Symmetric object languages and the analysis of objects in LFG

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Proceedings of the LFG'23 Conference

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2023

PubliKon

lfg-proceedings.org

Abstract

Lexical-Functional Grammar (LFG) assumes that each object in a clause can be assigned to a distinct grammatical function, receiving a distinct syntactic representation. When this framework is applied to highly object symmetric languages like the Kordofanian language Moro, this results in a difference in syntactic representation without any corresponding difference in syntactic behaviour. In this paper, I build on previous work on objecthood and object symmetry in LFG to present a new proposal that develops the notion of a set-valued OBJ function as a solution to the problem of symmetric object languages in LFG. This proposal demonstrates the fundamental role that thematic roles and semantic properties play in the properties of objects, resulting in an analysis that takes full advantage of the modularity of the Parallel Projection Architecture to provide an empirically adequate and less redundant analysis of object properties across languages.

1 Introduction

Most formal approaches to generative syntax, including Lexical-Functional Grammar (LFG), assume *asymmetrical encoding* of objects – different objects within the same clause receive different syntactic representations (Ackerman et al. 2017).[†] In the case of LFG, this asymmetry is captured by the distinctions among the unrestricted OBJ and various thematically restricted OBJ_θ functions. This assumption of asymmetry poses a problem for the analysis of symmetric object languages, in which multiple objects in a given clause exhibit identical syntactic properties.

In this paper, I argue that previous LFG approaches to symmetric object languages are unsatisfactory in the case of languages like the Kordofanian language Moro, as these approaches entail a difference in syntactic representation without any corresponding difference in syntactic behaviour. I therefore propose a new analysis, drawing on proposals by Patejuk & Przepiórkowski (2016) to replace the OBJ and OBJ_θ functions with a single, set-valued OBJ function. The bulk of this proposal is concerned with how such a set-valued OBJ function can be incorporated into the mapping theory, following the template approach to lexical mapping proposed by Findlay (2020). The goal of this proposal is to provide a minimal modification to existing LFG analyses that can satisfactorily account for highly object symmetric languages. In so doing, this proposal supports prior work on avoiding redundancies that arise from representing semantic properties at the level of syntax (e.g., Findlay 2016; Asudeh & Giorgolo 2012; Patejuk & Przepiórkowski 2016), as well as providing one formal solution to concerns that Börjars & Vincent (2008) raise regarding the OBJ/OBJ_θ distinction.

[†]I would like to thank my supervisor, Louise Mycock, for supporting me through this project, as well as Jamie Findlay, John Lowe, Miriam Butt, Ash Asudeh, the attendants of the SE-LFG31 meeting and LFG23 conference, and several anonymous reviewers for their helpful recommendations. Any errors that remain are entirely my own. I would also like to thank my partner, Lara Scheibli – without her, none of this would be possible.

In §2, I discuss object symmetry and the representation of objects in LFG. §3 summarises data reported in Ackerman et al. (2017) regarding the Kordofanian language Moro, a key case study of object symmetry. §4 discusses previous LFG proposals, with a focus on Bresnan & Moshi (1990). §5 details the current proposal. §6 discusses some merits and limitations of this proposal. §7 revisits the theoretical question of (a)symmetry in light of this proposal. I conclude in §8.

2 Object symmetry

For the purposes of this paper, I define objects as internal core arguments of a predicate; i.e prototypical arguments (in contrast to obliques) which are relatively restricted to the domain of the predicate (in contrast to 'external' arguments).

Symmetric object languages (also referred to as '(fully) neutral alignment' of objects, see e.g., Haspelmath 2008) are a class of languages in which all objects in both monotransitive and higher transitivity clauses exhibit the same syntactic properties (Dryer 1986; Haspelmath 2008). These languages pose something of a puzzle for LFG. Under a traditional LFG analysis, an object is any constituent whose f-projection is the value of an OBJ or OBJ_θ grammatical function (GF) at f-structure, where OBJ refers to the thematically unrestricted object function and OBJ_θ refers to any member of the set of thematically restricted object functions $\{\text{OBJ}_{\text{THEME}}, \text{OBJ}_{\text{RECIPIENT}}, \text{OBJ}_{\text{GL}}, \ldots\}$. The Consistency wellformedness condition on f-structures guarantees that each OBJ/OBJ_θ function(s) take single f-structures as their values (Kaplan & Bresnan 1982); this constraint is supplemented by Function-Argument Biuniqueness in the mapping theory, which requires that the mapping between GFs and thematic roles is 1:1 (Bresnan 1982; Bresnan & Kanerva 1989). These two constraints together (assuming singleton GFs, *contra* the proposals in this paper) guarantee *asymmetric encoding*: different objects in a clause are assigned distinct syntactic representations, implying distinct syntactic properties. Symmetric object languages appear to contradict these assumptions.

Following Bresnan & Moshi (1990), the typological differences between symmetric and asymmetric languages have been characterised in LFG by the setting of the Asymmetrical Object Parameter (AOP). The AOP is a parametrisation of a universal proposed earlier by Alsina & Mchombo (1989),[1] and is expressed as a constraint on the intrinsic classifications of arguments under Lexical Mapping Theory (LMT; see Bresnan & Kanerva 1989; Bresnan & Zaenen 1990; Zaenen 1993; Kibort 2004, 2007; Bresnan et al. 2016; *inter alia*).

ASYMMETRICAL OBJECT PARAMETER (AOP): $$* \begin{array}{ccc} \theta & \ldots & \theta \\ | & & | \\ [-r] & & [-r] \end{array}$$

The AOP states that a single predicate cannot subcategorise for two non-highest thematic role arguments with a $[-r]$ specification. $[-r]$ here refers to the mapping

[1]The universal constraint can still be seen in some recent proposals, such as Kibort (2014).

features of LMT. Each argument is assigned (some combination of): $[\pm r]$, where r stands for *thematically restricted*, i.e. whether or not the argument is restricted in the thematic roles it may represent; and $[\pm o]$, where o stands for *object*, i.e. whether or not the argument can be realised as an object. These mapping features are used to assign each argument of the predicate to a single GF at f-structure; for example, OBL_θ is defined as $[+r, -o]$ and so only arguments which satisfy these mapping features can be assigned to OBL_θ. Arguments receive their mapping features from three main sources: *intrinsic assignments* associated with particular thematic roles (e.g., themes are assigned either $[-r]$ or $[+o]$ intrinsically), specific morpholexical operations, and the *default assignment*, which monotonically assigns $[-r]$ to the 'highest' thematic role and $[+r]$ to other thematic roles.

Bresnan & Moshi (1990) argue that the typological difference between asymmetric and symmetric object languages is the presence or absence (respectively) of the AOP. In the case of symmetric object languages, the AOP is absent, and as such multiple objects of a predicate may receive $[-r]$, resulting in a symmetric application of morpholexical operations such as the passive. Note, however, that under this approach each object is assigned a distinct GF, and thus the approach maintains an asymmetric assignment of GFs in symmetric object languages. I will return to a more detailed discussion of Bresnan & Moshi's (1990) proposals in §4.

3 Moro: A case study in object symmetry

Moro (Mor. *Dhimorong*) is a Kordofanian language spoken in the Nuba Mountains region of southern Sudan. Ackerman et al. (2017) argue that Moro is a symmetric object language.

