Unstable structures and Generalized Dynamic Antisymmetry

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This work aims to extend Dynamic Asymmetry by relying on Labelling Algorithm. The central proposal is to generalise this approach to symmetric head-head structures, the inevitable first step of any derivation. The two symmetry-breaking "repair" options available give rise to basic head-initial and head-final word orders. One of the consequences of this approach is that all word-order parameters reduce to head-movement options. We take this to be a conceptual advance for the theory of word-order variation.

0. Introduction

The principal goal of this paper is to extend the Dynamic Asymmetry (DA) framework of Moro (1997b, 2000) in two directions. Our first proposal is that the instability of symmetric structures is due, not to linearization as proposed in a later version of DA by Moro (2009), but to the impossibility of labelling, given Chomsky's (2013, 2015) Labelling Algorithm (LA). Second, we extend the DA framework to symmetric head-head structures, the inevitable first step of any derivation. Given one further general assumption, the two symmetry-breaking "repair" options available give rise to basic head-initial and head-final typologies.

The paper is organised as follows: in Section 1, we introduce the maximally simple, symmetric formulation of Merge. On the simplest assumptions, this version of Merge gives rise to three configurations, two of which are unstable in the technical sense we define. Sections 2 and 3 deal with each of these, the XP-YP structure and the head-head structure, in turn. Section 4 develops the idea of Generalised Dynamic Antisymmetry (GDA) and briefly considers some further implications of the approach.

1. Symmetric Merge

Moro's (2000) Dynamic Antisymmetry (DA) framework claimed that fully symmetrical structures of the kind in (1) are ungrammatical (linear order irrelevant):

(1) * [XP YP]

[1] This paper was presented at Linearization Constituents Across Domains (LCAD) 2020.We would like to thank the audience for their comments and questions. We would also like to express our gratitude to Erich Groat for extremely insightful comments and discussion of earlier drafts of this paper, which led to significant improvements. The remaining errors are all ours.

In essence, (1) is "too symmetrical" to be tolerated. There are two possible repair strategies which can derive a well-formed structure from (1):

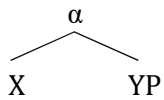
(2) a. XP … [(XP) YP] (Repair Strategy I)
b. YP … [XP (YP)] (Repair Strategy II)

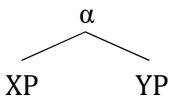
Repair strategy I raises XP out of the symmetric structure, while Repair Strategy II raises YP. Both strategies result in an asymmetric structure, since the lower copy is only one segment of the chain and labelling cannot involve only one segment (see Chomsky 2013, 2015). To a first approximation, a major result of the DA framework is the idea that movement is driven by the need to *break symmetry*, i.e. triggered by purely geometrical, configurational factors, as opposed to feature-driven triggers, although, of course, morphological restrictions are active in deciding which element can move and where.

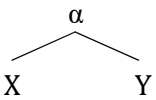
More explicitly, the DA framework has two theoretical consequences which distinguish it from standard views in the general context of minimalist syntax, one concerning movement (Internal Merge), the other concerning Merge more generally. First, it dissociates movement from quasi-morphological factors involving feature-checking/valuation/agreement, or other means of licensing formal features (see Moro 2000, 2004, 2009 for arguments for this approach). Second, under this approach Merge is allowed to generate symmetrical structures as opposed to the original inherently asymmetric formulation in Chomsky (1995:244) also adopted by Kayne (1994). In turn, this leads to a maximally simple formulation of Merge of the kind proposed in Chomsky (2013, 2015), seen in (2):

(3) Merge (X, Y) = {X, Y}

Adopting the DA framework, the syntactic objects X and Y either result from a prior operation of Merge or they do not. If they do, they are maximal; if they do not, they are minimal. Since each can be maximal or minimal independently of the other, prior to linearization the output of (3) can be visualised as one of the structures in (4) (or their mirror-image notational variants):

(4)a. 

b. 

c. 

