Restructuring and Clitic Climbing in Romance: A Categorial Grammar Analysis

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0. Introduction and Background

This paper proposes a local treatment of restructuring (RS hereafter) and clitic climbing (CC hereafter) in Romance using the Generalized Categorical Grammar based on Lambek Calculus (Moortgat 1988), which includes a type-changing rule, Division, and polymorphic categories, and argues that it has empirical advantages over its comparable minimalist analysis proposed by Cinque (2000 and 2004/2006). This paper primarily deals with Spanish data; however, the analysis proposed here can easily be extended to other Romance languages that allow RS and CC.

In most Romance languages certain verbs taking a non-finite clausal complement can optionally allow the pronominal clitic that is thematically associated with the embedded verb to appear phonologically attached to them, as shown in the examples from Spanish.

1 a. José quiere leer***lo***.[1] 'Joe want to read it' (both)[2]
   Joe wants to.read.CL-acc.3sg.masc
  b. José ***lo*** quiere leer.

2 a. José siguió mirándo***me***. 'Joe kept watching me' (both)
   Joe kept-3sg watching.CL-1sg
  b. José ***me*** siguió mirando.

Clitic climbing gives evidence that sentences like (1b) and (2b) have a mono-clausal structure, where the matrix verb and the embedded verb form a complex predicate. On the basis of the clitic climbing and some other related facts, Rizzi's (1978/1982) argues for a syntactic operation called RESTRUCTURING, which collapses a bi-clausal structure into a mono-clausal one.[3] As a result, the pronominal clitic thematically associated with the embedded verb becomes a clause mate with the matrix verb and is phonologically attached to it, yielding strings like (1b) and (2b). The restructuring operation is supposed to apply optionally, and, according to Rizzi, its application is lexically induced. Strozer (1976), Rivas (1977), Contreras (1979), and Aissen and Perlmutter (1983) independently propose a similar mechanism for Spanish.

Since then several mono-clausal analyses of RS and CL have been proposed within the generative framework for Italian, for the theory can no longer sustain the restructuring operation. One such proposal comes from Thomas Rosen (1989), who postulates that *querer* 'to want', for instance, may be used as a full-fledged verb or as a "light verb", which needs to borrow arguments from the embedded verb. Roberts (1997) proposes a similar analysis treating RS verbs

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[1] The clitic is enclitic when the host verb is in the non-finite (infinitive or gerundive) form; otherwise it is proclitic. Orthographically, the clitic is written as if it is an independent word when it is proclitic; otherwise it is written as a part of the verb.
[2] Semantically, they are commonly thought to be equal. See Napoli for a discussion as to how they differ.
[3] Other constructions that allow RS include long object preposing (LOP) and auxiliary selection.

as “auxiliary verbs”.[4] Most recently, Cinque (ibid.), working within the minimalist framework, goes one step further and proposes that RS verbs are heads of various functional projections, which form the universal template, as shown in (3).

3. Functional Projections: Cinque (2004: 12)
   $MoodP_{speech\ act}$ > $MoodP_{evaluative}$ > $ModP_{epistemic}$ > TP(past) >
   TP(Future) > $MoodP_{irrealis}$ > $AspP_{habitual}$ > $AspP_{repetitive(1)}$ >
   $AspP_{frequentative}$ > $ModP_{volitional}$ $Asp_{celerative(1)}$ > TP(Anterior) > $AspP_{terminative}$ >
   $AspP_{continuative}$ > $AspP_{retrospective}$ $AspP_{proximative}$ > $AspP_{durative}$ > $AspP_{generic/progressive}$ >
   $AspP_{prospective}$ > $ModP_{obligation}$ $ModP_{permission/ability}$ > $AspP_{completive}$ > VoiceP >
   $AspP_{clerative(II)}$ >$AspP_{repetitive(II)}$ > $AspP_{frequentative(II)}$

Furthermore, Cinque (2004 and 2006) postulates that even when there is no CC evidenced, the RS verb is invariably generated as the head of a functional projection; thus, (1a) and (b) both have exactly the same mono-clausal underlying structure in his analysis. The clitic may optionally move from the embedded verb to adjoin to any of the RS-based functional heads, i.e., ModP and AspP, yielding strings like (1b).

Cinque’s analysis of RS verbs as functional heads is problematic for two reasons.[5] First, he claims that RS verbs, in their roles as functional heads, are raising verbs like *seem* (*sembrare* in Italian or *parecer* in Spanish) and do not assign a θ-role to their subject. Many RS verbs, however, are what are commonly analyzed as subject control verbs like *querer* ‘to want’, *tratar* ‘to try’, etc., which, unlike purely modal verbs like *poder* ‘can’ and *deber* ‘must’, do assign a θ-role to their subject.

The more serious problem with Cinque’s analysis, however, is that in Spanish, RS/CC is evidenced, as discussed in Luján (1980) and Contreras (1979), and Suñer (1980), with some object control verbs which include directive verbs like *permitir* ‘to permit’, *ordenar* ‘to order’, *prohibir* ‘to prohibit’, *mandar* ‘to command’, etc., as illustrated in (4b), and *enseñar* ‘to teach’, as shown in (5b).

4 a. José me permitió leer***lo***. ‘Joe permitted me to read it’ (both)’
   Joe me permitted to.read=it
  b. José me ***lo*** permitió leer

5 a. José me enseñó a leer***lo***. ‘Joe taught me how to read it’ (both)
   Joe me taught to read it
  b. José me ***lo*** enseñó a leer

Obviously, object control verbs cannot be reduced to the heads of some functional projections, which poses a serious challenge to Cinque’s proposal. The mono-clausal analyses that treat RS verbs as light verbs or auxiliary verbs also face the same problem.

Kayne (1989) and Cinque (ibid.), the latter following the former, argue that strings in (4) and (5) are “hidden instances of the causative construction (2006: 24)”, suggesting that these strings need to be handled independently from those like (1) and (2), on par as strings like (6).

[4] Also see Burzio (1981/1986), Goodall (1987), DiSciullo and Williams (1987), and Sadock (1991) for other types of analyses. Monachesi (1999) proposes a lexical analysis of Italian clitics using the HPSG framework.
[5] Also see Laca (2004) for the inadequacy of Cinque’s proposal from a semantic point of view.

6 a. José me hizo leer***lo***. ‘Joe made me read it’ (both)
Joe me made to.read it
b. José me ***lo*** hizo leer

Indeed, the strings in (4) are superficially similar to the causative sentences in (6). Nonetheless, the empirical data indicate, as shall be seen in Section 1, that object control verbs like *permitir*, *enseñar*, etc. behave differently from the causative verb *hacer*, and that (4b) and (5b) are indeed instances of restructuring, like (1b) and (2b).

Although Rizzi does not discuss object control RS verbs, the bi-clausal analysis using the restructuring operation should be able to account for strings like (4b) and (5b) in the same fashion as (1b) and (2b) since this operation amalgamates the complements of both the matrix and the embedded verb as it reduces two clauses into one. Ironically, the subsequently proposed mono-clausal analyses, although they have done away with the theoretically unfavorable operation, have retained empirical inadequacies.

In this paper we propose an analysis of RS and CC that can account for all RS/CC strings in a uniform fashion, adopting a generalized version of Categorial Grammar (CG, henceforth), as explored in Moortgat (ibid.). Our analysis allows the clitic/s in RS/CC-strings like (1b) or (4b) to first combine with the RS verb and then with the embedded verb, as in [[*lo=quiero*] *leer*] or [[*me=lo=permitieron*] *leer*], respectively, while thematically linking each clitic with the appropriate verb. We show that the CG analysis can not only handle the relevant data but also offers a straightforward account of certain coordination facts involving RS and CC, for which Cinque’s or his predecessor’s analyses mentioned above do not yield an easy solution.

The organization of this paper is as follows. Section 1 defines the scope of data dealt with in this paper. It also establishes that strings like (4b) and (5b) are instances of restructuring and need to be accounted for in the same way as strings like (1b) and (2b). Section 2 provides a brief description of the theoretical framework used in this paper. Section 3 presents our CG analysis of RS and CC and discusses its empirical advantages over the comparable minimalist analysis and alternative CG analyses. Section 5 summarizes the key points.