Moro has underived and derived (applicative and causative) ditransitive clauses. Moro ditransitive objects exhibit symmetric syntactic behaviour in a range of core object properties. Firstly, either object in a Moro ditransitive clause may be the subject of a passive alternative (1a)-(1b), with no indication in the literature of any preference for one object over another to be realised as the subject of the passive, and either object may be realised as an object marker on the verb (1c). These properties may be combined, with a single ditransitive clause including multiple object markers, or one object realised as the subject of a passive alternation and the other as an object marker on the verb (1d). Examples (1a)-(1b) are constructed on the basis of examples 8, 10 and 18 in Ackerman et al. (2017: 10-13).

(1) a. *óráŋ* *g-ʌ-nʌtʃ-***ən***-ú* *ŋerá*
CLg.man CLg.SM-MAIN-give-**PASS**-PFV CLŋ.girl
'The man$_{\text{RECIPIENT}}$ was given a girl$_{\text{THEME}}$.' /
'The man$_{\text{THEME}}$ was given to a girl$_{\text{RECIPIENT}}$.'

b. *ŋerá* *ŋ-ʌ-nʌtʃ-***ən***-ú* *óráŋ*
CLŋ.girl CLŋ.SM-MAIN-give-**PASS**-PFV CLg.man
'The girl$_{\text{RECIPIENT}}$ was given a man$_{\text{THEME}}$.' /
'The girl$_{\text{THEME}}$ was given to a man$_{\text{RECIPIENT}}$.'

c. *é-g-a-natʃ-é-**lo*** *ŋerá*
1SG.SM-CLg-MAIN-give-PFV-**3PL.OM** CLŋ.girl
'I gave them$_{\text{RECIPIENT}}$ the girl$_{\text{THEME}}$.' /
'I gave them$_{\text{THEME}}$ to the girl$_{\text{RECIPIENT}}$.'

d. *óráŋ* *g-ʌ-nʌtʃ-**ən**-ə́-**ŋó***
CLg.man CLg.SM-MAIN-give-**PASS**-PFV-**3SG.OM**
'The man$_{\text{THEME}}$ was given to her$_{\text{RECIPIENT}}$.' /
'She$_{\text{THEME}}$ was given to the man$_{\text{RECIPIENT}}$.'
(cf. Ackerman et al. 2017: 10-11)

Secondly, the mapping from syntactic arguments to thematic roles is ambiguous in both morphology and syntax: both objects are assigned accusative case,[2] and, if the Theme object is animate, either object may come in either order, with ambiguous thematic role assignment in either case, as shown in (2).

(2) *é-g-a-natʃ-ó* *ŋállo-**ŋ*** *kóʤa-**ŋ***
1SG.SM-CLg-MAIN-give-PFV CLg.Ngallo-**ACC** CLg.Kodja-**ACC**
'I gave Ngallo$_{\text{THEME}}$ to Kodja$_{\text{RECIPIENT}}$.' /
'I gave Kodja$_{\text{THEME}}$ to Ngallo$_{\text{RECIPIENT}}$.'
(Ackerman et al. 2017: 10)

The applicative and causative alternations in Moro may also be applied to underived ditransitive verbs. These tritransitive clauses exhibit the same object symmetries as ditransitive clauses: all three objects are marked for accusative case and can ambiguously carry any appropriate thematic roles; all three objects can be the subject of a passive alternative; all three objects can be realised as object markers; and these object properties may be combined. For tritransitive and further examples, see Ackerman & Moore (2011); Ackerman et al. (2017).

Ackerman et al. identify two areas in which Moro objects exhibit non-symmetric properties. Firstly, a non-Theme argument preferentially follows the verb. This preference becomes a constraint if the Theme is inanimate: inanimate objects in immediately post-verbal position cannot be interpreted as themes (3).

(3) a. *é-g-a-natʃ-ó* *óráŋ* *áḏámá*
1SG.SM-CLg-MAIN-give-PFV CLg.man CLg.book
'I gave the book$_{\text{THEME}}$ to the man$_{\text{RECIPIENT}}$.'

b. **é-g-a-natʃ-ó* *áḏámá* *óráŋ*
1SG.SM-CLg-MAIN-give-PFV CLg.book CLg.man
(Ackerman et al. 2017: 41)

[2] The accusative suffix -**ŋ** surfaces only on proper nouns, and it occurs on objects of mono-, di- and tritransitive clauses, including objects introduced by the applicative or causative. In addition, Moro has a locative prefix **i**- and an instrumental suffix which reduplicates the noun-class prefix. Arguments bearing locative or instrumental case marking exhibit all other primary object properties, including being realised as the subject of a passive alternative or as an object marker on the verb, although in such cases it must co-occur with a corresponding locative or instrumental verbal inflection. For further discussion, see Ackerman & Moore (2011).

However, this does not seem to be a constraint on the assignment of GFs. The violability of this word order preference in cases with animate themes (and resultant ambiguities) suggests that what is at stake here is a semantic preference, which has been grammaticalised in cases with inanimate themes (Ackerman et al. 2017: 42).

The second apparent asymmetry discussed by Ackerman et al. concerns bound anaphora: a bound anaphor can only be bound by a co-argument that linearly precedes it (Ackerman et al. 2017: 43-44). Binding patterns such as this can be accounted for by binding principles based on linear order, without the need to presuppose structural asymmetries (Ackerman et al. 2017: 44, and references therein to Arka & Wechsler 1996; Bresnan 1995, 2001; for a detailed discussion of binding in LFG, see Dalrymple 1993, 2001), and so I omit further discussion of this case.

These data pose two problems for a traditional LFG analysis. Firstly, a labelling problem: each object must be assigned some label, and Consistency requires that these labels are distinct, yet the only distinct object GF labels available in LFG imply that one object (OBJ) differs in both syntactic prominence and thematic restriction from all other objects, and there is no evidence to justify such a distinction in Moro. Secondly, a symmetry problem: even with satisfactory labels, there is no non-arbitrary way in which those labels can be assigned, because all objects in a Moro clause exhibit the same syntactic properties, and thus it becomes unclear what is meant by assigning each object a distinct syntactic representation.

We may try various ways to resolve these problems without departing from traditional LFG analyses. We could, for example, utilise a zero restricted OBJ_θ, i.e. an OBJ_θ function in which θ is the set of all thematic roles,[3] to resolve the labelling problem in the ditransitive; or we could treat all objects of a Moro clause as OBJ_θ functions, assigned according to their thematic roles for a given interpretation of the clause. However, the former proposal only solves the labelling problem in the ditransitive, while the tritransitive case still requires assigning one of the objects a higher degree of thematic restriction; and neither proposal can solve the symmetry problem, as only OBJ is compatible with appearing as passive SUBJ.

Alternatively, we could appeal to some kind of alternation, where the object that can passivise is interpreted as OBJ and the other object(s) are interpreted as OBJ_θ, along the lines of previous LFG treatments of the dative alternation (see e.g., Dalrymple et al. 2019; Kibort 2008; Allen 2001; Her 1999; Bresnan et al. 2007; Ford & Bresnan 2013; Kendall et al. 2011, *inter alia*).[4] Such an approach resolves the labelling problem, but struggles to account for the symmetry problem: an alternation would imply multiple distinct syntactic structures in the active, one for each possible object that could be assigned OBJ; if this were the case, we should expect to see some independent (morpho)syntactic evidence of these distinct structures in the active, but this is not what we see in the Moro data.