Following one of the leading ideas in Chomsky (2013, 2015), a structure must be **stable** in order to be legible at the interfaces. There are two ways for a structure to be stable. First, a structure is stable if and only if it is **linearisable at PF**. That is, it must be compliant with the Linear Correspondence Axiom (LCA) of Kayne (1994); this means that the terminals must meet the requirements for a locally total linear ordering as defined in Kayne (1994:4). Second, a structure must be **labellable throughout the derivation** (Chomsky 2013, 2015). Without labels, syntactic objects are invisible to the operations of

the system; this has a range of potential consequences for locality as explored in particular by Bošković (2015).

Of the structures in (4), only (4a) (and its identical counterpart modulo linearization [$_{\alpha}$ XP Y]) meets these requirements. Intuitively, both the XP-YP structure in (4b) and the head-head configuration in (4c) are "too symmetrical" to be tolerated by the system: in the DA framework, they are dubbed "points of symmetry" (PoS). In the next two sections, we explore the consequences of this conclusion for each of these PoS in turn.

2. Symmetric XP XP structures

Chomsky (2015: 9) discusses null-subject languages (of the Italian type, where null subjects are licensed by "rich" agreement). He proposes that α in (5a) can be directly labelled as φP thanks to the "strong" φ-features intrinsically associated with T in languages of this type. The result is shown in (5b):

(5) a. [$_{\alpha}$ T[φ_{strong}] [$_{vP}$ EA VP]]

b. [$_{\varphi P}$ T[φ_{strong}] [$_{vP}$ EA VP]]

As a result of T's strong φ-features labelling α here, DP-raising to SpecTP is not required. In this case, SpecTP can remain unfilled, and the EA can remain in a low position with the remnant vP raising around it, giving rise to "free inversion", along the lines proposed by Belletti (2004).[2] In turn, this implies that long-distance extraction is possible from the low position, giving rise to surface complementiser-trace violations. In this way, the very important results of Rizzi (1982) are maintained.

In non-null-subject languages, on the other hand, T's φ-features are weak, as shown in (6):

(6) [$_{\alpha}$ T[φ_{weak}] [$_{vP}$ EA VP]]

Here DP-raising is required in order to provide φ-features to label α, hence SpecTP is always filled. The effect of the original Extended Projection Principle of Chomsky (1982:10) results. Furthermore, "free inversion" is impossible and so subject-extraction across a complementiser is impossible (assuming extraction over a "complete" C-field is always impossible, as argued by Rizzi & Shlonsky 2007, Bošković 2015, Douglas 2017).

[2] We assume that vP raises out of the structure in (i):
(i) [$_{\alpha}$ EA vP]
If the raising takes before α is labelled, vP is maximal and so able to move. This movement renders α asymmetrical and able to be (vacuously) labelled by the EA. We will return to this option for the structure in (i) when we consider VOS languages in Section 4. See also the brief discussion of Italian causatives in Note 11.

However, as pointed out by Moro (1997a), we do see EPP-effects in NSLs of the Italian type. Consider first examples such as the following:

(7) a. Questa foto era la causa della rivolta.
This picture was the cause of.the riot
"This picture was the cause of the riot."

b. La causa della rivolta era questo foto.
the cause of.the riot was this picture
"The cause of the riot was this picture."

(7a) is a canonical copular sentence (where the raised DP is an argument, namely the subject of predication), while (7b) is an inverse copular sentence (where the raised DP is the predicate, the copula being the expression of just tense, aspect and agreement features).[3] Both (7a) and (7b) derive from the structure in (8):

(8) BE [$_{\alpha}$ [$_{DP}$ questa foto] [$_{DP}$ la causa della rivolta]]

Here, the constituent α is a case of the unstable structure, namely the PoS (4b). Movement of either DP, giving rise to the different kinds of copular clauses seen in (7), can repair the structure, by allowing α to be labelled by the unmoved DP. So here we see an "EPP-effect" in a null-subject language, resulting from movement which is driven by the need to provide a label for the unstable structure α. The EPP-effect nature of this phenomenon is manifest if one considers the following example:

(9) a. **pro* è questa foto la causa della rivolta.
is this picture the cause of.the riot

b. *pro* è [$_{\alpha}$ [$_{DP}$ questa foto] [$_{DP}$ la causa della rivolta]]

If SpecTP in general does not have to be filled in null-subject languages of the Italian type, this movement cannot be driven by feature-checking requirements as T does not impose such requirements on its Specifier in these languages. Crucially, inserting an expletive *pro* in SpecTP here would not yield a grammatical construction. The resulting sentence would be the ungrammatical (9a), containing the unstable substructure α, as shown in (9b) (see Moro 2009 for a detailed account including movement to a postverbal focus position as a rescue strategy).

