Deriving Linguistic Variation from Learnability Conditions: the Chunking Procedure*

Adriana Fasanella[1] and Jordi Fortuny[1,2,3]
[1]*Centre de Lingüística Teòrica (CLT), Facultat de Lletres, Edifici B, Universitat Autònoma de Barcelona, 08193, Bellaterra (Barcelona), Spain*
[2]*Departament de Lingüística General, Facultat de Filologia, Edifici Josep Carner, Universitat de Barcelona, Gran Via de les Corts Catalanes, 585, 08007, Barcelona, Spain*
[3]*Complex Systems Lab, Parc de Recerca Biomèdica de Barcelona, Universitat Pompeu Fabra, Dr. Aiguader 88, 08003, Barcelona, Spain*

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Abstract

A parametric model must not only account for linguistic variation but also provide elements that guide the learner in the process of acquiring a particular I-language. Indeed, we stress that the central problem of parametric theory is the so-called Plato's problem (how do humans learn a language?), whereas what we may call Greenberg's problem (what is the shape and degree of linguistic variability?) is derivative. We review several macro- and micro-parameters and we show that they do not satisfy certain intuitive learnability conditions, whereby they are not plausible learning paths, nor plausible elements of UG. This leads us to explore a different parametric approach, which conjoins, on one hand, a mechanism of data analysis parametrically defined (the Chunking Procedure) arguably used by the Language Acquisition Device to attain a morphological analysis of its Primary Linguistic Data and, on the other, bootstrapping mechanisms that use the attained morphological analysis to specify more abstract syntactic properties of the target language, the clustering properties which standard parameters range over.

1 Introduction

This study capitalizes on the rationale that parametric theory must be concerned both with Plato's problem (how are natural languages learned?) and what we may call, using Fasanella (2011)'s terminology, Greenberg's problem (what is the degree and format of permissible variation?).[1] Our two general objectives are (a) to critically review a representative selection of parametric proposals in order to show how they neglect Plato's problem and (b) to propose a particular parametric approach that can be accommodated to the problem of language acquisition by means of a procedure of data analysis, which we will call the *Chunking Procedure*. As we will see, a parametric approach to both learnability and linguistic variation has numerous advantages and interesting consequences.

In section 2 we begin by reviewing certain macroparametric proposals and microparametric schemata in relation to certain intuitive learnability problems and conditions. This review to parametric proposals shows that most of the representative candidates of macro- and micro-parameters cannot be legitimate parameters coded in UG, but (in the best case) descriptive artifacts.

This situation forces us, in section 3, to investigate an alternative approach to parametric theory that satisfies the above-mentioned learnability conditions. Our starting point will be to define in a parametric way part of the mechanism of data analysis used by the Language Acquisition Device (LAD) in order to attain a morphological analysis of its Primary Linguistic Data (PLD).[2] Once this morphological analysis is attained, we will investigate the existence of bootstrapping mechanisms that use it to specify higher order syntactic properties of the target language, namely those properties that traditional parameters range over. In subsections 4.1, 4.2 and 4.3 we illustrate how three representative clusters of syntactic properties may be derived from the conjunction of procedures of morphological analysis and bootstrapping mechanisms, and we briefly consider in 4.1.1 the problem posed by mixed languages. In section 5 we summarize and conclude.

The present work is compatible with the idea that language learning can be viewed as a parameter fixation problem, since we define mechanisms of data

[1] In general, Plato's problem appears when some knowledge is not easily explained on the basis of direct learning from the environment, whereby it is necessary to appeal to some other factor, typically innate, to justify it. Language acquisition is a particular instantiation of Plato's problem. Whenever we use the expression 'Plato's problem' throughout these pages we will refer particularly to the problem of language learning, i.e., to the problem of attaining the remarkably complex linguistic knowledge from the environment.

[2] With the expression *Language Acquisition Device* (*LAD*) we refer, as usual, to the component of the human mind/brain responsible for carrying out the process of acquiring an I-language through the analysis of the PLD and guided by UG. Throughout this article, we will indistinctively use the acronym *LAD* and the very common terms *learner*, *infant* and *child*.

analysis parametrically, although it rejects the assumption that parameters exist as statements coded in UG. Syntactic variation patterns are derived precisely from the value attained by the conjunction of procedures of morphological analysis and bootstrapping mechanisms.