Thus, there does not seem to be any non-arbitrary way to analyse the Moro data under a traditional LFG analysis, in which each object is assigned a distinct GF.

[3]My thanks to Ash Asudeh for raising this possibility.
[4]My thanks to Miriam Butt for raising this possibility.

4 Symmetric objects in LFG

The seminal work on LFG approaches to symmetric object languages is Bresnan and Moshi's (1990) treatment of applicative constructions in the Bantu language Kichaga. The focus of this account is typological, giving particular attention to the contrasts between symmetric and asymmetric object languages.

Kichaga applicatives exhibit many of the same symmetric object properties as Moro (see §3), including symmetric passivisation and object marking.[5] In addition to these symmetric properties, however, Bresnan and Moshi identify two key cases of object asymmetry in Kichaga: word order and extraction. Firstly, with respect to word order, the patient argument may be adjacent to the verb unless the applied object instantiates one of the 'indirect object' thematic roles of beneficiary, maleficiary, or recipient (see Bresnan & Moshi 1990: 157-158 for examples). Unlike in the case of Moro word order outlined in §3, animacy is not a relevant factor in this word order constraint: the same strict constraint applies across both animate and inanimate objects. Secondly, with respect to extraction, Kichaga exhibits a restriction against long-distance extractions of beneficiary/maleficiary and recipient objects, but *only* these objects – patients and applied instrumentals or locatives do not exhibit the same constraint (see Bresnan & Moshi 1990: 158-159).

The authors are explicit that these should be considered asymmetries – the data are raised as evidence against accounts which would collapse the object-indirect object distinction (Bresnan & Moshi 1990: 157-159). It should also be noted that the asymmetries observed in Kichaga may be characterised exclusively in terms of thematic roles. We shall return to this point in §5.

Bresnan and Moshi's analysis of Kichaga preserves asymmetric syntactic representation among the objects in Kichaga applicative ditransitive clauses: the applied object is assigned to OBJ, while the patient is assigned to $\text{OBJ}_{\text{PATIENT}}$. The symmetric properties of Kichaga objects are then represented as the product of the interaction of the mapping theory, rules governing morpholexical operations, and the setting of the Asymmetrical Object Parameter (Bresnan & Moshi 1990: 171-172), already introduced in §2. The final detail of Bresnan and Moshi's analysis which I will briefly mention here also comes from Alsina & Mchombo (1989): that theme/patient and applied arguments may be specified for $[-r]$ or $[+o]$, except for beneficiary, maleficiary and recipient applied arguments, which may only be specified for $[-r]$ (Bresnan & Moshi 1990; Alsina & Mchombo 1989).

Due to limitations of space, it is not possible to summarise the full formal details of Bresnan and Moshi's treatment, although beyond this point the bulk of Bresnan and Moshi's analysis follows fairly standard LMT assumptions regarding the mapping principle, syntactic defaults, intrinsic assignments, and the mapping from mapping theory specifications to grammatical functions (Bresnan & Moshi 1990: 166-171; compare Bresnan & Kanerva 1989; Bresnan et al. 2016; Dalrymple

[5]Bresnan and Moshi identify two further properties of object symmetry in Kichaga – reciprocalisation and unspecified object deletion. As neither of these properties appear in the Moro data, I omit these from the present discussion.

et al. 2019: Chapter 9). It will suffice to give a single example: symmetric and asymmetric passivisation in Kichaga and Chicheŵa.

Bresnan and Moshi assume a suppression model of the passive. This is in contrast to map-to-oblique or map-to-zero proposals such as Kibort (2007, 2001, 2004, 2012), in which the active subject is demoted to an oblique or zero realisation, for example by the addition of lexical mapping features. The major difference between these approaches is that under Bresnan and Moshi's proposal an overt realisation of the active subject in the passive is an adjunct of the verb, while under Kibort's proposal it is an oblique argument. Following Findlay (2020), my proposal in §5.4 follows Kibort's approach. (For arguments in favour of the demotional model, see Kibort 2004; Dalrymple et al. 2019.)

As a worked example, let us begin with an abstract applicative verbal predicate 'eat-for', which subcategorises for an agent, a patient, and an applied beneficiary. The intrinsic assignments assumed by Bresnan and Moshi assign agent $[-o]$, beneficiary internal arguments $[-r]$, and patient arguments either $[-r]$ or $[+o]$. As Chicheŵa has the AOP, two non-highest thematic roles cannot both be $[-r]$, and so the patient is assigned $[+o]$. The Passive suppresses the agent, and the syntactic defaults assign $[-r]$ to the highest thematic role and $[+r]$ to all compatible non-highest thematic roles. Absent the agent, only the $[-r]$ beneficiary is compatible with SUBJ, hence only this argument can surface as the passive subject.

In Kichaga, the AOP is absent. As a result, the patient may also be assigned $[-r]$. Thus, either the beneficiary or the patient can surface as the passive subject, resulting in symmetric passivisation patterns, as schematised in figure 1. The wellformedness conditions (w.f.) guarantee a 1:1 mapping from arguments to GFs. Other symmetric properties of Kichaga are accounted for along similar lines.

	'eat-for' ⟨	AGENT	BENEFICIARY$_{APPL}$	PATIENT	⟩
		$[-o]$	$[-r]$	$[-r]$	
Passive:		∅			
defaults:					
			OBJ/SUBJ	OBJ/SUBJ	
w.f.			OBJ	SUBJ	*or*
			SUBJ	OBJ	

Figure 1: Analysis for Kichaga symmetric passivisation behaviour. Based on Bresnan & Moshi (1990: 173).

It should be noted that, as Bresnan and Moshi's analysis is concerned with the mapping theory, they do not present a formal specification of word order constraints. The key generalisation is that the beneficiary, maleficiary, and recipient objects preferentially appear adjacent to the verb. Bresnan and Moshi hold that these 'indirect object' roles are assigned unrestricted OBJ, and that OBJ preferentially appears adjacent to the verb. However, while Bresnan and Moshi's proposal can account for this constraint, the lack of a formal treatment will limit my discussion of word order constraints in Kichaga in §5.6.

An analysis along these lines, if applied to Moro, is likely to be empirically adequate. However, such an analysis falls afoul of the symmetry problem discussed in §3: in Kichaga, the assignment of distinct syntactic representations to the two objects of applicative clauses (OBJ vs. $\text{OBJ}_{\text{PATIENT}}$) is justified by asymmetric syntactic behaviours, namely word order and extraction; but no such asymmetries are evident in Moro. Thus, I develop an alternative proposal.

5 The current proposal

I aim to provide a thorough formal treatment of Patejuk and Przepiórkowski's (2016) set-valued OBJ proposal. This proposal seeks to provide a solution to the problems outlined in §3-§4 by treating all objects in a Moro clause as members of a single OBJ set. As they do not ultimately take up this proposal, Patejuk and Przepiórkowski do not provide an account for how such a proposal intersects with the wider LFG formalism, and in particular the mapping theory. Since symmetrical passivisation is a key property of symmetric object languages, this proposal cannot resolve the issues raised by symmetric object languages unless a treatment of this proposal's implication for the mapping theory is developed. The remainder of this section is concerned with providing such a treatment.