It is also important to observe that DP features do not always need to be shared locally inside

[3] The possibility of having either a canonical or an inverse sentence makes the traditional association of grammatical function to the sequence S → DP VP as subject and predicate untenable, since the subject may also be contained in situ within the DP. For the history of the notion of copula and its implication in clause structure see Moro 2010, 2019.

α, which could potentially allow α to be labelled as φP. This is shown by well-formed cases of feature-mismatch like (10a), where the DP subject of α is masculine plural (*i libri* "the books") while the predicate DP is feminine singular (*la mia passione*). (10a) is derived from a structure like (10b) contrasting with (10c-d) where agreement between the two DPs is indeed necessary (for an analysis regarding the cases where agreement is necessary including psych-nouns, see Moro 1997b: 78ff, 2009: 37):

(10) a. i libr-i sono la mia passion-e
books-MPl are the my passion-FSg
"Books are my passion"

b. I libri sono [$_{\alpha}$ ([$_{\text{DP-MPl}}$ i libri]) [$_{\text{DP-FSg}}$ la mia passione]]

c. Gianni è amico/*amici di Maria
Gianni is friend.Sg/friend.Pl of Maria
"Gianni is a friend/*friends of Maria."

d. Gianni e Pietro sono amici/ *amico di Maria
Gianni and Pietro are friend.Pl/friend.Sg of Maria
"Gianni and Pietro are friends/friend of Maria."

So we see that features do not only not need to be shared, as mentioned above, but in fact features could in principle be fully shared, but the structure remains a PoS. Here, then, the LCA must be responsible for symmetry-breaking, as originally argued by Moro (1997b, 2000). We see then that the symmetry breaking rescue strategy as having a dual nature, deriving in some cases from labelling based on Chomsky's labelling algorithm and in some cases from the linearization requirements based on LCA (and in some cases, such as (10), from both; we are particularly grateful to Erich Groat for discussion of this point).

Furthermore, there is robust evidence that the expletive *ci* ("there") in SpecTP in (11a) is moved from the underlying predicate position of α as shown in (11b) rather than inserted in subject position. *There*-sentences are in fact inverse copular sentences (see Moro 1997b, 2018 on the categorial status of expletives of this kind):

(11) a. C' è una foto.
There=is a photo
"There's a photo."

b. BE [$_{\alpha}$ [$_{\text{DP}}$ una foto] [$_{\text{DP}}$ ci]]

We conclude that structures like (4b) are "too symmetrical" to be read at the interfaces; these PoS are rescued by movement of either XP or YP. Which option is taken is a matter of indifference to the computational system unless morphological restrictions hold on the landing site; in fact, both are possible in many cases as we see in cases involving two DPs as subject and predicate from alternations like that seen in (7); the alternation would not be possible in case the predicate is an AP, given that the preverbal position is only able to host nominal projections, although the requirement they are arguments is lost given the existence of inverse copular constructions. This DA account of movement triggers based on configurational reasons is empirically superior to a "morphological" (i.e. feature-checking/valuing/agreeing trigger) approach to accounting for movement, as we see from the Italian data in (7, 9, 10). It is also theoretically superior in that specific properties of features such as strength, (un)interpretability, etc., do not need to be postulated. Movement results from a simple requirement to repair unstable structures freely generated by the simplest formulation of Merge, as in (3).