2 A critical review of standard parametric approaches

Traditional parametric proposals as well as some of the more recent minimalist approaches (understanding Minimalism as a second stage of the PP framework (cfr. Chomsky (1993, 1995) and subsequent work) have stressed the role of parameters in describing cross-linguistic morphosyntactic variation, but it is worth noting that a model of PP must also provide the elements that guide the learner in the process of interpreting the data he receives in terms of linguistic evidence in order to attain a particular I-language. Indeed our working hypothesis is precisely that taking into consideration learnability conditions we can attain a more accurate answer to both Plato's problem and Greenberg's problem. As noted above, this approach agrees with the original rationale behind Principles and Parameters. However, as we will argue in the following subsections, several representative studies within this framework neglect Plato's problem.[3]

2.1 Macroparametric proposals

The usual criticism against macroparameters vastly found in minimalist literature appeals to the argument of evolutionary plausibility. It is claimed that the more UG is overspecified with articulate and intricate networks of parameters, the less plausible an account of its supposedly recent evolutionary origin is (Chomsky 2005, Roberts and Holmberg 2010, Boeckx 2011). Our criticism, though, does not resort to evolutionary arguments, but deals with learnability considerations. Our observation is that, although macroparameters seem elegant in systematizing cross-linguistic variation (but see 4.1.1), they are not adequate to define formal models for language acquisition, since they exhibit what we may call the Locality Problem:

[3]The inverse situation can also be found, for instance in Gibson and Wexler (1994), the most representative learnability approach to parameter setting, which is related to Plato's problem and neglects Greenberg's problem. This study is focused on the formalization of the notion of *trigger* and explores whether parameters can be set using triggers through the Triggering Learning Algorithm, but it is not concerned with the discovery of those parameters that define the permissible degree of variability. It must also be noted that, as shown by Berwick and Niyogi (1996), the Triggering Learning Algorithm cannot in general ensure convergence to the target language.

(1) *Locality Problem*
In order to fix the value of a macroparameter the learner should analyze the data he receives in a global and transverse way, since macroparameters are defined on highly general properties that are spread across the target language.

We will illustrate this problem with the Polysynthesis Parameter (Baker 1996), defined in (2); properties associated with the positive fixation of the Polysynthesis Parameter that consequently languages like Mohawk or Nahuatl should show are listed below in (3).

(2) *The Polysynthesis Parameter*

Every argument of a head element must be related to a morpheme in the word containing that head.
Yes: Mohawk, Nahuatl, Mayali, etc.
No: English, French, Chichewa, etc.

(3) *Properties associated with a positive value of (2)*

a. There is subject and object agreement on inflected V (person, number and gender).
b. There is possessor agreement on N.
c. Inflections are obligatory and fixed in position.
d. Word order is free, noun phrases can be omitted and discountinuos constituents are possible.
e. There is noun incorporation.

For the learner to fix the value of such a general statement like (2), he should be able to determine what the arguments and the heads of a given sentence are, what arguments depend on what heads, by means of which morphemes arguments are realized in the word containing the heads, among many other properties. Moreover, all these analyses should be carried out for every sentence or piece of input the learner would receive and always before the fixation of the parametric value. Nevertheless it is obvious that the child cannot have access to a sufficient number of tokens of all relevant types of constructions of its language environment at once, as we linguists do have when examining the properties of a given language. This does not mean that the child does not receive enough data to set parameters, but rather that in order to set the value of a global macroparameter such as the Polysynthesis Parameter it is necessary to determine properties of a multitude of less general parameters tacitly compressed in the macroparameter (for example, whether the nominative morpheme is expressed in the word containing the verb, whether the accusative morpheme is expressed in the word containing the verb, and so on). In different words, it is

hardly conceivable that the LAD can set the value of a macroparameter unless less general properties are set before.

This entails that the the global procedure required in a macroparametric acquisition of a language is highly unlikely and, contrary to what has been claimed, macroparametric schemata (as the one in Baker (2001)) do not constitute plausible learning paths, since they do not adhere to the following efficiency learnability condition:

(4) *Atomicity Condition*
Parameters must be atomic, they cannot be clusters of properties.

This criticism also applies to most intermediate parameters, and in general to how standard parametric models have been developed so far, provided that the definition of parameters has been guided by the ideal of compressing multiple properties in a single and more abstract property. Inasmuch as the search for parameters is conceived in this way, the Atomicity Condition is automatically neglected, thereby leaving learnability conditions aside.