1. Data

1.1 Basic Data on RS/CC

Not all verbs that take a non-finite clausal complement allow RS since CC is not allowed from a non-finite clause in some cases, as shown in (7) below.

7 a. José espera leer***lo***. ‘Joe hopes to read it’
Joe hopes/expects to.read.it
b. *José ***lo*** espera leer.

Verbs that allow RS/CC are commonly defined as motion, modal, and aspectual verbs (Rizzi ibid.). Although it is true that many of the RS verbs resemble the raising verb *sembrare/parecer* ‘to seem’ in that they do not assign a θ-role to their subject, as Cinque claims, not all verbs share this property. One such case is subject control verbs, and another is object control verbs, as discussed in 1.2 below. In essence, the RS/CC verbs do not constitute a completely homogeneous semantic or syntactic class. We postulate that RS verbs are lexically marked (cf. Rizzi 1978/1982, Thomas Rosen 1989, Monachesi 1999, inter alias). The fact that the list of RS verbs varies from speaker to speaker also supports this position.

There are cases in which RS/CC appears to occur with the clause headed by a preposition, as shown in (8) and (9).

8 a. José trató de leer***lo***. ‘Joe tried to read it’ (both)
b. José ***lo*** trató de leer.

9. a. José empezó a leer***lo***. ‘Joe began reading it’ (both)
b. José ***lo*** empezó a leer.

Following Luján (1982), we assume that *de* and *a*, as used in these strings, are not real prepositions but rather functional elements which show up only when certain verbs embed an infinitival clause.

RS may involve not only two clauses, as shown in (1b) above or (10b) below, but also three or four, as shown in (10c) and (d), respectively, allowing the clitic thematically linked with the most deeply embedded verb to show up with each of the RS verb.

10 a. José quiere tratar de empezar a leer***lo***. ‘José wants to try to begin reading it’ (All)
b. José quiere tratar de empezar***lo*** a leer.
c. José quiere tratar***lo*** de empezar a leer.
d. José ***lo*** quiere tratar de empezar a leer.

1.2 Object Control Restructuring Verbs

As mentioned above, the empirical adequacy of Cinque's analysis hinges critically upon whether verbs like *permitir* and *enseñar*, as in (4b) and (5b), are RS verbs or not. This is not an issue specific to Spanish data; Italian also allows CC with one object control verb, *insegnare* ‘to teach’, as shown in (11) below, taken from Cinque's own example (ex. 46: 24).

11 a. Gli ho insegnato a far***lo*** io. ‘I taught him (how) to do it’ (both)
him have taught to do it I
b. Glie***l***’ho insegnato a fare io

Do (4b), (5b), and (11b) indeed illustrate “hidden instances of the causative construction,” as Kayne conjectures and Cinque claims?[6] The dative object of the Romance causative construction representing the causee is commonly analyzed as the underlying external argument of the embedded clause, and not as the argument semantically related to verb *hacer* itself (Burzio 1981/1986, Kayne 1989, Zubizarreta 1985, Zagona 1988, Rosen 1989, Moore 1998; inter alias).[7] Cinque tries to support his claim by demonstrating that the dative occurring with *insignare*, for instance, behaves differently from the ordinary dative, but similarly to the one occurring with the causative verb *fare*. He shows that the dative argument of a ditransitive verb *regalare* ‘to.give’ can be cliticized in terms of *si* if it is reflexive or reciprocal, as shown in (12b). Note that this does not hold for the dative occurring with *fare*, and importantly, *insegnare*, as shown in (13b) and (14b), respectively. (Cinque's data slightly modified to show the contrast.)

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[6] Cinque explains that ‘to teach someone (how) to do something’ is semantically causative because it can be decomposed into ‘to make someone learn to do something’.

[7] Bordelois (1988), however, analyzes the causative construction as the object control construction.

12 a. Gianni e Mario regalarono un disco a Carlo/l'uno all' altro.
Gianni and Mario gave a disk to Carlo/to each other
'Gianni and Mario gave a disk to Carlos/to each other'
b. Gianni e Mario ***si*** regalarono un disk.
Gianni and Mario si gave a disk
'Gianni and Mario gave themselves/each other a disk'

13 a. Gianni e Mario fecero imparare la procedura a Carlo/l'uno all'altro.
Gianni and Mario had learn the procedure to Carlo/to each other
'Gianni and Mario had Carlo/each other learn the procedure'
b. Gianni e Mario ****si*** fecero imparare la procedura.

14 a. Gianni e Mario insegnrono la procedura a Carlo/l'uno all'altro.
Gianni and Mario taught the procedure to Carlo/to each other
'Gianni and Mario taught Carlo/each other the procedure'
b. Gianni e Mario ****?si*** insegnarono la procedura.
Gianni and Mario *?si taught the procedure'[8]

Cinque's argument, however, cannot be sustained for Spanish because both *permitir* and *enseñar* do not pattern with *hacer* in terms of the dative-related *se*-cliticization. First, just like in Italian, a ditransitive verb can occur with the dative-related reflexive/reciprocal clitic *se*, as shown in (15), whereas the causative verb *hacer* cannot, as shown in (16).

15. Juan y José ***se*** regalaron un disco. (ditransitive)
Juan and Joe *se* gave a disk
'John and Joe gave a disk to themselves/to each other'

16. Juan y José ****se*** hicieron aprender el proceso. (causative with *hacer*)
Juan and Joe se-3 made-3pl to.learn the procedure
(Intended: John and Joe made themselves/each other learn the procedure)

However, unlike in Italian, the dative-related reflexive/reciprocal clitic *se* may occur with *enseñar*, as shown in (17) and (18), and *permitir*, as shown in (19).[9,10]

17. "… olvidas que yo ***me*** enseñé a mí a hacerte gozar."
…you.forget that I se-1sg taught to myself to have.you enjoy
'… you forget that I taught myself how to have you enjoy'

18. Juan y José ***se*** enseñaron el uno al otro a hacer los trucos.
John and Joe se-3 taught-3pl the one to.the other to do the tricks

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[8] My two Italian native speakers commented that this sentence is odd because without the disambiguating phrase *l'uno all'altro* 'each other' the sentence tends to be interpreted as reflexive and the act of teaching oneself is odd in Italian. However, both accepted that *si* can be used with *insegnare*, if the intended meaning is reciprocal. This fact considerably weakens Cinque's argument.
[9] Note that in (17) and (19), the clitic *se* changes its form in agreement with the person/number value of the subject.
[10] Examples in (17) and (19) are taken from the Real Academia Española written corpus CREA.

‘John and Joe taught each other how to do the tricks’

19. ¿Cómo ***te*** permitiste, (por ayudar a un lunático), correr un riesgo de ese tamaño?
How se-2sg permitted-2sg, (for helping a lunatic), to.run a risk of that size
‘How did you permit yourself, (for helping a lunatic), to run a risk of that size?

In view of the data in (15)-(19), the dative of *permitir* or *enseñar* in (4) or (5), respectively is no different from the dative of the ditransitive verb *regalar*, but behaves differently from the one occurring with the causative verb *hacer*.

There are several other pieces of evidence that support that strings like (4) and (5), containing *permitir* and *enseñar*, respectively, as the matrix verb, are different from the purely causative construction. First and most importantly, for the causative verb, the causee may be case-marked as dative, as shown in (6), or accusative, as shown in (20), depending on the transitivity of the embedded clause.[11]

20. José ***lo*** hizo caminar todo el día.
José CL-acc.3sg.masc made to.walk all the day
‘José made him walk all day long’

With *permitir* and *enseñar,* on the other hand, no such variation is evidenced in any variety of Spanish. The object is uniformly dative and never accusative, regardless of the transitivity of the embedded clause, as shown in (21) and (22).

21. José ***le/*lo*** permitió caminar todo el día.
Joe him/her-dat/*him-acc permitted to.walk all day long

22. José ***le/*lo*** enseñó a tocar el piano.
Joe him/her-dat/*him-acc taught to.play the piano

Second, when *permitir* takes a finite clause, the dative argument can commonly remain controlling the subject of the finite embedded clause, as shown in (23).