Moreover, the choice of XP- or YP-fronting to repair (4a), although a matter of indifference to the narrow syntax, gives rise to obvious differences at the interfaces. First, we see local feature-sharing at PF in the form of standard Spec-head agreement in the inverse copular sentence in (12b) by means of an intervening pro-predicative null pronoun *pro* in a lower subject position (one of the slots made available in the SpecTP space); the existence of null pro-predicative pronouns must necessarily be assumed anyway, given the contrast in (12c-d):

(12) a. I libri erano la causa della rivolta.
the.$_{MPL}$ books.$_{MPL}$ **were.$_{PL}$** the.$_{FSG}$ cause.$_{FSG}$ of.the riot
"the books were the cause of the riot."

b. La causa della rivolta (*pro*) erano i libri.
the.$_{FSG}$ cause.$_{FSG}$ of.the riot **were.$_{PL}$** the.$_{MPL}$ books.$_{MPL}$
"the cause of the riot was the books"

c. pro sono io
pro am I
"it's me"

d. *io sono[4]
I am

[4] This in turn implies, unless the occurrence of *pro* is restricted *ad hoc* to inverse copular constructions, that *pro* is also present in the lower slot of SpecTP in canonical copular sentences and arguably in all Italian sentences with non-trivial consequences for the acquisition of the pro-drop parameter (see Moro 1997b: 67ff). Concerning the existence of two positions for the subject in SpecTP see also independent evidence in Cardinaletti (1997), Cardinaletti & Roberts (2002) and Poletto (2000).

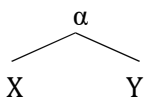
Second, we see focus effects at LF:

(13) a. Queste foto non sono l'origine ma la fine della rivolta/*ma le canzoni.
"These photos are not the origin but the end of the riot/*but the songs."
b. La fine della rivolta non sono le foto ma le canzoni/*ma l'origine.
"The end of the riot are not these pictures but the songs/*the origin."

The computational system appears to exapt the required fronting operation at the interfaces. But we do not regard the movements as caused by the interface effects (which would require some kind of look-ahead); the movements are caused by the need to repair the unstable structure (4b).

3. Symmetric X X structures

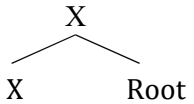
In this section we look at the other principal type of PoS, namely the unstable head-head structures. Consider again (4c), repeated here:

(4c)


In this structure X and Y cannot be linearised. This is the well-known "bottom-pair" problem, recognised as arising from the combination of the LCA and bare phrase structure since Chomsky (1994). Nor, as it stands, can the structure be labelled (assuming X and Y are distinct categories; see below). This structure is therefore inherently unstable and will cause the derivation to crash at the interfaces.

As recognised by Chomsky (1994), this is a serious problem. If only atomic, minimal syntactic elements are accessible to External Merge (4c) must be the first step of any and every derivation. If we depart from the assumption that only minimal categories can be externally merged, then we are implicitly allowing narrow-syntactic operations, i.e. Merge of some kind, into either the Lexicon or the Numeration (or both). This is clearly an undesirable move, which in any case may only displace the problem.

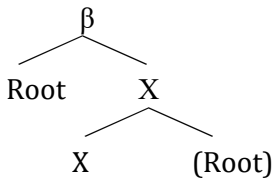
One solution to the problem posed by (3c) was first put forward in a different context by Marantz (1997), and adopted in the context of labelling theory by Chomsky (2013). This is the idea that one of X and Y, say Y, has no categorial feature. In other words, Y is a Root, and X is a categoriser. In these terms, (4c) becomes (14):

(14)


The structure now clearly has a label, X. Nonetheless linearization is still not possible since the lowest occurrence of X, namely X^{min}, and Root mutually c-command; hence, even in languages where X-Root or Root-X appears to be the order of morphemes in category-plus-root structure (and of course there are many languages that depart from this simple pattern, e.g. the Semitic languages), the structure cannot be (14) as this structure is too symmetrical.[5] By parity of reasoning with our discussion of (4b) in the previous section, one of X^{min} and Root must move. Let us discuss each movement option in turn.

The first option we consider is that of moving Y, the Root. This gives rise to the derived structure in (15):

(15)



In this structure α is successfully labelled X and the Root (Y) can be linearised as preceding X since it now asymmetrically c-commands X. Furthermore, β must be labelled X as Root has no categorial feature.[6] In this structure, the lowest occurrence of X in (15) is defined as X^{min}, the head of β, with β defined as X^{max}. Y, the Root is the complement of X^{min}. We see then that the complement has moved around the head, so (15) is then effectively a case of rollup of the kind defined by Biberauer, Holmberg & Roberts (2014): movement of the complement around the head.[7] The first repair option of (4c), then, effectively yields a head-final structure.