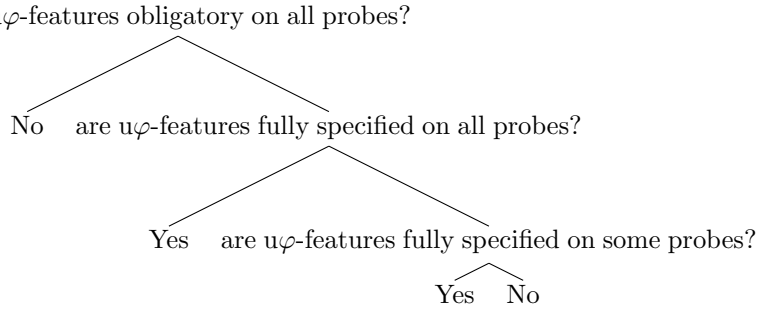
2.2 Microparametric proposals

Emphasizing the twofold goal of parametric theory, namely, to account for the problem of language acquisition and for the problem of what is the degree of morphosyntactic variation among languages, microparametric schemata are understood as both potential learning paths and as typological biases. One of the first attempts to develop an explanation in these lines is the work initiated by Gianollo et al. (2008). They claim that an important number of classical parameters could be formulated in terms of one of only five abstract parameter schemata that are supposed to be part of UG (Gianollo et al. 2008, 119):

(5) a. Is F, F a functional feature, grammaticalized?
b. Is F, F a grammaticalized feature, checked by X, X a category?
c. Is F, F a grammaticalized feature, spread on Y, Y a category?
d. Is F, F a grammaticalized feature checked by X, strong (i. e., does it overtly attract X)?
e. Is F, F a grammaticalized feature, checked by a category X°?

Another example of a parameter schema is the one proposed by Roberts and Holmberg regarding null arguments. They argue that the typological generalizations concerning this phenomenon could be accomodated to a specific schema (Roberts and Holmberg 2010, 49), simplified as follows:

(6)



If the first question is answered by the child with 'no', then he will end up having a radical pro-drop language; if the second is a 'yes', then the language will be polysynthetic; regarding the last question, a 'yes' will describe a non-pro-drop language and a negative answer will point to the different types of null subject languages.

A simpler example is proposed by Boeckx with the aim of summing up some of the most relevant parameter schemata in the literature (Boeckx 2011, 215):

(7) a. Is F present/active in the language? Yes/No
b. If Yes, does F give rise to Movement, or simply Agree(/Merge)?

As pointed out in the literature, third factor mechanisms (Chomsky 2005) should play an important role in the general working of microparametric schemata, since principles of conservativity are assumed to strongly guide the learner. This intuition is expressed by Holmberg and Roberts (2010) in the following terms:

> Acquirers, and therefore languages, favor a high position in the network. For general reasons of computational conservativity, the acquirer is always trying to stop, as it were. Acquirers only move down the tree if forced to by the PLD.

Nonetheless, it is crucial to notice that microparametric schemata rely on too abstract syntactic notions, like the cheking operation in (5), the probe-goal relation in (6) or the Agree operation assumed in (7), which the learner cannot directly detect on the basis of linguistic input. Consequently we argue that acquirers would be able to neither *move down the tree* nor even begin with the schema *if forced to by the PLD*. These approaches should clarify, for instance, how the infant could determine when a grammatical feature is checked by a category, what counts as a probe or when an Agree relation takes place, by

inspecting the PLD. Note that, even if we assume that all these operations and formal entities are part of UG, it is necessary to provide the means of connecting these prior notions to the analysis of linguistic evidence. In sum, microparametric schemata face the so-called Linking Problem, which has been already observed in the acquision literature:[4]

(8) *Linking Problem*
Parameters are defined over abstract linguistic entities such as verbs, nouns and pronouns, so the infant still faces the problem of linking these abstract mental representations to actual physical entities in the speech signal (Gervain and Mehler (2010) p. 194; cfr. Pinker (1984)).