23. José ***le**$_i$* permitió que pro$_i$ leyera el libro.
Joe him/her-dat permitted that pro read-subj.imp the book
‘Joe permitted him/her to read the book’

However, with *hacer*, strings like (24) below, where the dative remains controlling the subject of the finite embedded clause, is judged either ill-formed or extremely marginal by native speakers.[12]

[11] This is the prescriptive rule given by the Spanish Royal Academy (Real Academia Española). In spoken Spanish, this rule may not be strictly observed, and there may be other factors governing the case alternation. However, this fact does not weaken our argument because *permitir, enseñar*, etc. does not allow case alternation across all varieties of Spanish.

[12] My Spanish native speaker consultants were from Costa Rica (1), Mexico (1), and Central Spain (2).

24. *? José ***le***$_i$ hizo que pro$_i$ leyera el libro.
Joe him/her-dat made that pro read-subj.imp the book

Moore (1998) uses some constituency tests to demonstrate that verbs like *permitir* cannot be assimilated with the causative verb. One such test is the formation of cleft sentences, as shown in (25) below.

25 a. Lo que me permitió/ordenó/mandó fue [barrer la verada].
'What s/he permitted/ordered/commanded me was [to sweep the sidewalk]'
b. *Lo que me hizo/dejó fue [barrer la verada].
'What s/he made/let me was [to sweep the sidewalk]' (Moore's examples 31a and b)

The embedded non-finite clause of *enseñar* can also be clefted, as shown in (26).

26. Lo que me enseñó fue [hacer los trucos].
'What s/he taught me was to do the tricks'

Based on the data in (25) and some others, Moore argues that for *permitir* the dative is the object of this verb which controls the subject of the embedded clause, whereas for *hacer* the dative is (underlyingly) the subject of the embedded clause.

In sum, the data presented in this section provides ample evidence supporting that verbs like *permitir* and *enseñar* are indeed object control verbs, and strings like (4b), (5b), and (11b) are instances of RS and CC. In Section 3, we propose an analysis that provides a uniform account of strings like (1b) and (2b) and of those like (4b), (5b), and (11b). In this paper, however, we will not deal with the causative construction, as in (6) and (20), or the construction involving perception verbs, as in (27), which is assumed to have a similar underlying structure as the causative construction.

27. José me lo vio romper.
Joe me it saw break
'Joe saw me break it'

2. Theoretical Framework: Generalized Category Grammar

2.1 Categorial Lexicon: Assigning Expressions to Syntactic Categories

Categorial Grammar has two components: a) Categorial Lexicon, where expressions are assigned to syntactic categories (CAT hereafter) according to their lexical properties, and b) a set of reduction rules.

Linguistic expressions are assigned to atomic or complex categories. (28) shows some of the atomic categories from Spanish.

28. Atomic CAT: Some examples
S : El niño está muy contento. 'The boy is very happy'
N : niño 'boy'
NP : el niño 'the boy'
AP (predicative) : muy contento

Complex categories are formed on the basis of atomic categories and connectives. In the first place, we have the so-called FUNCTOR categories which contain connectives, /, \, and |, as shown in (29) below.

29. Functor CAT:
   a. right-looking   X/Y
   b. left-looking   Y\X[13]
   c. bi-directional   X|Y   where X and Y can be basic or complex CAT.

These categories are considered as functions from CAT Y (domain) to CAT X (range). Linguistically, X/Y, Y\X, and X|Y mean that expressions that belong to these categories can combine with expressions of CAT Y to their right (/), to their left (\), or to either direction (|), respectively, to yield expressions of CAT X. Since X and Y can be atomic or functor CAT, given atomic categories A, B, C, and D, X/Y, for instance, can be A/B, (C\A)/B, (C\A)/(B/D), etc.

Besides functor categories, we also use PRODUCT categories, as shown in (30) below.

30. Product CAT: (A•B) where A and B are atomic categories.

An expression assigned to CAT (A•B) is a concatenation of an expression of CAT A and an expression of CAT B. CAT (C\D)/(A•B), therefore, is equivalent to CAT ((C\D)/B)/A.

Complement-taking verbs are good examples of complex categories. Transitive verbs like *lee* 'reads' and *leer* 'to read', for instance, belong to the functor categories, as shown in (31a) and (b), respectively. The thematic correspondence of a functor category is provided using the lambda notation.

31.	Linguistic Expression	Syntactic CAT	Thematic Representation
a.	*lee* 'reads'	$(NP_{Sub\ [3sg]}\backslash S)/NP_{DO}$	$\lambda x \lambda y$[lee' (x) (y)]
b.	*leer* 'to.read'	$(NP_{Sub}\backslash S_{inf})/NP_{DO}$	$\lambda x \lambda y$[leer'(x) (y)]

The verb *lee* or *leer* takes the DONP to the right, forming an expression whose combination with a subject NP to the left would yield a finite S or an infinitival S, respectively; for *lee*, the subject NP must be [3sg], whereas for *leer*, the subject's person/number value is unspecified.[14]

Ditransitive verbs like *da* 'gives' and *dar* 'to give' take both the DO and the IO besides the subject to form an S. Here we use a product category (NP_{DO}•a NP_{IO})[15] to represent their complement structure, as shown in (32) below.

32.	Linguistic Expression	Syntactic CAT	Thematic Representation
a.	*da* 'gives'	$(NP_{Sub\ [3sg]}\backslash S)/(NP_{DO}$•*a* $NP_{IO})$	$\lambda x \lambda y \lambda z$[da' ($x$) (y) (z)]
b.	*dar* 'to.give'	$(NP_{Sub}\backslash S_{inf})/(NP_{DO}$•*a* $NP_{IO})$	$\lambda x \lambda y \lambda z$[dar' ($x$) (y) (z)]

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[13] We would like to alert that the practitioners of Combinatory Categorial Grammar (cf. Steedman 2000) consistently place the domain category on the right-hand side of the connective. Thus, the left-division functor CAT is represented as X\Y instead of Y\X.

[14] Spanish is a null-subject language; however, in this paper, we will not deal with how the null subject can be handled within Categorial Grammar, since it is not critical for the purpose of this paper.

[15] The IO in Spanish is always accompanied by the particle *a*. There is no consensus among linguists on whether the IO is an NP or PP. In this paper, we will simply represent it this way since it is not critical for our purposes.

Note that CAT $(NP_{Sub}\backslash S)/(NP_{DO}\bullet a\ NP_{IO})$ is equivalent to CAT $((NP_{Sub}\backslash S)/a\ NP_{IO})/NP_{DO}$.

Quiere 'wants', as used as a subject control verb, is assigned to the following category.

33. *quiere* 'wants' $(NP_{Sub[3sg]}\backslash S)/(NP_{Sub}\backslash S_{inf})$[16]: $\lambda p \lambda y$[quiere' (p (ana' y)) (y)]

Quiere combines with an expression of CAT $(NP_{Sub}\backslash S_{inf})$, i.e., infinitival VP, to the right, forming an expression whose combination with a subject $NP_{[3sg]}$ to the left yields a finite S. Following Steedman (2000), we represent an argument that is controlled by *y* as (ana' *y*), an analogue to the controlled PRO. Here *y* is the subject of the matrix verb.

Likewise, object control verbs like *permite* 'permits' belong to the CAT shown below.

34. *permite* 'permits' $((NP_{Sub[3sg]}\backslash S)/a\ NP_{IO})/(NP_{Sub}\backslash S_{inf})$: $\lambda p \lambda x \lambda y$[permite' (($p$ (ana' x)) (x)) (y)]

Permite first takes an infinitival VP to the right, then an IO to the right, and finally a 3rd person/singular subject to the left to yield an S. Note in the thematic representation that the controlled subject of the embedded verb here, (ana' *x*) is anaphoric to the IO of *permite*.

To what categories do clitics belong? Following Miller (1992) and Miller and Sag (1996), we take the strong lexicalist approach, defining clitics as verb affixes which need to combine with a verb in the lexicon. The most critical empirical evidence in favor of this position comes from the following facts: a clitic, unlike a word, cannot take wide scope in a coordinate structure, as shown in (35a) below, but needs to be attached to each of the two verbs coordinated, as shown in (35b). See Miller (1992) and Miller and Sag (1996) for further arguments.