The second option for repairing (4c) involves moving X, i.e. X^{min}. This gives rise to the derived structure in (16):

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[5] Here we are assuming the standard definition of c-command from Reinhart (1983):

(i) α c-commands β if and only if the first branching node γ dominating α dominates β.

By this definition, the lower occurrence of X and Root clearly c-command one another. For asymmetric c-command to obtain, one of α or β must have internal structure, but that is not case here by assumption: we are dealing with externally merged elements.

Given Kayne's (1994:16) category-based definition of c-command neither X nor Root asymmetrically c-commands the other and so the structure is equally unlinearisable. Kayne's definition of c-command runs as follows:

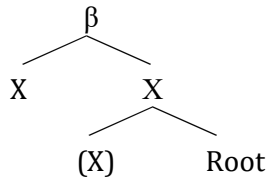
(i) X c-commands Y iff X and Y are categories and every category that dominates X dominates Y.

In (4c), as given, no category dominates either X^{min} nor Root; moreover, X^{min} is not a category, but a segment, and Root is not a category as it has no categorial features. Alternatively, since Kayne's definition of c-command is based on the distinction between segments and categories, we could postulate that this distinction does not apply to heads. In that case, once again the structure in (14) would be unlinearizable since the lower copy of X would symmetrically c-command Root. See also Note 6.

[6] Here we must assume Reinhart's notion of c-command rather than Kayne's (see the previous Note). If not, by Kayne's definition of c-command here, with β=X, Y=Root does not c-command X and so linearization becomes impossible. This problem does not arise, however, if we adopt the suggestion in the previous Note that the segment-copy distinction does not hold for heads. In order to prevent the intermediate X c-commanding Root, giving an ordering paradox, we would have to add the specification "every category distinct from X that dominates X dominates Y" to Kayne's definition in Note 5.

[7] Since we assume that movement is not driven by feature-checking, Abels' (2003) argument against this kind of movement dissolves. This conclusion does not imply that there is no anti-locality constraint; it implies that complement-to-specifier movement is not necessarily too local (essentially stipulated by Biberauer, Holmberg & Roberts) and that whatever anti-locality follows from is not redundancy of feature-checking.

(16)



Here, as in (15), X will again label β. Unlike in (15), however, the moved X asymmetrically c-commands the Root Y. Hence, by the LCA, X is linearised as preceding the Root. Since it is X^{min} that moves, this is a case of head-movement. It therefore gives rise to head-initial order.

We see then that the possible repairs of (4c) give rise either to rollup (15), and hence head-final order, or to head-movement (16), and hence head-initial order. This naturally leads us to consider these two options as a parameter. We can state the parameter as follows:

(17) **The second-Merge parameter (first pass):**
Repair the unstable structure in (4c) **either** with:
Move X (= head-movement, giving head-initial structure/order), **or** with:
Move Y (= roll-up, giving head-final structure/order).

Let us now adopt the "emergentist" approach to parametric variation (see Biberauer 2017, Biberauer & Roberts 2015, 2017, Roberts 2012, 2019), whose central idea is that parametric variation arises from the interaction of the three factors of language design of Chomsky (2005). According to this approach, parametric variation emerges from the interaction of a radically underspecified UG (first factor), the learner's characteristic mode of interaction with Primary Linguistic Data (second factor) and, most relevant here, optimisation conditions of various kinds (third-factor). The factor relevant here is the third factor Input Generalisation (see Roberts 2007: 275). We formulate this as follows (this formulation differs from the feature-based formulation in the references above):

(18) If operation O applies in context C_i in Grammar G, then O applies in all compatible contexts (C_1 … C_n) in G.