This proposal closely follows Findlay (2020) in its formal treatment of Mapping Theory, with necessary modifications to account for set-valued GFs and multiple arguments in a single predicate argument slot.

5.1 Grammatical functions

Börjars & Vincent (2008) argue that the OBJ/OBJ_θ distinction is theoretically dubious. Following Patejuk & Przepiórkowski (2016), if thematic roles are semantically specified then thematic θ-indices on GFs are redundant; thus, I propose collapsing the OBJ/OBJ_θ distinction in favour of OBJ, resulting in a single object GF. The point here is not to 'remove' thematic roles from GFs and then 'add them back in' in the semantics; rather, Patejuk and Przepiórkowski's claim is that we have independent reason to posit thematic roles in the semantics, and thus, including thematic roles as part of GF labels at f-structure as well is redundant (cf. work on the redundancy of thematic roles at a-structure, e.g., Alsina 1996; Findlay 2016; Kibort 2007).[6] I return to issues concerning thematic roles at s-structure in §5.2. If we omit the θ-index from the OBL function for consistency, this leaves us with a simple tripartite division of core GFs: SUBJ,[7] OBJ and OBL.[8] A similar tripartite division of GFs is

[6] My thanks to Miriam Butt for indicating the need to clarify this point.

[7] Or $\widehat{\text{GF}}$, if you prefer Falk's (2006) subjecthood analysis.

[8] Miriam Butt (p.c.) suggested that one could, following Zaenen & Crouch (2009), eliminate (at least semantically marked) OBL from the set of core GFs, resulting in what amounts to a Proto-Role analysis. I do not attempt to develop such a proposal here.

proposed on independent grounds by Alsina (1996).

Following Patejuk & Przepiórkowski (2016), I propose that OBJ and OBL are set-valued functions, similar to ADJ and DIS (for DIS, see Dalrymple et al. 2019). The choice of a set value here is not intended to imply unbounded membership, but merely syntactic equivalence. The value of OBJ is a set of f-structures of the internal core arguments of the predicate, while the value of OBL is the set of f-structures of the oblique arguments of the predicate. SUBJ remains a singleton function that takes an f-structure as its value; it is defined as the external (core) argument function.

Collapsing the OBJ/OBJ$_\theta$ distinction requires a revision of the mapping features associated with OBJ. In particular, OBJ is assumed to be specified for $[+o]$ but to be underspecified for $[\pm r]$. Following Findlay (2016, 2020), these features are expressed as disjunctions of grammatical functions, see (4).

(4) a. MINUSO $\equiv$ {SUBJ|OBL} c. MINUSR $\equiv$ {SUBJ|OBJ}
b. PLUSO $\equiv$ {OBJ} d. PLUSR $\equiv$ {OBJ|OBL}

5.2 Thematic roles and s-structures

Thematic roles present a particularly thorny challenge for the present proposal. On the one hand, a satisfactory list of thematic roles has never been given (Davis 2011; Dowty 1991) and so we may wish to avoid reifying a particular set of thematic role labels in our analysis (Jamie Findlay, p.c.).[9] On the other hand, it is quite clear from the data discussed in §3-4 that thematic roles, or something very like them, play a definite role in various syntactic constraints.

I balance these contradictory pressures by proposing a set of mnemonic labels which serve as a stand-in for some more theoretically rigorous labels future research may develop. These thematic role labels act as the attribute labels for arguments of a predicate at s-structure. For the formal examples in this paper, I opt to draw these labels from the set of commonly assumed thematic role labels; thus, a theme argument would project as the value of a THEME attribute at s-structure. The reader may substitute their preferred set of thematic role labels, so long as the labels of that set fulfil their required roles in the syntactic constraints characterised by the data in §3-4, and that set maintains Consistency at s-structure, i.e. it is a sufficiently granular set such that each argument of the predicate is assigned a distinct thematic role label.

I introduce the abbreviation ARG,[10] defined as the set of thematic role labels.

[9]Miriam Butt (p.c.) raised a related concern over the difficulty of providing a satisfying semantics for the AGENT and PATIENT/THEME thematic roles, and thus whether it is desirable to include these roles in s-structure representations. As agent and patient/theme already appear widely in predicate logic meaning expressions in both contemporary LFG work (e.g., Findlay 2016, 2020; Dalrymple et al. 2019; Asudeh & Giorgolo 2012; Asudeh et al. 2014, *inter alia*) and non-LFG neo-Davidsonian semantics (cf. Altshuler et al. 2019), I take this as a more general problem for the field, beyond the scope of the present paper to address.

[10]I use the symbol ARG to create appropriate parallels between ARG and Findlay's (2020) $\widehat{\text{ARG}}$, and to remain neutral as to the status of the labels in this set.

For previously stated reasons, I do not here propose an exact contents for this list. Provisionally and for the sake of providing definite examples in the present paper, I carry forward the list proposed by Bresnan & Kanerva (1989), except for the PATIENT role, which I collapse into THEME.

(5) ARG $\equiv$ {AGENT|EXPERIENCER|THEME|RECIPIENT|BENEFICIARY| INSTRUMENTAL|LOCATIVE}

Where distinct thematic roles regularly pattern together in their syntactic behaviour, further abbreviations may be introduced: I introduce GL, the set of GOAL-like thematic roles, which Bresnan & Moshi (1990) refer to as 'indirect object' roles.

(6) GL $\equiv$ {RECIPIENT|BENEFICIARY}

Lastly, I posit an additional s-structure feature, ARG-TYPE, which takes an atomic value from the set {arg1|arg2|arg3|arg4} as its value. This feature is used to store the intrinsic argument classification of the argument according to the Kibort-Findlay valency frame approach to mapping theory.

The formal resources used to refer to these s-structural properties in syntactic constraints will also be used to refer to other syntactically relevant s-structural features, such as animacy.

5.3 Referencing object properties

Representing objects (and obliques) as members of an OBJ (or OBL) set introduces functional uncertainty:[11] constraints which only reference a member of a set may reference any member of that set.

This uncertainty can be circumnavigated in two ways. In the first case, if the thematic role of the object is known, it is possible to refer to that object via its s-structure projection by means of the inverse function of σ, σ^{-1}. This s-structure could be specified in the template or introduced as an argument of it. To give a hypothetical example, a plausible template for third person object agreement could resemble (7), where *arg* is an s-structure.

(7) 3-OBJ-AGREEMENT(arg) :=
$((arg)_{\sigma^{-1}}\ \text{PERS}) =_c 3$

In the second case, if the constraint in question applies to any one object, local names, indicated by the % symbol, can be used to guarantee the same resolution for a functionally uncertain path in all uses within a local description. Continuing with the hypothetical example of third person object agreement, if we did not care which object was third person, but only required that at least one of them was, the template could be modified to use a local name, as in (8).

[11] My thanks to Miriam Butt for raising this problem.