35 a. José ****lo*** [compró y leyó].
Joe it [bought and read]
b. José ***lo*** compró y ***lo*** leyó. 'Joe bought and read it'
it bought and it read

We assume that an ACC clitic or a DAT clitic belongs to a functor category that takes a verb needing a DO or an IO, respectively, and possibly another complement, and partially instantiates the DO or IO, respectively, by specifying some morphological features for these complements. In other words, the ACC clitic *lo* and the DAT clitic *le*, for instance, belong to the type-raised, polymorphic categories, as shown in (36) and (37), respectively below.[17] Note that clitics belong to bi-directional categories in Spanish because they can be proclitic (right-division) or enclitic (left-division) depending on whether their host verb is finite or non-finite.

36. <u>ACC clitics</u>

lo [acc.3sg.masc] CAT $((NP_{sub[\beta]}\backslash S_{\alpha fin})/\$)|(((NP_{sub[\beta]}\backslash S_{\alpha fin})/\$)/NP_{DO})$: $\lambda p[p(\text{lo})]$

where a) α is + or -;

b) If α is +, X|Y is to be interpreted as X/Y and β contains a specified person/number value; otherwise X|Y is to be interpreted as Y\X and β contains no specified person/number value;

c) [-fin] can be infinitival or gerundive;

[16] Hereafter, we use a simple S for finite clauses.

[17] A polymorphic CAT contains variables like $ or &, as in (36) and (37).

d) \$ is a complement type that can co-occur with $NP_{DO,}$ which includes a NP_{IO}, PP, $NP_{sub}\backslash S_{inf}$ (=infinitival VP), CP, and Ø;

37. DAT clitics

le [dat.3sg] CAT $((NP_{sub[\beta]}\backslash S_{\alpha fin})/\&)|(((NP_{sub[\beta]}\backslash S_{\alpha fin})/a\ NP_{IO})/\&)$: $\lambda p[p(\text{le})]$

where a), b), c) Same as for ACC clitics;

d) & is a complement type that can co-occur with an *a* NP_{IO}, which includes NP_{DO}, $NP_{sub}\backslash S_{inf}$ (=infinitival VP), CP, and Ø.

Details of how clitic doubling is handled are beyond the scope of this paper; however, we assume that, when a clitic-doubled NP is incorporated into a string, its referential and semantic properties are unified with those of the clitic and together they fully instantiate the DO or IO.

2.2 Reduction Rules

The second component of Categorial Grammar is comprised of two kinds of reduction rules: a) binary rules, which combine two expressions to form a new expression, and b) unary rules, which changes the category assigned to a set of expressions.

The first binary rule, Functional Application, has two versions, as shown in (38).

38. Functional Application (Abbreviated as FA)

a. Forward A (>FA)

$X/Y: f \quad Y: (a) \rightarrow X: f(a)$

b. Backward A (<FA)

$Y: (a) \quad Y\backslash X: f \rightarrow X: f(a)$

In these rules, as the functor X/Y or Y\X finds the argument Y in the direction specified in the connective, Y gets cancelled out, and X results. Besides FA, Lambek Calculus includes another combinatory rule, Functional Composition, whose forward version is shown in (39).

39. Functional Composition (Abbreviated as FC)

$X/Y: f \quad Y/Z: g \rightarrow X/Z: f(g)$

In this rule, as the domain of CAT X/Y and the range of CAT Y/Z match, they cancel, yielding a new functor CAT X/Z. This rule can concatenate two linguistics expressions that do not form a standard constituent (cf. Steedman 2000).

In addition to the binary rules, Lambek Calculus, as explored in Moortgat (ibid.) for linguistic analyses, includes some unary, type-changing rules. One such rule is Division; we use the rightward main functor harmonic version and its permutation dual, Main Functor Disharmonic version, as shown in (40), in this paper.

40. Division (Abbreviated as D or D')[18]

a. Main functor Harmonic (D)

$X/Y: \lambda p[p] \rightarrow (X/Z)/(Y/Z): \lambda q\lambda r[(q(r))]$

b. Main Functor Disharmonic (D')

$Y\backslash X: \lambda p[p] \rightarrow (Y/Z)\backslash(X/Z): \lambda q\lambda r[(q(r))]$

---

[18] This rule is also called "Geach Rule" by Jacobson (1999).

Division introduces a variable Z into both the domain and the range of a complex category, where Z may be an atomic, functor or a product CAT. Note that D+A, as shown in (41a), can obtain the same result as FC, as shown in (41b).

41 a.
```
     X/Y            Y/Z
---------------D
(X/Z)/(Y/Z)
--------------------------->FA
       X/Z
```

b.
```
X/Y          Y/Z
------------------->FC
         X/Z
```

Both alternatives, D+FA and FC, are able to account for RS/CC; however, as we shall discuss in Subsection 3.4 below, we prefer the first alternative for its empirical advantage.

3. Analysis: Restructuring and Clitic Climbing

3.1 RS/CC with Subject Control, Modal, Aspectual, and Motion Verbs

We assume that non-RS/CC strings like (1a) and their RS/CC counterparts like (1b) are formed differently. (1a) is constructed by successive FAs, analogous to a derivation in phrase structure grammars. First, the clitic combines with its host verb and is phonologically affixed to it in the lexicon, as shown in (42a), as the variable $ takes the value Ø. The result, shown under the line, is an expression that needs a subject NP to form an infinitival S. The thematic correspondence to this syntactic process is provided in (42b), where the clitic *lo* 'it' is properly interpreted as the internal argument of the verb *leer*.

42. Cliticization: a.

leer 'to.read' = $(NP_{Sub}\backslash S_{inf})/NP_{DO}$ *lo* 'it' $(((NP_{Sub}\backslash S_{inf})/\$)/NP_{DO})\backslash((NP_{Sub}\backslash S_{inf})/\$)$

--<FA ($=Ø)

$(NP_{Sub}\backslash S_{inf})$

b. <FA: $\lambda P[P(\text{lo})](\lambda x\lambda y[\text{leer'}(x)(y)]) \rightarrow \lambda x\lambda y[\text{leer'}(x)(y)](\text{lo}) \rightarrow \lambda y[\text{leer'}(\text{lo})\ (y)]$

Subsequently, *leer=lo* combines with the matrix verb and then with the subject, as shown in (43), yielding the RS/CC string (1a).

43 a. *José* 'Joe' $NP_{Sub[3sg]}$ *quiere* 'wants' $(NP_{Sub[3sg]}\backslash S)/(NP_{Sub}\backslash S_{inf})$ *leer=lo* 'to.read it' $(NP_{Sub}\backslash S_{inf})$

-->FA

$(NP_{Sub[3sg]}\backslash S)$

--<FA[19]

S

b. >FA: $\lambda P\lambda x[\text{quiere'}(P(\text{ana'}x))(x)](\lambda y[(\text{leer'}(\text{lo}))(y)]) \rightarrow \lambda x[\text{quiere'}(\lambda y[\text{leer'}(\text{lo})(y)]\ (\text{ana'x}))(x)]$

$\rightarrow \lambda x[\text{quiere'}(\text{leer'}(\text{lo})\ (\textit{ana'}\ x))(x)]$

<FA: $\lambda x[\text{quiere'}\ (\text{leer'}\ (\text{lo})\ (\textit{ana'}\ x))\ (x)](\text{jose'}) \rightarrow \text{quiere}\ (\text{leer'}\ (\text{lo})\ (\text{ana' jose'}))(\text{jose'})$

Turning to the RS/CC string (1b), the clitic *lo* first needs to be combined with and affixed to the RS verb *quiere*, but the two expressions are not categorially compatible, as shown in (44).

---

[19] This FA takes place only if the two subject person/number values match. This is analogous to feature checking in minimalism.

44. *lo* 'it' *quiere* 'wants'

$((NP_{Sub[\alpha]}\backslash S)/\$)/(((NP_{Sub[\alpha]}\backslash S)/\&)/NP_{DO})$ $((NP_{Sub[3sg]}\backslash S)/(NP_{Sub}\backslash S_{inf}))$

--*

However, the use of D with both expressions will resolve this categorical incompatibility, and the two expressions can be combined by FA, as shown in (45) below, where the variables, &, Z, α, and W, are assigned specified values, as shown in the parenthesis next to FA.