The import of Input Generalisation formulated as in (18) in the current context is that, all else equal, it will give rise to fully harmonic[8] head-finality as rollup generalises if the Y-option in (17) is taken, and to fully harmonic head-initiality as head-movement generalises if the X-option is taken. In principle,

[8] By "harmonic" we mean that all head-complement pairs show the same linear order, regardless of category. This is essentially the sense of word-order harmony that originates in Greenberg (1963) and is formulated in terms of heads and complements in Hawkins (1983).

the options in (17) can "flip" at any stage of the derivation; this is what gives rise to the possibility of disharmonic orders.[9]

A possible typological consequence of the parameter in (17) combined with Input Generalisation is that head-movement systems have richer probes, able to license defective goals by head-movement. Hence we may expect relatively rich functional structure in systems which take the head-movement option in (17), i.e. head-initial systems. It has been observed that head-final languages tend to lack determiners (Sheehan 2013), that head-final relatives are always non-finite and lack relative pronouns (Hawkins 2004, Kayne 1994, Cinque 2020a), etc. Furthermore, Ledgeway (2012: 242) argues that there were parallel changes in CP and PP between Early and Classical/Late Latin and Romance which involved the loss of final, silent probes and their replacement by initial, overt probes. Ledgeway relates these changes to the more general shift from primarily head-final order in Early Latin to primarily head-initial order in Romance. Roberts (2020: 193) summarises this development as follows:

(19) a. $[_{XP} [\ldots \text{Goal} \ldots] \ [_{Probe} \varnothing]]$
b. $[_{XP} [_{Probe} X \neq \varnothing] [\ \ldots \text{Goal} \ \ldots]]$

In terms of (17), however, we could reformulate (19a) as rollup movement over a silent head, while (19b) represents the head-movement option. The changes observed by Ledgeway are hence changes in the value of (19), and we expect the emergence of overt initial probes as a system shifts from the IM option to the EM option. What remains unresolved is what Roberts calls "the intriguing, and at first sight very difficult, question … why the 'head-final probe' should tend to be silent while the head-initial one tends to be overt." There is also a natural connection to head- vs dependent-marking in the sense of Nichols (1986, 1992), with head-marking reflecting the head-movement option and dependent-marking the roll-up option. Dependent marking and head-final orders are connected, as has often been observed in the typological literature (Nichols 1986: 79f., 1992: 105f, Tables 21-24; Song 2014: 200).

In this section, we have seen how the repair strategies for the unstable structure in (4c) represent the parametric options in (22), which relate directly to cross-linguistic word-order variation and possibly other properties.

[9] In principle, either head-final over head-initial or head-initial over head-final disharmonic orders are allowed by (17). However, the Final-Over-Final Condition of Sheehan, Biberauer, Holmberg & Roberts (2017) rules out the former option. FOFC can be informally stated as follows:
(i) A head-final phrase XP cannot immediately dominate a head-initial phrase YP (in a given local domain).
FOFC itself does not follow from the mechanisms under consideration here. Roberts (2019: 161) proposes that it follows from the application of a version of the Strict Cycle Condition of Chomsky (1973) to roll-up:
(ii) The Strict Cycle Condition:
No rule R can apply to a domain dominated by a node A in such a way as to solely affect B a proper subdomain of A.
In other words, if R can apply to B in (iii), then it must do so:
(iii) … $[_A \ldots [_B \ldots] \ldots] \ldots$
So rollup must always apply in the smallest domain it can. It will therefore derive head-final order in B before applying to A to derive head-final order there. As such, head-initial orders will never appear in the direct complement of a head-final category; such an order would necessarily involve non-application of roll-up in B followed by its application in A.

4. Generalized Dynamic Antisymmetry: Some Possible Typological Consequences

In this section we generalise our notion of PoS and, rather speculatively, consider some possibly typological implications of our approach.

We can define our generalised notion of PoS as in (20):

(20) $[\ X^{\alpha max/\beta min}\ Y^{\alpha max/\beta min}\ ]$

Stated in this way, there are four cases of PoS, shown in (21):

(21) a. $[\ X^{+max/-min}\ Y^{+max/-min}\ ]$

b. $[\ X^{-max/+min}\ Y^{-max/+min}\ ]$

c. $[\ X^{-max/-min}\ Y^{-max/-min}\ ]$

d. $[\ X^{+max/+min}\ Y^{+max/+min}\ ]$

Case (21a) is (4b), the unstable structure where two XPs are sisters, discussed in Section 2. Case (21b) is the head-head structure, discussed in Section 3. Case (21c) would involve two intermediate projections as sisters, ruled out by traditional X'-theory and impossible in bare phrase structure combined with labelling given the definitions of minimal and maximal: one of X or Y must provide the label, rendering the other +maximal. Case (21d) would be a clitic cluster, on the assumption that clitics are both maximal and minimal categories (Muysken 1982, Chomsky 1995, Roberts 2010, among others). We thus derive a result parallel to that in Kayne (1994: 19ff): fully symmetric syntactic clitic clusters, where the clitics are sisters, are impossible. For Kayne, this follows from his category-based definition of c-command (see Notes 5 and 6); we are able to derive it as a case of Generalised Dynamic Antisymmetry (GDA).