Accordingly and contrary to what is commonly claimed, microparameters are not plausible learning paths useful for the child in order to acquire language. More precisely, although microparametric schemata satisfy the Atomicity Condition in (4), they fail to satisfy the following learnability condition:

(9) *Accessibility Condition*
Parameters must be set by directly inspecting phonological and morphological properties of utterances.[5]

We conclude this critical review by pointing out a third general learnability problem shared by some macro- and micro-parametric proposals: one of the two values of a parameter (or of a parametric statement) would be fixed on the basis of negative evidence. We call this problem the Indetermination Problem:

(10) *Indetermination Problem*
One of the two values of certain parameters cannot be determined on the basis of positive evidence.

Consider for concreteness the first statement of the microparametric schema in (7): "Is a feature F present/active in the language? Yes/No" . Let us reflect about how the child could procede to value this particular statement. We could

[4]The same problem has also been labeled 'the Epistemological Problem' (Dresher 1999).

[5]In order to solve the Linking Problem the existence of *cues* has been postulated. Cues are understood as parts of the linguistic input associated with parameters that enable their valuation by the learner. Models assuming cues (Dresher and Kaye (1990), for example) defend that UG provides the learner with all the parameters and with all the cues associated one by one to them. Although this is an attempt to solve the problem of linking input environment with the abstract entities parameters refer to, we see this move as a complication of what UG must consist of, that can be avoided by taking into account elements that are independently at work, like mechanisms of data analysis and bootstrapping, as we will show.

be tempted to believe that the child could set its positive value if he were provided with the appropriate positive evidence, say a relevant amount of sentences displaying an overt mark of feature F. However, it is unclear how he could discover that the target language lacks F. In order to show that this parametric statement is part of a plausible learning path it is necessary to propose a mechanism to compensate the lack of negative evidence. For instance, one could try to find out how many sentences should the learner receive before concluding, with no direct positive evidence, that F is absent. This problem extends to other microparametric statements as well as to some macroparametric proposals. Another example could be one of the five microparameters in (5): "Is F, F a grammaticalized feature, checked by X, X a category?" If the learner can positively detect that X checks F, then he can assign a positive value to this microparameter, but one must ensure that the learner will not search for positive evidence for ever when the target language does not display this checking operation. Seemingly, if a leaner were trying to assign a value to the so-called Polysynthesis Parameter (2), he would search endlessly for positive evidence if the target language does not show that every argument of a head is related to a morpheme in the word containing that head.[6]

In brief, if parameters are set through experience, formulating parameters that cannot be fully determined on the basis of positive evidence introduces complications from a learnability point of view that should be avoided, if possible. It is also conceptually implausible that UG is constituted of useless instructions for language acquisition, which cannot be easily determined on the basis of linguistic input. We express this rationale in terms of the following condition:[7]

(11) *Positive Evidence Condition*
Both values of a parameter must be set on the basis of positive evidence.

[6]It is possible to avoid the Indetermination Problem by assuming that the value of a parameter that cannot be set on the basis of positive evidence is the default value. The parameter would be initially set to this default value and would only be switched to the non-default value on the basis of positive evidence. Actually, the first 'parameter' proposed in the literature (Rizzi 1982, footnote 25), the possibility of having different bounding nodes for subjacency, is conceived in this fashion because of learnability considerations: the more restrictive option (NP and S are bounding nodes) is the default value and is only partially abandoned by the learner if data shows the contrary (S is not a bounding node in Italian, for example.) This is also one of the main features of the cue-based learning model developed by Dresher and Kaye (1990).

[7]In a very general sense this Positive Evidence Condition is covered by the Accessibility Condition, which states that parameters must be set by *directly* inspecting phonological and morphological properties of utterances. Nonetheless we want to make explicit this condition to remark that a great number of parameters found in the literature have a value that cannot be set on the basis of positive evidence in the PLD, leaving aside whether or not they appeal to abstract and non-detectable entities.

The three conditions formulated in this section that we argue that parameters must meet, in (4), (9) and (11), are directly deduced from learnability considerations. Our goal is not to overload the theoretical apparatus needed to approach the problem of language acquisition; on the contrary, we want to shed light on necessary learnability considerations that have been traditionally overlooked. Indeed these three conditions are no more than principles governing data analysis used in language acquisition, and thus would be part of Third Factor mechanisms (Chomsky 2005). Therefore, this work takes a step forward in the research of third factor mechanisms, since some conditions that would be part of them and play an important role during the growth of language in the individual are made explicit.