45 a. *lo* 'it' *quiere* 'wants'

$((NP_{Sub[\alpha]}\backslash S)/\&)/(((NP_{Sub[\alpha]}\backslash S)/\&)/NP_{DO})$ $(NP_{Sub[3sg]}\backslash S)/(NP_{Sub}\backslash S_{inf})$

--D_2 --D_1

$(((NP_{Sub[\alpha]}\backslash S)/\&)/W)/((((NP_{Sub[\alpha]}\backslash S)/\&)/NP_{DO})/W)$ $(((NP_{Sub[3sg]}\backslash S)/Z)/((NP_{Sub}\backslash S_{inf})/Z)$

-->FA ($\&=\emptyset$, $Z=NP_{DO}$, $\alpha=[3sg]$, $W=(NP_{Sub}\backslash S_{inf})/NP_{DO}$)

$(NP_{Sub[3sg]}\backslash S)/((NP_{Sub[3/sg]}\backslash S_{inf})/NP_{DO})$

b. D_1: $\lambda P\lambda y$[quiere' (P (ana' y)) (y)] → $\lambda Q\lambda x\lambda y$[quiere' (($Q$($x$)) (ana'$y$)) ($y$)]
   D_2: λP[P(lo)] → $\lambda R\lambda S$ [(R(S)) (lo)]
   FA: $\lambda R\lambda S$ [(R(S)) (lo)] ($\lambda Q\lambda x\lambda y$ [quiere' ((Q(x)) (ana'y)) (y)])
   → λS [($\lambda Q\lambda x\lambda y$ [quiere' ((Q(x)) (ana'y)) (y)] (S)) (lo)]
   → λS [$\lambda x\lambda y$ [quiere' ((S(x)) (ana'y)) (y)] (lo)]
   → $\lambda S\lambda y$[quiere' ((S(*lo*)) (ana'y)) (y)]

Into this complex expression formed above, the embedded verb and subsequently the subject $NP_{[3sg]}$ are incorporated, both by FA, as shown in (46), yielding the RS/CC sentence (1b).

46 a. *José* 'Joe' *lo=quiere* 'it=wants' *leer* 'to.read'

$NP_{Sub[3sg]}$ $(NP_{Sub[3sg]}\backslash S)/((DP_{Sub}\backslash S_{inf})/DP_{DO})$ $(DP_{Sub}\backslash S_{inf})/DP_{DO}$

--->FA

$NP_{Sub[3sg]}\backslash S$

--<FA

S

b. >FA: $\lambda S\lambda y$[quiere' ((S(*lo*)) (ana'y)) (y)] ($\lambda x\lambda z$[leer'(x)(z)])
   → λy[quiere' (($\lambda x\lambda z$[leer' (x)(z)] (lo)) (ana'y)) (y)]
   → λy[quiere' (λz[leer' (lo)(z)] (ana'y)) (y)]
   → λy[quiere' (leer' (lo)(ana'y)) (y)]
   <FA: λy[quiere' (leer' (lo') (ana'y)) (y)](josé') → quiere' (leer'(lo') (ana'josé')) (josé')

Note that in the above analysis, although it is directly combined with the matrix verb, the clitic *lo* is thematically interpreted as the complement of the embedded verb, as shown in (46b), in the same way as for non-RS/CC string in (43b).

Division, as used in (45), applies only to restricted set of lexical items, i.e., RS verbs and clitics. To capture such lexically idiosyncratic properties, we propose two lexical rules, the first one of which pertains to RS verbs, as formulated in (47).

47. Type-changing Rule (D) for RS verbs in Spanish (1st approximation):

$[V]_{(NPsub\backslash S[\pm fin])/(NPsub\backslash S[-fin])}$ → $[V]_{(NPsub\backslash S[\pm fin])/Z)/((NPsub\backslash S[-fin])/Z)}$
where V={*querer, tratar,*…};

$Z=NP_{DO}$, a NP_{IO}, or $(NP_{DO}\bullet a\ NP_{IO})$.

The basic syntactic property of an RS verb is to combine with a non-finite clausal complement to form a VP. However, the above rule, as it applies to an RS-verb, changes its category in such a way that it can combine with a non-finite verb subcategorized for the DO, the IO, or both to form a complex verb needing such arguments.

The second type-changing lexical rule is for clitics, whose generalized schema is formulated in (48).

48. Type-changing Rule (D or D')[20] for CLs (1st approximation): $[CL]_{X|Y} \rightarrow [CL]_{(X/Z)|(Y/Z)}$

As applied to ACC clitics, the rule reads, as in (49).

49. Type-changing Rule (D or D') for ACC clitics

$[CL]_{((NPsub[\beta]\backslash S\alpha fin)/\$)|((NPsub[\beta]\backslash S\alpha fin)/\$)/NP_{DO})} \rightarrow [CL]_{(((NPsub[\beta]\backslash S\alpha fin)/\$)/Z)|((((NPsub[\beta]\backslash S\alpha fin)/\$)/NP_{DO})/Z)}$

where CL={*lo, la, los, las*,*me, nos, te, os*}.

An ACC clitic would normally combine with a verb requiring the DO to instantiate this argument. Division changes its category, making it able to combine with an RS verb and instantiate the DO argument of whatever transitive verb is later embedded under the RS verb.

The analysis so far proposed can easily handle strings with multi-clausal RS/CC like (10d) without any extra mechanism. We first combine the clitic *lo* and the first RS verb *quiere*, as shown in (45) above. Next, the three lowest verbs are assembled into a complex verb, as follows.[21]

50 a. *tratar* 'to try' — $(NP_{sub}\backslash S_{inf})/(NP_{sub}\backslash de\ S_{inf})$; *de empezar* 'to begin' — $(NP_{sub}\backslash de\ S_{inf})/(NP_{sub}\backslash a\ S_{inf})$; *a leer* 'to read' — $(NP_{sub}\backslash a\ S_{inf})/NP_{DO}$

--D_2 (*tratar*): $((NP_{sub}\backslash S_{inf})/W)/((NP_{sub}\backslash de\ S_{inf})/W)$

--D_1 (*de empezar*): $((NP_{sub}\backslash de\ S_{inf})/Z)/((NP_{sub}\backslash a\ S_{inf})/Z)$

--$>FA_1(Z=NP_{DO})$: $((NP_{sub}\backslash de\ S_{inf})/NP_{DO})$

--$>FA_2$ ($W= NP_{DO}$): $(NP_{sub}\backslash S_{inf})/NP_{DO}$

b. D_1: $\lambda P\lambda y$[empezar' $(P$ (ana' y)) (y)] $\rightarrow$ $\lambda Q\lambda x\lambda y$[empezar'(($Q(x)$)(ana'$y$)) (y)]

$>FA_1$: $\lambda Q\lambda x\lambda y$ [empezar'(($Q(x)$)(ana'y)) (y)] ($\lambda w\lambda z$[(leer'(w))(z)])

$\rightarrow$ $\lambda x\lambda y$[empezar'(($\lambda w\lambda z$[(leer'(w))(z)](x))(ana'y))(y)]

$\rightarrow$ $\lambda x\lambda y$[empezar'(λz[(leer'(x))(z)](ana'y))(y)]

$\rightarrow$ $\lambda x\lambda y$[empezar'((leer'(x))(ana' y)) (y)]

D_2: $\lambda P\lambda x$[tratar'(P (ana' x)) (x)] $\rightarrow$ $\lambda T\lambda w\lambda z$[tratar'(($T(w)$) (ana' z)) (z)]

$>FA_2$: $\lambda T\lambda w\lambda z$[tratar'(($T(w)$) (ana' z))(z)] ($\lambda x\lambda y$[empezar'((leer'(x))(ana' y)) (y)])

$\rightarrow$ $\lambda w\lambda z$[tratar'(($\lambda x\lambda y$[empezar'((leer'(x))(ana' y)) (y)] (w)) (ana' z))(z)]

$\rightarrow$ $\lambda w\lambda z$[tratar'((λy[empezar'((leer'(w))(ana' y))(y)](ana' z)) (z)]

[20] The harmonic division (D) is used when the clitic is proclitic to an RS verb, as in (1b); the disharmonic counterpart (D') is used when the clitic is enclitic to an RS verb, as in (10b) and (10c).