Our approach replicates a basic result of Chomsky (2013, 2015) to the effect that movement out of vP must take place. This is one case of Alexiadou & Anagnostopoulou's (2001, 2006) "*in-situ* generalization," formally:

(22) $*[_{vP}\ EA\ [_{VP}\ V\ IA\ ]]$

This is clearly an instance of (21a/4b). Chomsky's (2013, 2015) proposal that the structure is repaired by moving the EA to SpecTP is clearly fully consistent both with Alexiadou & Anagnostopoulou's generalization and with the general approach here. But there is also a potential typological consequence, in that (22) may also be relevant for Mahajan's Generalisation (see Mahajan 1994, Taraldsen 2017): there are no SVO ergative languages (see Taraldsen 2017 and Roberts forthcoming for documentation of this). If an ergative-marked EA is frozen *in situ* in Spec,vP by whatever mechanism Case-licenses it (see the papers in Coon, Massam and Travis 2017 for a range of proposals along these lines), then, even if the *in-situ* IA is able to access some special means of Case-licensing (e.g. a "low Absolutive" of some

kind), then (22) will result. But this structure features an unresolved PoS and so cannot survive to the interfaces. If the EA raises, then, by assumption, it is not ergative but nominative.

The GDA approach adopted here leads us to contemplate other possible derivational options. Consider the structures in (23):

(23) a. $[_{vP}$ (EA) v $[_{VP}$ V IA]] -- SVO
b. $[_{vP}$ EA (v+V) $[_{VP}$ (V) IA]] -- VSO
c. $[_{vP}$ EA v ($[_{VP}$ V IA])] -- VOS

The structure in (23a) corresponds to the repaired version of (22); this is the typical structure in SVO languages (which, as we have just seen, cannot feature ergative alignment). Here V-movement is also an option, as has been well known since Pollock (1989). In fact, if the IA has no internal structure V-movement would be required, given the discussion in Section 3.

In fact, (23b) corresponds to VSO order, or, more precisely to VSO order arising in languages where the EA does not raise out of vP. Following earlier proposals by Carnie & Guilfoyle (2000), Biberauer & Roberts (2010) suggest that there are two kinds of VSO languages (see also Roberts 2019: 383-98), distinguished largely in terms of the surface position of the EA. One type raises the EA, and so has the structure in (23a), but with V-movement to a higher position in the TP field than that occupied by the EA; this is what we find in the Celtic and Semitic VSO languages. The other type instantiates (23b) in that the verb raises (perhaps, at least in some languages, to a fairly low position in the TP field) and the EA does not move. This is the situation in various Austronesian and Mayan languages (see for example Massam 2001 on Niuean, and Coon 2013 on Chol). In these languages, the *in-situ* generalisation is satisfied by V/v-movement, suggesting that Alexiadou & Anagnostopoulou's reduction of it to Case-licensing is probably not correct. Taking verb-movement to be a consequence of the head-movement option in (17), the proposals in Section 3 predict that such languages will be head-initial and head-marking in Nichols' sense, which is basically correct. If we continue to follow Chomsky's (2013, 2015) assumption that copies are not relevant for labelling, then we predict that predicative categories would be labelled as nominal in these languages, given that v/V has raised out of vP/VP and the idea that copies do not count for labelling. There is some support for this idea, at least in Niuean where verbs may be "participial or even nominal in nature" (Massam 2005: 240), from which it follows that predicates are too. In VSO orders with the structure in (23b), V/v-movement must facilitate Case-licensing of the IA independently of the Case-licensing of the EA. VSO languages of this type tend to be ergative, consistent with the idea that the ergative-marked EA is frozen in place.