3 The Chunking Procedure

In this central section we will suggest a possible solution to the Locality Problem, the Linking Problem and the Indetermination Problem above mentioned by considering how certain morphosyntactic properties are signaled by acoustic or phonological features. We will explore the possibility that genuine parameters, that is, those satisfying the Atomicity Condition, the Accessibility Condition and the Positive Evidence Condition, can be reduced to or expressed in terms of mechanisms of data analysis.

Accordingly, we will not view parameters as points of variation coded in UG that compress multiple and relatively diverse aspects of the morphosyntax of possible natural languages, thereby differing from macroparametric approaches. Apart from that, the properties to be set by our mechanism of data analysis are not only atomic but can also be set by inspecting phonological and morphological properties of utterances, thereby differing from the higher order properties postulated by microparametric proposals, which are more remote from the morphophonological inspection of the PLD. Moreover, all values to be fixed by this mechanism of data analyisis could be set on the basis of positive evidence.

Our first step will be to express in a parametric way part of the mechanism of data analysis used by the LAD in order to attain a morphological analysis of its PLD. Once this morphological analysis is attained, we will investigate the existence of bootstrapping mechanisms that use it to specify higher order syntactic properties of the target language, namely those properties that traditional parameters range over. Our approach consists, therefore, in coding parameters in mechanisms of morphological data analysis and deriving syntactic variation from the value attained by those mechanisms. This move will suggest that Greenberg's problem may be reduced to Plato's problem.

It has been shown that infants are able to detect and extract abstract regularities from input (Marcus et al. 1999). It has also been argued that they are capable of using general-purpose statistical methods of analysis (Saffran et al. 1996) as well as phonological cues to segment continuous speech in terms of discrete units (Christophe et al. 1994, Sansavini et al. 1997). However, as objected by Yang (2004), statistical learning cannot reliably be used to segment words when scaled to a realistic setting. Yang discusses a series of computational models tested on a random sample of child-directed English sentences from CHILDES database. The computational model using only statistical learning methods based on local minima yields poor results, even assuming that the learner has syllabified the input correctly, a non-trivial task. Unsurprisingly, a second model that incorporates a small amount of prior knowledge about phonological structures to statistical learning obtains much better results. The third model considered by Yang, which obtains better results than the previous two models, does not use Statistical Learning Minima whatsoever: it simply stores previously extracted words in the memory to bootstrap new words.

However, we will not consider the word unit as a primitive of our parametric procedure, but rather the minimal morphological category, which we will call *morph* or *head*, and is understood as follows:

Definition
A linguistic form α, viewed as a string of phonemes, is a morph or head iff it is meaningful and does not contain any meaningful non-empty proper substring.

The task of segmenting continuous speech into heads or morphs seems to be guided by linguistic knowledge about phonological structures, such as prosodic information (see Kemps et al. (2005) and references cited therein). For instance, it has been observed that, in stress-timed languages, a stressed vowel of a noun (a head/morph) reduces as a function of the number of unstressed syllables attached to it (see Nooteboom (1972), for Dutch; Fowler (1977), Lehiste (1970), for English; Lindblom and Rapp (1973), for Swedish). This acoustic difference, which is perceived by listeners (Kemps et al. 2005), provides a useful cue to segment complex words into heads.[8]

We will take certain morphophonological properties of heads as *unit of inquiry* of the specific parameterization procedure. Our starting intuition is that all languages share the same class of grammatical features but differ as to how they realize them morphophonologically. We thus adhere to Cinque's cartographic proposal (Cinque 1999), according to which all languages share the same set (and hierarchy) of grammatical categories, although they may differ precisely as to whether they are realized as free ([-bound]) heads, agglutinating ([+bound,

[8]It seems reasonable to assume that, once a head has been identified, it is stored in the memory and used to bootstrap other heads, since this mechanism provides the most optimal model to learn non-complex words in a language like English, as noted above.

-closing]) suffixes, inflectional ([+bound, +closing]) suffixes, or non-heads, i.e., adverb phrases.[9] Let us now define the morphophonological analysis mechanism we want to explore:

(12) *Chunking Procedure*
Given a head H, the learner determines:
a. whether H is phonologically dependent of other heads ([+bound]) or not ([-bound]), and
b. whether H conveys only one morpheme ([-synthetic]) or more than one morpheme ([+synthetic]).