(8) $\text{NEUTRAL-3-OBJ-AGREEMENT} :=$
$\%\text{obj3} = (\uparrow \text{OBJ} \in)$
$(\%\text{obj3 PERS}) =_c 3$

5.4 Mapping templates

My analysis follows a modified version of the Kibort-Findlay valency frame approach to mapping theory (Findlay 2016, 2020; Kibort 2007, 2008, 2014). According to this approach, intrinsic classifications arise from verbal subcategorisation, drawn from a universally available ordered set of argument positions. Each position is associated with a single LMT mapping feature $[\pm r, \pm o]$.[12]

Originally (as used in e.g., Kibort 2007, 2014; Findlay 2016, 2020), this approach assumed that each argument slot may be used a single time by an (underived) predicate, with the first three slots arg_{1-3} taking $[-o/-r]$, $[-r]$, and $[+o]$ respectively, while all remaining argument slots arg_{4-n} were specified $[-o]$. Some more recent versions (e.g., Kibort & Maling 2015; Findlay et al. forthcoming) recognise the need for multiple $[+o]$ slots, and thus generalise to allow iteration of arg_3 and arg_4 slots, eliminating the need for slots of $arg_{n>4}$. However, such proposals typically retain only a single arg_2 $[-r]$ slot. This poses a problem for our current analysis: Moro exhibits symmetric passivisation even with underived ditransitives, suggesting that in Moro underived ditransitives both objects are subcategorised for as $[-r]$ arguments. I thus posit expanding the frame to allow the iteration of arg_2 in the same way as arg_3 and arg_4, resulting in the frame given in figure 2.[13] Note that although all argument slots are universally available, not all argument slots are used in all languages.

$$\left\langle \begin{array}{ccccccc} arg_1 & arg_2 & \ldots & arg_3 & \ldots & arg_4 & \ldots \\ | & | & & | & & | & \\ [-o/-r] & [-r] & & [+o] & & [-o] & \end{array} \right\rangle$$

Figure 2: Revised valency frame.

For the formal implementation of the mapping theory, I largely follow the proposals of Findlay (2020). However, the proposed templates must be modified to account for set-valued GFs and the possibility of multiple arg_2 arguments in a single underived predicate. In addition, I revise the core mapping templates to take s-structures, rather than s-structure attributes, as their arguments.

I begin with Findlay's (2020: 136, 138-139) $\text{DEFAULT-}\widehat{\text{ARG}}$, MAP and NOMAP templates. The MAP template must be adjusted to account for the possibility of set-valued OBJ and OBL; this is achieved by introducing a disjunction that maps an

[12] Arg_1 is associated with two possible classifications: $[-o]$ in unergative verbs and $[-r]$ in unaccusative verbs. Verbs that are not unaccusative take the unergative specification.

[13] This proposal has the added desirable property of formally encoding the special status of arg_1 in relation to the other argument slots, as it is the only argument slot that cannot be iterated. I am grateful to an anonymous reviewer for this observation.

s-structure to either the s-projection of the value of a singleton GF (SUBJ) or to the s-projection of one member of the set of a set-valued GF (OBJ or OBL), as shown in (10). In addition, all three templates must be adjusted to take s-structures as their arguments, rather than s-structure labels; i.e. the values of *arg* in the templates in (9)-(11) should be s-structure paths, such as $\uparrow_\sigma$ THEME, rather than the label THEME. This latter change will be necessary for the analysis of symmetric passives.

(9) $\textsc{Default-}\widehat{\textsc{arg}}(arg) :=$
$\{(\uparrow_\sigma \widehat{\textsc{arg}}) = (arg) | (\uparrow_\sigma \widehat{\textsc{arg}})\}$

(10) $\textsc{Map}(GF, arg) :=$
$\{(\uparrow GF)_\sigma = (arg) | (arg)_{\sigma^{-1}} \in (\uparrow GF)\}$

(11) $\textsc{NoMap}(arg) :=$
$(arg)_{\sigma^{-1}} = \emptyset$

Findlay's analysis guarantees the correct mapping between arguments and s-structures by means of the DEFAULT-MAPPING and PREFERRED-MAPPING templates (*ibid.*: 137, 139). The DEFAULT-MAPPING template ensures that a particular argument defaults to the correct GF when its preferred GF is unavailable, as well as blocking mappings with incompatible mapping features; using our revised MAP, this template can be taken over unchanged. The PREFERRED-MAPPING template ensures that one of three possibilities hold: either an argument is assigned to its preferred GF; or some other argument is mapped to that preferred GF; or the argument is not mapped to any GF. Findlay's PREFERRED-MAPPING template is not expressed in terms of MAP, but it can be so expressed without altering its operations, as shown in (12).

(12) $\textsc{Preferred-Mapping}(GF, arg) :=$
$\left\{ \begin{array}{l|c|l} @\textsc{Map}(GF, arg) & (\uparrow GF) & @\textsc{NoMap}(arg) \\ & \neg @\textsc{Map}(GF, arg) & \end{array} \right\}$

We now have everything in place to define the mapping relations between particular arguments and their associated GFs. First, we must define argument mapping templates for each of the slots of the valency frame, i.e. for both *arg1*s (unergative and unaccusative), *arg2*, *arg3* and *arg4*. The only change for the ARG1, ARG1-UNACCUSATIVE, and ARG4 templates (Findlay 2020: 140-141) is the specification of the ARG-TYPE feature in place of defining local names for each argument. This prevents contradictions arising when the same lexical entry includes multiple arg_{2-4} slots. With these changes, ARG1 in (13) maps an (unergative) $[-o]$ arg_1 to SUBJ by default, $\in$ OBL otherwise; ARG1-UNACCUSATIVE in (14) maps an unaccusative $[-r]$ arg_1 to SUBJ by default, $\in$ OBJ otherwise; and ARG4 in (15) maps a $[-o]$ arg_4 to SUBJ if there's no SUBJ, or else to $\in$ OBL by default.

(13) $\textsc{Arg1}(arg) :=$
$@\textsc{Default-Mapping}(\textsc{subj}, arg, \textsc{pluso})$
$(arg\ \textsc{arg-type}) = \text{arg1}$

(14) $\textsc{Arg1-Unaccusative}(arg) :=$
$@\textsc{Default-Mapping}(\textsc{subj}, arg, \textsc{obl})$
$(arg\ \textsc{arg-type}) = \text{arg1}$

(15) $\textsc{Arg4}(arg) :=$
$@\textsc{Default-Mapping}(\textsc{obl}, arg, \textsc{pluso})$
$@\textsc{Preferred-Mapping}(\textsc{subj}, arg)$
$(arg\ \textsc{arg-type}) = \text{arg4}$

In addition to adding the ARG-TYPE specification, collapsing the OBJ/OBJ_θ distinction allows us to simplify the ARG3 template (Findlay 2020: 141), as shown in (16): $[+o]$ is equivalent to default mapping to $\in$ OBJ, blocking mapping to MINUSO, no PREFERRED-MAPPING needed.