Turning next to (23c), this structure can derive VOS order. As is well known, this order is general in Malagasy (Pearson 2001, 2005). VOS order also alternates with VSO in verb-initial languages of the Austronesian/Mayan type discussed above. In the VOS order the object fails to show

case (Niuean) or definiteness (Chol) marking, and has an obligatory indefinite interpretation, as illustrated by the following examples:

(24) a. Ne inu kofe a Sione. (Niuean VOS)
Past drink coffee Abs Sione
"Sione drank coffee."

b. Ne inu e Sione e kofe. (Niuean VSO)
Past drink Erg Sione Abs coffee
"Sione drank the coffee."

(25) a. Tyi i- kuch- u (*jiñi) si' aj- Maria. (Chol VOS)
PRFV A3-carry-TV DET wood DET Maria
"Maria carried wood."

b. Tyi i- kuch- u aj- Maria *(jiñi) si'. (Chol VSO)
PRFV A3-carry-TV DET Maria DET wood
"Maria carried the wood."

As both Massam and Coon argue (see also Clemens & Coon 2018), the object undergoes a form of incorporation into the verb in these orders. Again, this is consistent with these languages adopting the head-movement value of (17) and, again, we predict general head-initiality and head-marking.[10] This is also the structure proposed by Belletti (2004) for "free inversion" in Italian, as briefly mentioned in Section 2. However, here the verb also moves, instantiating the basic option found across Romance. This indicates that these languages too take the head-movement option in (17), although the VP-movement in free inversion must then be considered something other than a repair option.[11] Still assuming copies do not count for labelling, the derived structure after VP-movement out of vP in (23c) is asymmetric, containing the head v and the EA, an XP. This is therefore a case of (4a), and v labels the residual category as vP, hence the EA is not required to move.

[10] Note that FOFC is relevant here, in that if a system opts for the head-movement option in (17) at the lowest structural level it cannot "flip" to rollup at higher levels, on pain of violating FOFC (i.e. the Strict Cycle; see Note 6). On the other hand, a system opting for rollup at the lowest level can "flip" to head-movement at higher levels, giving various permitted forms of disharmonic orders (and, presumably, mixed head- and dependent-marking).

[11] There may be a further option of rescuing the symmetrical structure by moving the VP to a higher position without verb-movement, much as it happens in causatives in Italian such as in … far [$_{\alpha}$ [$_{VP}$ lavare la macchina] a [Gianni t] (make clean the car to Gianni; "make Gianni clean the car") according to the analysis proposed in Guasti & Moro 2001. This may be a motivation for smuggling derivations in general, including in passives in many languages; see Collins (2005) and the papers in Belletti & Collins (forthcoming).

In addition to the options underlying basic SVO, VSO and VOS seen in (23), we have the rollup option shown in (26):

(26) i. [$_{vP}$ EA [$_{VP}$ IA V (IA)]]
ii. [$_{TP}$ [$_{vP}$ EA [$_{VP}$ IA V (IA)]] T (vP)]

This, of course, straightforwardly derives SOV order along with the possibility (a preference, given Input Generalisation) for general head-final orders and dependent-marking. The raised vP in (26i) constitutes a PoS unless the EA moves away; this does not affect the basic SOV word order.

A final logical possibility is shown in (27):

(27) * [$_{vP}$ EA [$_{VP}$ V (IA)]]

We assume that this structure is ruled out by Relativised Minimality: the IA is unable to move over the intervening EA (hence the necessity for smuggling derivations in passives and elsewhere, as first pointed out by Collins 2005).

These typological remarks require a great deal of further substantiation, and a range of structures involving clitics, smuggling and other patterns of (remnant) VP-movement need to be considered. However, we believe that the strengths and predictive power of GDA are clear.

5. Conclusion

Our central claims, for now, supporting a GDA approach to movement remain (i) that the generation of LCA-linearisable structures follows from Chomsky's Labelling Algorithm, and (ii) the third factor Input Generalisation applying to the head-movement and roll-up based repair strategies seen in (17) gives rise to the main word-order types we observe, yielding a range of other typological predictions and, many of which remain for future investigation, along with a full discussion of the dual nature of GDA.

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