Property (12-a) is fixed by inspecting a string of heads. Whether a head is bound or not is arguably determined on the basis of phonological cues in the acoustic signal, such as pauses: if a pause can grammatically appear before and after a head, then this head is unbound; otherwise the head is bound. Similarly, if a head appears in isolation is unbound, and bound otherwise. Language-specific cues may also play a role, such as vowel duration, as noted above. Quoting Kemps (2005, 46), "the observed sensitivity of listeners to these prosodic differences [such as duration and intonation] suggests that these acoustic cues help the perceptual system in determining early in the signal whether an inflected (bisyllabic) or an uninflected (monosyllabic) form is likely to be heard". For instance, the length of a vowel of a noun in stress-timed languages indicates whether the following syllable constitutes a head bound to this noun or not.

Property (12-b) is fixed by inspecting how a head is related to grammatical categories provided by UG, henceforth *morphemes*. More precisely, the analysis mechanism should inspect whether a head conveys a sole morpheme or more. Here not only mechanisms of speech segmentation are involved, but the set of grammatical categories provided by UG must also be taken into consideration. In this respect, Pinker (1984)'s model regarding paradigmatic relations must be considered. Pinker assumes that adult morphological knowledge is represented by means of paradigms, and that the task of the child is building these paradigms during language acquisition:

> Instead of classifying declensional information solely by appending gramatical features to the lexical entries for each affix (and thus having the affixes server as indexes to that information), the grammatical information itself can also serve as an indexing system, under which particular affixes are listed (Pinker 1984, 174).

[9] We do not commit ourselves, though, to the claim that cartographies are a primitive of the syntactic component of UG (see Fortuny (2008) for discussion).

An important advantage of a model of paradigmatic morphology (apart from easing the segmentation task and allowing a more natural explanation of syncretisms, among others) is the simplification of the task under discussion, the discovery of the +/- synthetic nature of heads (or: which notions are encoded in a language's morphology?), one of the most "formidable search problems", in Pinker's words, the learner is faced with. On one hand, the gramatical information already learned for a given paradigm serves as an indexing system capable of atributing this particular information to the novel learned forms that enter into the paradigm. In other words, if the learner has hypothesized that certain form encodes, for example number and gender, he will extrapolate this knowledge to all the novel forms that will enter into this paradigm, symplifying the whole task of discovering the morphological content of his linguistic input. On the other hand, new information regarding which morphemes are represented by each morph is hypothesized on the basis of phonological and semantical salient properties of new paradigmatic acquired forms. This means that the learner would be endowed not only with a mechanism of morphophonological bootstrapping, but also with a semantic one (see Pinker (1984) for the details).

It seems reasonable to assume that the proposed procedure entertains firstly property (12-a) by considering mechanisms of speech segmentation and secondly property (12-b) by incorporating semantic considerations into the morphological analysis once segmention has been obtained. Indeed, developmental studies clearly demonstrate this fact: children learn to segment morphs and then use them respecting only one of the several morphematic distinctions they are associated with (say gender), and it is only later that they learn the full set of morphematic distinctions related to these morphs (gender and number, for example), as it has been shown by Slobin (1984).

Two clarifications are in order. Firstly, the fact that we take the properties of being ±bound and ±synthetic as the basics of the analysis mechanism regarding morphs does not mean that these are the very first operations that the LAD would entertain when trying to learn the target language. Prosodic analyses or the determination of phonological distinctions in the target language, to mention two representative examples, should occur first. Secondly, the properties of heads of being ±bound and ±synthetic must be indispensably fixed by the learner, independently of whether or not one assumes the mechanism in (12): determining the morphological segmentation and discovering the semantic content of units are mandatory tasks for the learner in order to acquire language. The novelty of our approach is to link two morphophonological necessary valuations and also to relate these valuations with bootstrapping mechanisms of high-order syntactic properties, as it will be shown below.

Let us highlight some general advantages of introducing (12) into the study of parametric theory. Firstly, the procedure satisfies the above-mentioned intuitive learnability conditions, thereby differing from standard macro- and micro-

parametric approaches. The properties or parameters of being [±bound] and [±synthetic] satisfy the Atomicity Condition, since they do not range over a variety of morphophonological properties but only on a single morphophonological property: being bound or unbound and conveying a sole morpheme or more, respectively. The properties of being [±bound] and [±synthetic] also satisfy the Accessibility Condition: the learner can detect whether a head is bound or not by inspecting acoustic and phonological properties of utterances, and it can also detect whether a head is synthetic or not by determining on the basis of a morphological analysis whether it conveys a sole morpheme or more.[10] Finally the procedure in (12) satisfies the Positive Evidence Condition by offering values that can be fixed through positive evidence in the PLD.