[21] As is evident in (50b) and (51b) below, both *tratar* and *empezar* as well as *quiere* are treated as subject control verbs. However, the decision to treat these verbs as raising verbs or control verbs does not affect the analysis.

$\rightarrow \lambda w \lambda z$[tratar'(empezar'((leer'(w))(ana' z))(ana'z))](z)] (y=z)

The lowest RS verb, (*de*) *empezar* 'to begin', after its category is changed by D, combines with the most deeply embedded verb by >FC to form a complex verb [*empezar a leer*]. Likewise, *tratar* 'to try' undergoes a category change by D and combines with this complex verb to form another complex verb, [*tratar de empezar a leer*]. As shown in (51) below, the previously formed string, *lo=quiero* 'it=wants', combines with this complex verb by >FA, and finally the subject is incorporated into the sentence, yielding (10d).

51 a. *José* — *lo=quiere* — *tratar de empezar a leer*

$NP_{Sub[3sg]}$ — $(NP_{Sub[3sg]}\backslash S)/((NP_{Sub}\backslash S_{inf})/NP_{DO})$ — $((NP_{sub}\backslash S_{inf})/NP_{DO})$

--->FA

$(NP_{Sub[3sg]}\backslash S)$

--<FA

S

b. >FA:$\lambda P \lambda y$[quiere'((P(lo))(ana'y)) (y)]($\lambda w \lambda z$[tratar'(empezar'((leer'(w))(ana' z))(*ana'z*))(z)])

$\rightarrow \lambda y$[quiere'(($\lambda w \lambda z$[tratar'(empezar'((leer'(w))(ana' z))(*ana'z*))(z)] (lo))(ana'y)) (y)]

$\rightarrow \lambda y$[quiere'(λz[tratar'(empezar'((leer'(lo))(ana' z))(*ana'z*))(z)](ana'y)) (y)]

$\rightarrow \lambda y$[quiere'(tratar'(empezar'((leer'(lo))(ana' y))(*ana'y*))(*ana'y*)] (y)] (z=y)

<FA: λz[quiere'(tratar'(empezar'((leer'(lo))(ana' z)) (*ana'z*)) (*ana'z*)) (*ana*'z)) (z)](jose')

$\rightarrow$quiere'(tratar'(empezar'((leer'(lo))(ana'jose'))(*ana*'jose'))(*ana*'jose'))(*ana*'jose'))(jose')

Note that, although the clitic directly combines with the highest RS verb, it is correctly interpreted as the complement of the most deeply embedded verb *leer*.

The difference in the derivation between strings with one RS verb like (1b) and those with several RS verbs like (10d) is whether the complex expression comprising a CL and an RS verb takes a simple V or complex V as its argument. To generalize, all RS/CC strings have a surface structure, … [CL=V][$_V$ ($V_1 \ldots V_{n-1}$) V_n)] …, where ($V_1 \ldots V_{n-1}$) may be empty.

3.2 RS/CC with Object Control Verbs

We now turn to RS/CC strings with object control verbs and show that strings like (4b), (5b), and (11b) are formed in the same way as the RS strings like (1b). First, we assume that, when there is a cluster of clitics affixed to a verb, the cluster is first formed in the lexicon, as in (52) below, by applying D to the first clitic and combine this clitic with the second one by FA; the variables β, &, $, and Z are assigned specified values, as given in the parenthesis.

52. DAT=ACC Clitic-cluster formation[22]

a. *me* 'me' — *lo* 'it'

$((NP_{sub[\alpha]}\backslash S_{[+fin]})/\&)/(((NP_{sub[\alpha]}\backslash S_{[+fin]}))/a\ NP_{IO})/\&)$ — $((NP_{sub[\beta]}\backslash S_{[+fin]})/\$)/(((NP_{sub[\beta]}\backslash S_{[+fin]})/\$)/NP_{DO})$

---D

$(((NP_{sub[\alpha]}\backslash S_{[+fin]})/\&)/Z)/((((NP_{sub[\alpha]}\backslash S_{[+fin]}))/a\ NP_{IO})/\&)/Z)$

--->FA

$(((NP_{sub[\alpha]}\backslash S_{[+fin]})/(((NP_{sub[\alpha]}\backslash S_{\alpha fin})/a\ NP_{IO})/NP_{DO})$ — ($=a NP_{IO}, β=α, &=Ø, Z=$((NP_{sub.\alpha}\backslash S_{[+fin]})/a\ NP_{IO})/NP_{DO})$

[22] In this cluster *me* precedes *lo*; however, an ill-formed cluster **lo me* could also be categorially derivable. We assume that there are certain constraints placed on the order of the clitics forming clusters in terms of certain morphological features. Also, we used the categories for proclitics here to form the cluster *me=lo*; we can also use the categories assigned to enclitics to form the same cluster.

b. D: $\lambda P[P(\text{me})] \rightarrow \lambda Q\lambda x[(Q(x))(\text{me})]$
FA: $\lambda Q\lambda x[(Q(x))(\text{me})](\lambda P[P(\text{lo})]) \rightarrow \lambda x[(\lambda P[P(\text{lo})](x))(\text{me})] \rightarrow \lambda P[(P(\text{lo}))(\text{me})]$

Next, as shown in (53) below, this clitic cluster combines with the verb *permite* by FA after D changes the category assigned to each expression and the variables α, Z, and W take specified values. This step is exactly the same as for forming *lo=quiere* seen in (45) above.

53 a. *me=lo* 'me it' = *permite* 'permits'

$(NP_{Sub[\alpha]}\backslash S)/(((NP_{Sub[\alpha]}\backslash S)/\text{a } NP_{IO})/NP_{DO})$ $\quad$ $((NP_{Sub[3/sg]}\backslash S)/\text{a } NP_{IO})/(NP_{Sub}\backslash S_{inf})$

-- D_2 --- D_1

$((NP_{Sub[\alpha]}\backslash S)/W)/((((NP_{Sub[\alpha]}\backslash S)/\text{a } NP_{IO})/NP_{DO})/W)$ $\quad$ $(((NP_{Sub[3/sg]}\backslash S)/\text{a } NP_{IO})/Z)/((NP_{Sub}\backslash S_{inf})/Z)$

-->FA (α=3/sg,

$((NP_{Sub[3/sg]}\backslash S)/((NP_{Sub}\backslash S_{inf})/NP_{DO})$ $\quad$ $Z=NP_{DO}, W=(NP_{Sub}\backslash S_{inf})/NP_{DO})$

b. D_1: $\lambda P\lambda x\lambda y[\text{permite}'(P\ (\text{ana}'\ x))\ (x)\ (y)] \rightarrow \lambda Q\lambda z\lambda x\lambda y[\text{permite}\ ((Q(z)(\text{ana}'x))(x)(y)]$
D_2: $\lambda P[(P(\text{lo}))(\text{me})] \rightarrow \lambda R\lambda S\ [((R(S))(\text{lo}))(\text{me})]$
>FA: $\lambda R\lambda S\ [((R(S))\ (\text{lo}))(\text{me})](\lambda Q\lambda z\lambda x\lambda y[\text{permite}\ ((Q(z)(\text{ana}'x))(x)(y)])$
$\rightarrow \lambda S\ [((\lambda Q\lambda z\lambda x\lambda y[\text{permite}\ ((Q(z)\ (\text{ana}'x))(x)(y)]\ (S))(\text{lo}))(\text{me})]$
$\rightarrow \lambda S\ [(\lambda z\lambda x\lambda y[\text{permite}\ ((S(z)\ (\text{ana}'x))(x)(y)](\text{lo}))(\text{me})]$
$\rightarrow \lambda S\ [\lambda x\lambda y[\text{permite}\ ((S(lo)\ (\text{ana}'x))(x)(y)](\text{me})]$
$\rightarrow \lambda S\ \lambda y[\text{permite}\ ((S(lo)\ (\text{ana}'x))(\text{me})(y)]$

Subsequently, the embedded verb and then the subject NP get incorporated into the string, as shown in (54), both by FA, yielding the string (4b).