(16) $\textsc{Arg3}(arg) :=$
$@\textsc{Default-Mapping}(\textsc{obj}, arg, \textsc{minuso})$
$(arg\ \textsc{arg-type}) = \text{arg3}$

Last of the argument templates, ARG2 (Findlay 2020: 141) also receives the ARG-TYPE specification, and the DEFAULT-MAPPING proscription against PLUSR must be modified to specifically prohibit OBL, as OBJ appears in both PLUSR and MINUSR.[14] Additionally, the possibility of multiple arg_2 slots requires adjusting the priority constraint that gives arg_2 subject priority over arg_4. This revised constraint, given as line 3 of (17), now states that if this arg_2 argument is not SUBJ then either the highest thematic argument of the predicate $\widehat{\text{ARG}}$ is SUBJ, in line with Findlay's template (cf. *ibid.*: 141), or else SUBJ is associated with another arg_2. Allowing any of multiple arg_2s to surface as SUBJ will be necessary in our account of the symmetric passivisation data in (1), as discussed in §5.5. Thus, (17) gives us the desired mapping constraints for $[-r]$ arg_2s: prefer to map to SUBJ, taking preference over all arguments except $\widehat{\text{ARG}}$ and other arg_2s, and defaulting to $\in$ OBJ otherwise.

(17) $\textsc{Arg2}(arg) :=$
$@\textsc{Default-Mapping}(\textsc{obj}, arg, \textsc{obl})$
$@\textsc{Preferred-Mapping}(\textsc{subj}, arg)$
$(\uparrow \textsc{subj})_\sigma \neq (arg) \Rightarrow$
$\left\{ (\uparrow \textsc{subj})_\sigma = (\uparrow_\sigma \widehat{\text{ARG}}) \;\middle|\; (\uparrow \textsc{subj})_\sigma = \begin{array}{c} (\uparrow_\sigma \textsc{arg}) \\ (\rightarrow \textsc{arg-type}) = \text{arg2} \end{array} \right\}$
$(arg\ \textsc{arg-type}) = \text{arg2}$

Lastly, I revise the passive templates. Beginning with the PASSIVE template (Findlay 2020: 144), I introduce a new constraint defining the local name `%arg1` as identical with the s-structure that has the ARG-TYPE arg1, i.e. with the arg_1 s-structure. Defining a local name is necessary to guarantee that the functionally uncertain specification of the arg_1 s-structure is resolved consistently in both the

[14]One may instead opt to omit OBJ from PLUSR and MINUSR to represent underspecification for $[\pm r]$, in which case PLUSR and MINUSR could be used in negative constraints, but positive constraints would require the disjunction of PLUSR or MINUSR with OBJ.

long and short passive. The revised PASSIVE template is given in (18).

(18) PASSIVE :=
$(\uparrow \text{VOICE}) = \text{PASSIVE}$
$\%\text{arg1} = \begin{array}{c} (\uparrow_\sigma \text{ ARG}) \\ (\rightarrow \text{ARG-TYPE}) = \text{arg1} \end{array}$
$\{@\text{SHORTPASSIVE} | @\text{LONGPASSIVE}\}$

The PASSIVE template references two possible options for resolving the passive, represented by two templates: SHORTPASSIVE and LONGPASSIVE (Findlay 2020: 143-144). LONGPASSIVE calls the MAP function to map `%arg1` to PLUSR; as we have already revised MAP to take s-structures as its argument in (10) and we have revised PASSIVE to define `%arg1` as an s-structure in (18), this template can be taken over as is (Findlay 2020: 143). The SHORTPASSIVE calls two other templates: SUPPRESS, which suppresses an argument according to some semantic template, and CLOSURE, a semantic template for SUPPRESS (Findlay 2020: 144). As `%arg1` has been specified by the PASSIVE template, the SHORTPASSIVE template itself can be taken over unchanged (Findlay 2020: 144). However, SUPPRESS and CLOSURE must be revised in order to take an s-structure as the argument *arg*, instead of an s-structure label. The adjusted templates are given in (19).

(19) a. SUPPRESS$(arg, template)$:=
$@\text{NOMAP}(arg)$
$(arg \text{ REL}) = \text{var}$
$@template(arg)$

b. CLOSURE(arg) :=
$\lambda P.\exists x[P(x)] : [(arg) \multimap \uparrow_\sigma] \multimap \uparrow_\sigma$

Together, these revisions to PASSIVE, SUPPRESS and CLOSURE guarantee a passive alternation that will either map the arg_1 to OBL, or suppress the arg_1.[15]

5.5 Parameters of variation

This analysis adopts a microparametric view of parameters of variation: parameters are identified with selection between alternative templates in the lexical entry, with language-level generalisations arising from similar template choices across the lexicon for a given parameter.[16] To exemplify this proposal, I will focus on two key cases. In the first case, I will consider the difference in passivisation be-

[15] Which argument surfaces as the subject in the passive arises from the choice of argument templates (see §5.5). Where multiple arg_2 arguments are present, any arg_2 can surface as the subject of a passive alternative, resulting in multiple mapping possibilities. Thus, we resolve the symmetry problem in the passive: no arg_2 object is preferred over any other as subject of the passive alternation.

[16] For macro- and microparametric approaches to language variation, see Borer (1984); Chomsky (1995); Huang (2015); Biberauer (2008); Fábregas et al. (2015); Kayne (2005); *inter alia*. On templates and their relation to linguistic generalisation, see Dalrymple et al. (2004); Crouch et al. (2012); Asudeh et al. (2012); *inter alia*.

haviour in underived ditransitive behaviour between Moro, exemplified in (2)-(1), and an asymmetric object language like English, captured by differences in the AGENT-THEME-RECIPIENT-VERB templates. In the second case, I will consider the differences in passivisation behaviour of applied beneficiaries between symmetric and asymmetric object languages, as discussed by Bresnan & Moshi (1990) and captured by differences in the APPLIED-BENEFICIARY templates. These differences will jointly account for the symmetric passivisation behaviour of Moro tritransitives, as mentioned in §3.

Beginning with underived ditransitives, I set aside issues relating to dative alternations at present to focus on the basic agent-theme-recipient case. In the case of a language where the AOP is operative, such as English, we require that no more than one non-highest argument is assigned $[-r]$. As such, we posit three distinct argument slots: arg_1, which is specified $[-o]$ and assigned to the AGENT; arg_2, which is specified $[-r]$ and assigned to the RECIPIENT; and arg_3, which is specified $[+o]$ and assigned to the THEME. In addition, we want to specify the AGENT argument as the default highest thematic argument, $\widehat{\text{ARG}}$. This, with predictable semantic specification, gives us a template such as (20), where *ag,th,rec* are the AGENT, THEME and RECIPIENT s-structures, respectively.[17]

(20) AOP-AGENT-THEME-RECIPIENT-VERB$(ag,th,rec) :=$
$\lambda P \lambda x \lambda y \lambda z \lambda e.P(e) \wedge \textbf{agent}(e,x) \wedge \textbf{theme}(e,y) \wedge \textbf{recipient}(e,z)$:
$[(\uparrow_\sigma \text{ EVENT}) \multimap \uparrow_\sigma] \multimap (ag) \multimap (th) \multimap (rec)$
$\multimap (\uparrow_\sigma \text{ EVENT}) \multimap \uparrow_\sigma$

$(ag) \wedge (th) \wedge (rec)$

@DEFAULT-$\widehat{\text{ARG}}(ag)$
@ARG1(ag)
@ARG3(th)
@ARG2(rec)

In the case of Moro, however, the template in (21) will falsely predict that only the RECIPIENT can be the subject of a passive alternative; but as (1) shows, either object of the underived ditransitive can be a passive subject. In other words, both objects of the Moro underived ditransitive must be specified $[-r]$. As we are dealing with underived ditransitives, we cannot posit any morpholexical operation to produce a derived $[-r]$ argument, and so we must posit two arg_2 slots in the base verb template. This is captured in template (21), where the THEME argument also calls the ARG2 template. Note that as (21) would have the same semantic specification and existential constraints as (20), I opt to omit these lines from (21).

