (58):

- (58) a. **Mario ha en la Iglesia* (=ex. (2))
 b. **Mario esta/ha una hermana* (=ex. (4))

Both examples are un-interpretable, as they involve the merge of *ha* with a spatial, locative PP (*en la Iglesia* 'in the church'), and the merge of *estar* with a quantified NP, *una hermana* ('a sister'). Intuitively, the existence aspectual reading of *haber* cannot combine with the aspectual reading for a spatial PP. Since spatial PPs must combine with *estar*, we take that they have a different aspect than the existence one (e.g. durative or progressive) denoted by *haber*. Hence, the type of configuration shown in (57) emerges as a result: for this reason, the derivation crashes. Note that, if we would have chosen a bottom-up approach to derivations, instead of PIG, a binding relation between operators could not be established, as one operator (here, \mathbf{Op}'), should have been able to bind an operator outside its scope (here, \mathbf{Op}). PIG's top-down approach automatically solves this

²⁰ We note that XP and verb do not necessarily introduce the same situation referent, in a derivation, as we assume in (57) (i.e. we may have *s* and *s'* in this formula). We assume, however, that the binding process identifies these two referents first, and then matches the operators that apply on these referents. This assumption is consistent with minimalist approaches to the Agree relation, but also to DRT's treatment of anaphoric relations. We leave a discussion of technical details to another occasion.

problem, since the direction of binding relations coincides with scope relations.

A similar reasoning holds for *estar*, when this Verb merges with a quantified NP *una Hermana*, or for other ungrammatical pairs of verbs and complement phrases (cf. (58)). More in general, if we assume that verbs differ in the type of (basic) relation they denote, we would expect that their distribution partitions the logical space of copular constructions into distinct sub-domains. The pre-theoretical intuition is simple. If *tener*, *haber*, *ser* and *estar* differ by expressing different sub-types of relations that can hold among individuals and properties, then they will combine with specific sub-types of XPs. These distributional patterns are determined by both the auxiliary at hand, the semantic properties of the XP(s). For instance, if *tener* denotes a certain relation between an individual and a property (e.g. *Mario* and *miedo*), then a VP denoting an event of motion cannot combine with this auxiliary. The wrong types of information would be merged together. Therefore, we cannot have **tener corriendo*, since the semantic output of this syntactic string would be un-interpretable: auxiliary verb and verb do not match, in their type of relation.

So, our theory can account distributional patterns in a rather accurate way, as a consequence of more basic syntactic and semantic combinatory principles. A more thorough account, which could also make precise predictions on these patterns, would require a more precise theory on how these semantic partitions arise, in the first place. We must leave such a task aside, as it would take us too far afield. Since we have obtained a unified, compositional account of how these patterns are licensed, we have obtained our initial goal of explaining the distribution of *haber* and *tener*.

Before we come to conclusions, I make some further comments on the interaction between *haber* and the other auxiliary verbs. As we have discussed in the previous section, *haber* can (and should) merge with perfect, one-argument versions of *estar*, *ser* and *tener*. The result is a verbal complex which, via function composition, denotes the complex temporal/aspectual structure of a sentence, as the relation(s) holding among key situations. These results appear to contrast with our proposal for simple copular sentences. If each auxiliary verb denotes a certain aspectual value, then their interaction should be blocked. Binding/agreement problems should always render sentences un-interpretable, since they produce ill-formed strings. This conflict is indeed apparent. As we have seen, *haber* can take other verbs as complements, insofar as they occur in their perfect form. If these verbs occur in progressive form, for instance, then *haber* cannot merge with them, as the examples in (59)-(61) show in detail:

- (59) **Mario ha estando cansado*
 Mario is-H be-S-PROG cansado
 ‘Mario is being tired’
- (60) **Mario ha teniendo prisa*
 Mario is-H be-S-PROG hurry
 ‘Mario is being in a hurry’
- (61) *Mario ha siendo abogado*
 Mario is-H be-S-PROG lawyer
 ‘Mario is being a lawyer’

We take that *haber* can combine with perfect-denoting VPs, including copulae, because perfect morphology denotes a property of a situation which comes about, as a result of the main situation. So, the operator that binds this result situation cannot bind the main situation, by definition. In the case of the progressive form, this is not possible. Since this operator seems to be interpreted at a sentential level (cf. Portner 2010; a.o.), it likely binds the main situation s in our denotations. So it conflicts with the existence operator, and renders the sentences un-interpretable. We leave a more thorough discussion of these and related data aside, as we turn to our conclusions for this paper.

4. CONCLUSIONS

We started our paper by outlining one problem about *tener* and *haber*: the lack of a principled account of their syntactic and semantic properties that can account data such as (1)-(4).

In the remainder of the paper, we discussed the data on these two auxiliary verbs in more detail, and offered a thorough theoretical account that can predict their limited distribution with other XPs, and rule out unattested combinations. We have done so, by showing that once we look at the fine-grained aspectual properties of these copulae, we can derive which interpretations are possible, and which are ruled out. We have done so by proposing a novel account of their syntactic structure and derivation, which is also compositional in nature.

Overall, our account seems to correctly account and predict all the grammatical (interpretable) data about *tener* and *haber*, and exclude the ungrammatical (un-interpretable) ones. It also covers the distribution of these auxiliary verbs with respect to *ser* and *estar*, via general principles. We meet our initial goal, which is a welcome result.

Our account is not a complete proposal on the distribution of these four auxiliary verbs. For instance, it only sketches the interplay between fine-

grained aspectual data and distribution (e.g. the lack of progressive forms with *haber*). It also does not cover more complex distributional data, such as those involving complex tense forms, and/or their discourse properties (cf. Maierborn 2005). Another open question is whether our theory can be extended to cover cross-categorical and cross-linguistic data. Three aspects seem to be particularly important.

First, we do not know whether our approach can be extended to cross-linguistic data. Proposals that study *ser* and *estar* in other Ibero-Romance languages suggest that it may be possible (e.g. Gallego & Uriagereka 2009). We think that our proposal can be extended to other languages, but we leave this avenue of research for the future.

Second, and a consequence of the first point, **we do not whether** our approach can be extended to languages such as English, in which there is no explicit difference between *tener* and *haber*. As Gutiérrez-Rexach (2007) discusses, the English auxiliary verb *to have* can cover both the interpretations we associated to *tener* and *haber*. So, English seems to offer a counterexample to our more exclusive theory of auxiliary verbs and their meaning. We think that theories of feature neutralization such as Ferreira (2005) may help us to solve this problem, in the future.

Third, and a consequence of the second point, we do not know whether we can capture alternation phenomena involving the distribution of the counterparts of *ser* and *haber* across languages. As Sorace (2000) discusses, the syntactic difference between transitive and unaccusative verbs may be reflected in the semantic selection process. Given the complexity of this topic, we leave it aside, and generally defer the extension of our proposal to further research.

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