54 a. *José 'Joe'* $\quad$ *me=lo=permite* 'me.it.permits' $\quad$ *leer 'to read'*

$NP_{Sub[3sg]}$ $\quad$ $((NP_{Sub[3sg]}\backslash S)/((NP_{Sub}\backslash S_{inf})/NP_{DO})$ $\quad$ $(NP_{Sub}\backslash S_{inf})/NP_{DO}$

--->FA

$NP_{Sub[3sg]}\backslash S$

---<FA

S

b. >FA: $\lambda S\lambda y[\text{permite}\ ((S(\text{lo}))\ (\text{ana}'\text{me}))\ (\text{me})(y)](\lambda x\lambda z[\text{leer}'(x)(z)])$
$\rightarrow \lambda y[\text{permite}\ ((\lambda x\lambda z[\text{leer}'(x)(z)](\text{lo}))\ (\text{ana}'\text{me}))(\text{me})(y)]$
$\rightarrow \lambda y[\text{permite}\ (\lambda z[(\text{leer}'(\text{lo})(z)]\ (\text{ana}'\text{me}))(\text{me})(y)]$
$\rightarrow \lambda y[\text{permite}\ (\text{leer}'(\text{lo})(\text{ana}'\ \text{me}))(\text{me})\ (y)]$
>FA: $\lambda y[\text{permite}\ (\text{leer}'(\text{lo})(\text{ana}'\ \text{me}))(\text{me})\ (y)](\text{jose}')$
$\rightarrow$ permite (leer'(lo)(ana'me)) (me) (jose')

Note that, although the two clitics were combined with the matrix verb at the same time, each one of them is interpreted as a complement of the verb to which it is linked.

In order to incorporate the new data, we revise the two lexical rules proposed for RS verbs and clitics, as in (55) and (56), respectively.

55. Type-changing Rule (D) for RS verbs in Spanish (Revisited):

$[V]_{((NPsub\backslash S[\pm fin])/\$)/(NPsub\backslash S[-fin])} \rightarrow [V]_{((NPsub\backslash S[\pm fin])/\$)/Z)/((NPsub\backslash S[-fin])/Z)}$

where a) V={*querer, tratar*, *permitir*, *enseñar*,…};
b) \$=Ø or a NP_{IO};
c) $Z=NP_{DO}$, *a* NP_{IO}, or (NP_{DO}•*a* NP_{IO}) if \$=Ø; otherwise Z= NP_{DO}.

56. Type-changing Rule (D or D') for CLs (Revisited):

$[CL]_{X|Y} \rightarrow [CL]_{(X/Z)|(Y/Z)}$ where CL can be a single clitic or a cluster of clitics.

3.2 Comparisons

3.2.1 CG Analysis vs. Minimalist Analysis. Our CG analysis of Romance RS/CC has one additional advantage beyond its ability to handle RS/CC strings with object control verbs without a special mechanism. Since it allows the clitic to combine directly with the RS verb, it offers a straightforward account of the coordinate structure involving RS/CC, as shown in (57).

57. José [***lo*** puede y ***lo*** debe] leer. 'Joe can and must read it'
Joe [it can and it must] read

(57) is constructed first by forming each of the coordinated strings by combining the clitic and the RS verb. (58) shows the derivation of *lo=puede*.[23]

58 a. *lo* 'it' = *puede* 'can-3sg'

$((NP_{Sub[\alpha]}\backslash S)/\&)/(((NP_{Sub[\alpha]}\backslash S)/\&)/NP_{DO})$ $\quad$ $((NP_{sub[3sg]}\backslash S)/(NP_{sub}\backslash S_{inf}))$

---D_2 $\quad$ --D_1

$(((NP_{Sub[\alpha]}\backslash S)/\&)/W)/((((NP_{Sub[\alpha]}\backslash S)/\&)/NP_{DO})/W)$ $\quad$ $(((NP_{sub[3sg]}\backslash S)/Z)/(((NP_{sub}\backslash S_{inf})/Z))$

---FA_1 (α=3sg, &=Ø, Z= NP_{DO}, W=$(NP_{sub}\backslash S_{inf})/NP_{DO}$)

$(NP_{Sub[3sg]}\backslash S)/((NP_{sub}\backslash S_{inf})/NP_{DO})$

b. D_1: $\lambda P\lambda x[\text{puede'}(P(x))] \rightarrow \lambda Q\lambda r\lambda x[\text{puede'}((Q(r))(x))]$

D_2: $\lambda P[P(\text{lo})] \rightarrow \lambda R\lambda y\,[(R(y))(\text{lo})]$

$>$FA: $\lambda R\lambda S[(R(S))(\text{lo})](\lambda Q\lambda r\lambda x[\text{puede'}((Q(r))(x))])$

$\rightarrow \lambda S[(\lambda Q\lambda r\lambda x[\text{puede'}((Q(r))(x))]\,(S))(\text{lo})]$

$\rightarrow \lambda S[\lambda r\lambda x[\text{puede'}(S(r))(x))](\text{lo})] \rightarrow \lambda S\lambda x[\text{puede'}(S(lo))(x))]$

The other coordinated string *lo=debe* 'it.must' is formed similarly, resulting in an expression of CAT $(NP_{Sub[3sg]}\backslash S)/((NP_{sub}\backslash S_{inf})/NP_{DO})$ of the thematic representation, $\lambda P\lambda x[\text{debe'}((P(\text{lo}))(x))]$. Next, using the coordination rule proposed by Steedman (2000), as shown in (59), the two strings are coordinated, as shown in (60).

59. Coordination ($<\Phi^n>$) (Steedman 2000: 39)

X: g *CONJ*: b X: f => Φ^n X: $\lambda\ldots b(f\ldots)(g\ldots)$

60 a. *lo=puede* *y* 'and' *lo=debe*

$(NP_{Sub[3sg]}\backslash S)/((NP_{sub}\backslash S_{inf})/NP_{DO})$ $\quad$ *CONJ* $\quad$ $(NP_{Sub[3sg]}\backslash S)/((NP_{sub}\backslash S_{inf})/NP_{DO})$

--$<\Phi^n>$

$(NP_{Sub[3sg]}\backslash S)/((NP_{sub}\backslash S_{inf})/NP_{DO})$

b. $<\Phi^n>$: $\lambda S\lambda x[\text{puede'}(S(lo))(x))]$ and' $\lambda S\lambda x[\text{debe'}(S(lo))(x))]$

$\rightarrow \lambda S\lambda x\,[\text{and'}(\text{puede'}((S(\text{lo}))(x)))\,(\text{debe'}((S(\text{lo}))(x)))]$

---

[23] Note that the modal verb *puede* 'can-3sg' is assigned to the same syntactic category, $(NP_{sub[3sg]}\backslash S)/(NP_{sub}\backslash S_{inf})$, as the subject control verb *quiere* 'wants'; however, its thematic representation. $\lambda P\lambda x[\text{puede'}(P(x))]$, is different in that it does not take the subject argument of its own. Here we do not worry about the semantics of the modal.

Finally, the embedded verb and then the subject are incorporated into the string, as follows.

61 a. *José* 'Joe' — *lo=puede y lo=debe* — *leer* 'to read'

$NP_{Sub[3sg]}$ — $(NP_{Sub[3sg]}\backslash S)/((NP_{sub}\backslash S_{inf})/NP_{DO})$ — $(NP_{sub}\backslash S_{inf})/NP_{DO}$

---> FA

$NP_{Sub[3sg]}\backslash S$

--< FA

S

b. >FA: $\lambda S\lambda x$[and'(puede'((S(lo))(x))) (debe'((S(lo))(x)))]($\lambda z\lambda y$[(leer'(z)(y)])

→ λx[and' (puede'(($\lambda z\lambda y$[leer'(z)(y)](lo))(x)))(debe'((λxλy[leer'(x)(y)] (lo))(x)))]

→ λx[and' (puede'(λy[leer'(lo) (y)](x)))(debe'(λy[leer'(lo) (y)](x)))]

→ λx[and' (puede' (leer' (lo)(x))) (debe' (leer'(lo)(x))]

<FA: λx[and' (puede' (leer' (lo) (x)) (debe (leer'(lo)(x))](jose')

→ and'(puede'(leer'(lo)(jose'))(debe'(leer'(lo)(jose'))

Note that in Cinque's analyses, on the other hand, there is no straightforward way to derive coordinated RS strings like (57). Since he postulates that the clitic in the RS construction must come from the embedded verb, it is not clear how two instances of the clitic *lo* can be produced by movement from one source, i.e., *leer*. For all other mono-clausal analyses mentioned above, coordinated RS strings like (57a) are equally problematic.