[17] Cf. Findlay's (2020: 137) AGENT-THEME-BENEF-VERB template.

(21) SYMMETRIC-AGENT-THEME-RECIPIENT-VERB(ag, th, rec) :=
...
@DEFAULT-$\widehat{\text{ARG}}(ag)$
@ARG1(ag)
@ARG2(th)
@ARG2(rec)

This SYMMETRIC-AGENT-THEME-RECIPIENT-VERB template, in conjunction with the revised mapping and passive templates in §5.4, is sufficient to guarantee the symmetric passivisation behaviour observed in (1). The PASSIVE template requires that the arg_1 argument (i.e. the AGENT) is either suppressed or realised as a $[-o, +r]$ function (i.e. OBL). As both remaining objects use the ARG2 mapping template, both objects may map to either SUBJ or OBJ, and thus either argument can be assigned to either GF. The multiple mapping possibilities resulting from these constraints, which account for the symmetric passivisation patterns presented in §3, are schematised in figure 3.

		AGENT	THEME	RECIPIENT		
		|	|	|		
'give'	⟨	arg_1	arg_2	arg_2	⟩	
		$\emptyset$	$[-r]$	$[-r]$		
			SUBJ / $x \in$ OBJ	SUBJ / $x \in$ OBJ		
MAP			SUBJ	$x \in$ OBJ		*or*
			$x \in$ OBJ	SUBJ		

Figure 3: Argument mapping possibilities in Moro underived ditransitive.

One possible resolution to these multiple mapping possibilities, as expressed by a given thematic assignment over (1a), is represented in the f-structure to s-structure mapping presented in figure 4.

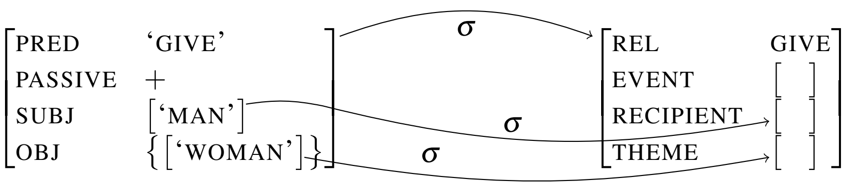

Figure 4: Partial f-structure and s-structure for one reading of (1a).

Let us turn now to the applicative.[18] As discussed in §3, Moro applicatives exhibit the same symmetric passivisation behaviour as Moro's underived ditransitives. Bresnan & Moshi (1990) identify similar behaviour in Kichaga applicatives, but contrast this with the non-symmetric passivisation behaviour in Chicheŵa ap-

[18] Due to limitations of space, I cannot here give a full treatment of the causative in Moro. The following discussion provides a template for adapting other morpholexical operations to the proposals made in this paper.

plicatives. Here again, then, we require two templates, one for languages with the AOP (such as Chicheŵa), and one for those without. For the sake of simplicity, I will only focus on the case of applied beneficiaries.

In the case of AOP languages like Chicheŵa, the APPLIED-BENEFICIARY template introduces a new beneficiary argument which is specified as $[-r]$ arg_2. Additionally, it must demote any existing arg_2 to prevent two non-highest arguments being assigned $[-r]$. In our present formalism, this can be achieved by a simple constraint requiring that if the applied beneficiary argument is not SUBJ, then SUBJ cannot have ARG-TYPE arg2, as shown in (22).[19]

(22) @AOP-APPLIED-BENEFICIARY$(ben) :=$
@ARG2(ben)
$(\uparrow \text{SUBJ})_\sigma \neq (ben) \Rightarrow (\uparrow \text{SUBJ})_\sigma = \begin{array}{c}(\uparrow_\sigma \text{ARG})\\(\rightarrow \text{ARG-TYPE}) \neq \text{arg2}\end{array}$
$\lambda P \lambda x \lambda e.P(e) \wedge \textbf{beneficiary}(e) = x :$
$[(\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma] \multimap (ben) \multimap (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma$

In the case of non-AOP languages like Moro and Kichaga, this constraint against other arg_2 arguments surfacing as subjects in the presence of applied beneficiaries is not present, as evidenced by the symmetric passivisation behaviours discussed in §3-4. We can therefore represent the applied beneficiary in these languages with a simplified template omitting the second line of (22), as shown in (23). (Semantic specification is the same as in (22) and omitted for brevity.)

(23) @SYMMETRIC-APPLIED-BENEFICIARY$(ben) :=$
@ARG2(ben)
...

This difference in templates, in conjunction with our revised mapping and passive templates, is sufficient to guarantee the differences in passivisation discussed in §3-4. In addition, by combining the SYMMETRIC-AGENT-THEME-RECIPIENT-VERB template in (21) with the SYMMETRIC-APPLIED-BENEFICIARY template in (23), we are able to predict the symmetric passivisation patterns of Moro tritransitives as discussed in §3: the THEME, RECIPIENT, and applied BENEFICIARY are each mapped using the ARG2 template, guaranteeing that each argument can be realised as either SUBJ or $\in$ OBJ.

5.6 Word order constraints

The proposals outlined §5.5 can be generalised to other phenomena which are normally accounted for by reference to mapping theory and morpholexical operations. However, word order poses an exception here: constraints on word order are not expressed through templates in the lexical entry, but rather as annotations on Phrase Structure Rules (PSRs). As such, it is necessary to treat word order apart from

[19] Compare and contrast Findlay's (2016: 328) BENEFACTIVE template.

other phenomena. The core proposal here is to incorporate s-structural conditions as annotations on PSRs, allowing word order constraints which depend on thematic roles to do so directly. Let us consider how this proposal may be applied to word order constraints in Kichaga and Moro, as discussed in §3-4.

I begin with constraints on the order of objects in Moro. Ackerman et al. (2017) give the relevant constraint as: non-theme argument must be immediately post-verbal if the theme is inanimate; if all objects are animate, any order is possible. I do not here attempt to represent violable word order preferences, but see Bresnan et al. (2001) for discussion of the relation between hard and soft constraints, and a framework for implementing soft constraints grounded in Stochastic Optimality Theory (Boersma 2000; Boersma & Hayes 2001; Boersma 1998). This constraint is represented by the PSR fragment[20] given in (24).