3.2.2 Alternative CG Analyses. There are a couple of possible alternative CG analyses of RS/CC. In the first alternative, the string (1b), for instance, is constructed, as follows.

62 a. José 'Joe' — *lo* 'it' — quiere 'wants' — leer 'to.read'

$NP_{sub[3sg]}$ — $((NP_{Sub[\alpha]}\backslash S)/\&)/(((NP_{Sub[\alpha]}\backslash S)/\&)/NP_{DO})$ — $(NP_{sub[3sg]}\backslash S)/(NP_{sub}\backslash S_{inf})$ — $(NP_{sub}\backslash S_{inf})/NP_{DO}$

-->FC

$(NP_{sub[3sg]}\backslash S)/NP_{DO}$

-->FA (α=3sg, &=Ø)

$(NP_{sub[3sg]}\backslash S)$

--<FA

S

b. >FC: λx[$\lambda P\lambda z$[quiere'(P)(z)](leer'(x)(ana' z)] → $\lambda x\lambda z$[quiere'(leer'(x)(ana' z))(z)]

>FA:λQ[Q(lo)]($\lambda x\lambda$z[quiere'(leer'(x)(ana'z))(z)])→ $\lambda x\lambda$z[quiere'(leer'(x)(ana' z))(z)](lo)

→ λz[quiere(leer'(lo)(ana' z))(z)]

<FA: λz[quiere(leer'(lo)(ana' z))(z)](jose') →quiere'(leer'(lo)(ana' jose'))(jose')

In this alternative, the two verbs are first combined by FC to form a complex verb. Subsequently, the clitic and then the subject NP are incorporated into the string, both by FA. The thematic interpretation agrees with that derived as in (45)-(46).

The above alternative analysis, however, runs into several difficulties. First, if allowed in the system as a combinatory rule, FC would freely overgenerate ill-formed strings like (7b), where a non-RS verb appears in an RS/CC context. In order to block strings like (7b), FC would have to be restricted from applying in certain cases. It seems more desirable to restrict the lexically-governed process by a type-changing rule, as Moortgat claims.[24]

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[24] Moortgat (1988), following Hoeksema's criticism, analyzes Dutch verb clusters through a lexical rule based on Division.

Second, the analysis by FC would require a special mechanism to handle the affixation of the clitic to its host verb since, in this analysis, the clitic combines with a complex verb and not directly with the RS verb. When the RS verb is finite, the clitic can just affix to the verb on the right. However, when the RS verb is non-finite, the clitic must be placed to the right of the RS verb, as in [*empezar**lo** a leer*] 'to begin reading it' (See10b); thus, a concatenative combinatory operation like FA does not suffice.[25] Moreover, because the clitic does not directly combine with the RS verb, the coordinated structure like (57) cannot be accounted for.

Recently Hoyt and Baldridge (2008) use what they call "D-rules" based on the D-combinator (Curry and Faye 1958), as formulated in (63), to account for various types of cross-conjunct extraction phenomena and use this rule to process strings like (57) seen above.

63. $x/(y/z){:}\ f \quad y/w{:}\ g \rightarrow x/(w/z){:}\ \lambda h.f(\lambda x.ghx)$

Note that this combinatory rule has the same effect as Division (applied to the second functor CAT) plus FC; thus, it is able to combine a CL directly with an RS verb. However, this rule, because it is a combinatory rule, cannot be blocked from generating ill-formed strings like (7b) seen above or (64) below, where a clitic is combined with a non-RS verb.

64 * Juan ***lo*** quería y ***lo*** esperaba leer.
John it wanted-3sg and it hoped-3sg to read

In sum, from an empirical point of view, the analysis that uses the lexically-governed Division is the best CG alternative for analyzing Romance RS and CC.

3.4 A Remaining Issue

Before we close this section, we address one remaining issue. which deals with ill-formed strings like (65b) and (c), where only one of the two clitics linked to the embedded verb has climbed.

65 a. José quiere mandár***melo***. 'Joe can send it to me'
Joe can-3sg send.CL-dat.1sg.CL-acc.1sg
b. * José ***me*** quiere mandar***lo***.
c. * José ***lo*** quiere mandar***me***.

Our CG analysis would derive both strings, as illustrated below, using (65b).

66. **José* *me=quiere* 'me.wants' *mandar=lo* 'to send.it'
$NP_{sub[3sg]}$ $((NP_{sub[3sg]}\backslash S)/(NP_{sub}\backslash Sinf)/a\ NP_{IO}$ $(NP_{sub}\backslash S_{inf})/a\ NP_{IO}$
--->FA
$(NP_{sub[3sg]}\backslash S)$
---<FA
S

[25] Non-concatenative operations like "wrapping" (Bach 1984) and "infixation" (Moortgat 1988) have been proposed in categorical grammar literature. However, these operations have not received much support because they tend to complicate the system.

In this derivation, *me=quiere* should be blocked from taking *mandar=lo* as its argument, although the two expressions are categorically compatible. In the RS/CC construction each one of the verbs forming the complex verb has to be a lexical verb. In terms of our analysis, the argument of the complex expression comprising a CL and an RS verb must be a lexical verb, either single or complex. In order to assure that this constraint is met, we can revise the type-changing rule for RS verbs, as follows, requiring the domain of the derived functor CAT to be lexical.[26]

55'. Type-changing Rule (D) for RS verbs in Spanish (final):

$$[V]_{((NPsub\backslash S[\pm fin])/\$)/(NPsub\backslash S[-fin])} \rightarrow [V]_{((NPsub\backslash S[\pm fin])/\$)/Z)/_{\boldsymbol{LEX}}((NPsub\backslash S[-fin])/Z)}$$

The specification *LEX* gets inherited as the clitic combines with the RS verb, as shown in (67). Any expression that might combine with this complex expression, *me=quiere*, must be a lexical verb; thus, (65b) is ruled out.

67. *me* 'me' — $((NP_{Sub[\alpha]}\backslash S)/\$)/(((NP_{Sub[\alpha]}\backslash S)/NP_{IO})/\$)$; *quiere* 'wants' — $(NP_{Sub[3sg]}\backslash S)/(NP_{Sub}\backslash S_{inf})$

---D2 ; ---D1

$(((NP_{Sub[\alpha]}\backslash S)/\$)/W)/((((NP_{Sub[\alpha]}\backslash S)/NP_{DO})/\$)W)$; $(((NP_{Sub[3sg]}\backslash S)/Z)/_{LEX}((NP_{Sub}\backslash S_{inf})/Z)$

-->FA (&=Ø, Z=NP_{DO}, α=[3sg], W=$_{LEX}(NP_{Sub}\backslash S_{inf})/NP_{DO}$)

$(NP_{Sub[3sg]}\backslash S)/_{\boldsymbol{LEX}}((NP_{Sub[3/sg]}\backslash S_{inf})/NP_{DO})$

4. Conclusion

In this paper we have proposed an analysis of restructuring and clitic climbing in Spanish using the generalized categorical grammar based on Lambek Calculus, as explored in Moortgat (ibid.), which critically includes the type-changing rule, Division. We have shown that this rule, as it applies to the RS verbs and the clitics, expands their syntactic combinatorial properties, enabling them to form complex expressions that are not standard constituents while preserving their basic thematic properties. Due to this greater generative capacity, the flexible CG adopted in this paper is able to explain the relevant data without recourse to movement or any special stipulations on phrase structures. Moreover, it provides a straightforward account of certain data for which phase structure grammars have no simple solution. They include RS/CC strings with an object control verb and the coordination of two conjuncts comprising a CL and and RS verb.

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[26] The idea of the specification *LEX* comes from Steedman and Baldridge (to appear).

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