(24)
$$\left\{\begin{array}{c|ccc|c} \text{(NP)}^* & \text{NP} & \text{NP} & \text{(NP)}^* & \ldots \\ \downarrow\in(\uparrow \text{OBJ}) & \downarrow\in(\uparrow \text{OBJ}) & \downarrow\in(\uparrow \text{OBJ}) & \downarrow\in(\uparrow \text{OBJ}) & \\ (\downarrow_\sigma \text{ANIMATE}) = + & (\uparrow_\sigma \text{THEME}) \neq \downarrow_\sigma & (\uparrow_\sigma \text{THEME}) = \downarrow_\sigma & & \\ & & (\downarrow_\sigma \text{ANIMATE}) = - & & \end{array}\right\}$$

Turning to Kichaga, I focus only on those constraints discussed for the applicative by Bresnan & Moshi (1990): the applied NP must be adjacent to the verb if it is a beneficiary or recipient. This constraint could be captured using our GL abbreviation, as in the PSR fragment given in (25).

(25)
$$\left\{\begin{array}{c|cc|c} \ldots & \text{NP} & \text{NP} & \ldots \\ & \downarrow\in(\uparrow \text{OBJ}) & \downarrow\in(\uparrow \text{OBJ}) & \\ & (\uparrow_\sigma \text{GL}) = \downarrow_\sigma & (\uparrow_\sigma \text{THEME}) = \downarrow_\sigma & \end{array}\right\}$$

The alternative case – the patient NP may be adjacent to the verb if the applied NP has any other thematic role – could be captured by the PSR fragment in (26).

(26)
$$\left\{\begin{array}{c|cc|cc|c} \ldots & \text{NP} & \text{NP} & \text{NP} & \text{NP} & \ldots \\ & \downarrow\in(\uparrow \text{OBJ}) & \downarrow\in(\uparrow \text{OBJ}) & \downarrow\in(\uparrow \text{OBJ}) & \downarrow\in(\uparrow \text{OBJ}) & \\ & (\uparrow_\sigma \text{THEME}) = \downarrow_\sigma & (\uparrow_\sigma \text{GL}) \neq \downarrow_\sigma & (\uparrow_\sigma \text{GL}) \neq \downarrow_\sigma & (\uparrow_\sigma \text{THEME}) = \downarrow_\sigma & \end{array}\right\}$$

This approach can be readily generalised to incorporate constraints on additional levels of structure, such as pragmatic constraints referencing i-structure. For previous LFG treatments of the relationships between syntactic constraints and discourse properties, cf. e.g., Butt & King (1996, 1999); *inter alia*.

6 Merits and limitations of the current proposal

The current proposal provides a rigorous treatment of a set-valued OBJ approach to resolving the problem of highly symmetric object languages in Lexical-Functional Grammar. This proposal has a number of theoretical merits over and against competing proposals to resolve this problem.

[20]The PSR fragments given here are intended to represent (some of) the contents of a disjunction that immediately follows V in a PSR $\text{V}' \rightarrow \text{V} \, [\ldots]$.

First and most importantly, this proposal offers a framework in which there is no difference in syntactic representation without some corresponding difference in syntactic behaviour. By removing the assumption of object asymmetry from the formal architecture, it allows an approach to symmetric objects that recognises such objects as syntactically identical and differentiated only in their thematic and semantic properties. Secondly, this proposal takes advantage of the modularity of the Parallel Projection Architecture to build on previous work on avoiding conflating syntactic and semantic categorises and reducing redundancy. Thirdly, this proposal provides one possible formal solution to concerns over the validity of the OBJ/OBJ_θ distinction raised by Börjars & Vincent (2008). Fourthly, the high degree of modularity in this proposal takes seriously the varying degrees of symmetry observed across the general typological category of 'object symmetric' languages.

This proposal is not the only proposal to attempt to resolve the issues discussed in this paper. As noted before, a descriptively adequate analysis of the Moro data along the lines of Bresnan & Moshi (1990) could be made, caveated by the theoretical concerns I have raised in this paper. Ackerman et al. (2017) propose their own solution grounded in a Head-driven Phrase Structure Grammar (HPSG) analysis; if one adopts Patejuk & Przepiórkowski's (2016) DEPS list proposal, this solution could be carried over into an LFG analysis with minimal further modifications.

The approach taken in this paper is also not without limitations. Firstly, by adopting a microparametric approach to modelling typologically significant parameters of variation, this proposal removes any explicit formal statement of the AOP. This proposal therefore inherently makes weaker predictions than those that treat the AOP as an explicit formal constraint on intrinsic classifications, although there is nothing in the framework itself to preclude our making the stronger prediction that a given language may only select either AOP or non-AOP templates.

Secondly, it is worth noting that due to the elimination of OBJ_θ as a category, certain syntactic phenomena will need to be re-examined. For example, Bresnan & Moshi (1990), following Alsina & Mchombo (1989), analyse a core part of the difference between Chicheŵa and Kichaga object marking as the former only allowing restricted objects to be realised as object markers, while the latter allows any object to be so realised. Under the present proposal, this constraint would need to be re-examined for an analysis in terms of ARG-TYPE, thematic roles, or a more complex interaction of constraints.

One possible concern with this proposal is that by introducing set-valued OBJ and the iterable arg_2 slot, this proposal reduces the predictive power of our analyses of objecthood to a degree that may be considered merely descriptive rather than explanatory. A full discussion of this topic is beyond the scope of this paper; nevertheless, I hold that the present analysis only cedes explanatory ground where the empirical phenomena necessitate it, and, further, that the account expands our explanatory resources in certain key ways, such as providing a clear formal indication of the special status of the arg_1 slot relative to other arguments.

7 (A)symmetry, revisited

The present proposal takes a strong view of object symmetry, arising from a commitment to a principle of *syntactic faithfulness*: that there should be no difference in syntactic representation without a corresponding difference in syntactic behaviour. This carries with it the principle that we should not posit a difference in syntactic representation in one case merely because a difference in syntactic behaviour would be apparent in a different but analogous case. In Moro, this can be seen in the proposed treatment of the animacy conditioning on word order constraints: that we observe syntactic differences with inanimate themes is not taken to justify differing syntactic representations between animate themes and other objects, where the differences in syntactic behaviour are not present. This is in contrast to approaches such as Bresnan & Moshi (1990), where the syntactic differences with recipient and beneficiary applied objects in Kichaga justify positing asymmetric representations when these differences are absent, as with applied instrumentals.

Where asymmetries are present in otherwise object symmetric languages, I aim to account for these asymmetries without requiring positing differences in syntactic representation where these asymmetries are absent. As it turns out, we can usually do so by characterising the asymmetric constraint in terms of the particular thematic or semantic properties of the arguments involved in the asymmetry.

8 Conclusion

In this paper, I have presented a formal treatment of the set-valued OBJ proposal as a solution to the problem of symmetric object languages in Lexical-Functional Grammar (LFG). By adapting Findlay's template approach to the Mapping Theory and making full use of the modularity of the Parallel Projection Architecture, this proposal provides a robust, empirically adequate, and less redundant formal analysis of object properties across languages. By its reliance on thematic roles and other semantic properties as key components in the description of object syntactic constraints, this approach builds on previous work to emphasise the importance and theoretical efficacy of examining the role that semantic properties play in syntactic constraints, and of conceiving of objecthood as the intersection of syntactic, thematic, and semantic properties. This proposal is not the only solution to representing symmetric object languages in LFG, but I argue that it is the minimal proposal necessary to account for highly symmetric object languages like Moro without resulting in an analysis that incorporates differences in syntactic representation without any corresponding difference in syntactic behaviour.

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