Secondly, linguistic variation can be attributed to accidental properties concerning how languages morphophonologically realize or pack features; in this sense the proposal we are developing emphasizes the minimalist Uniformity Hypothesis and reinforces the understanding of syntax as an invariant component (Chomsky 2001, 2):

(13) *Uniformity Hypothesis*
In the absence of compelling evidence to the contrary, assume languages to be uniform, with variety restricted to easily detectable properties of utterances.

And thirdly, as we will illustrate in the next section, the morphophonological parametric valuation attained in this procedure leads to certain syntactic patterns, and thereby we can account for standard case studies as well as for mixed patterns that cannot be so elegantly analyzed in classical parametric terms.

4 Deriving clusters of linguistic properties

The Chunking Procedure is a mechanism that explores the PLD in order to determine how heads are morphophonologically realized; it is thus part of the morphological analyzer of the LAD. In this section we will show how to use the analysis obtained by the Chunking Procedure as a trigger for bootstrapping syntactic properties of the target language. As usual, we consider bootstrapping mechanisms to be "heuristic learning mechanisms that exploit the universal correlations that exist between perceptually available, surface characteristics of

[10] This last point is relevant in order to understand what makes the Chunking Procedure different from microparametric proposals: the primitives of the analysis mechanism proposed are detectable on the basis of PLD, whereas the primitives used in microparametric proposals are too abstract to be detected in the input.

a language and its abstract morphosyntactic properties" (Gervain and Mehler 2010, 194).

We capitalize on the observation that there exist general correlations between abstract syntactic patterns and the analysis obtained by the Chunking procedure. These correlations reframe observations that have been noted in the literature, as will become clear. We will directly formulate these correlations as bootstrapping mechanisms that link syntactic patterns to the properties set by the Chunking Procedure, before discussing them in turn in the following subsections:

(14) *Bootstrapping mechanisms triggered by the Chunking Procedure*

a. Once the learner has determined that there is a [+bound] head instantiating a feature *F*, then he can infer that the maximal projection instantiating *F* in the target language:

1.has a free distribution, and

2.can be omitted.

b. Once the learner has determined that there is a [+bound] head conveying case or number on pronouns, then he can infer that any argument of the verb can be omitted in the target language.

c. Once the learner has determined that there is a [-bound] or a [+bound, -synthetic] head expressing path, then he can infer that multiple constructions that are related with the separate lexicalization of this head are available in the target language.

We will show how certain well-accepted correlations between morphophonological and syntactic properties can be recasted in terms of these three heuristic learning mechanisms. This situation helps us to derive linguistic variation from learnability considerations without falling into the problems of standard parametric approaches above noted. On the one hand, note that (14-a) is a general heuristic mechanism that may be relative to any grammatical feature; beside our case study of this general mechanism in section 4.1, all variation concerning the functional IP-area can be recasted in terms of whether a particular morpheme is realized through a maximal projecion (an adverb) or a functional head, following Cinque (1999). On the other hand, mechanisms (14-b) and (14-c) are relative to particular morphemes, case and number, and path, respectively.

4.1 The Polysynthesis Parameter

A starting general question in Baker (1996)'s work on polysynthesis is the nature and extent of morphosyntactic change. Two opposite views on the superficial

divergences between two apparently very different languages are considered: English and Mohawk. One possibility is that these two languages seem so different from each other as a consequence of a cumulative effect of a plenitude of minor differences. A further possibility is that English and Mohawk differ essentially as for a unique characteristic deeply embedded in their respective grammars that pervades a multitude of linguistic constructions. Baker's work is known to adhere to this second view, that is to the hypothesis that English and Mohawk look so different because they each have a different "structural genius". This approach leads Baker to the formulation and study of the Polysynthesis (macro-)Parameter, repeated below:

(15) *The Polysynthesis Parameter*

Every argument of a head element must be related to a morpheme in the word containing that head,

where a head is understood as an X^0 category in the X-bar format that is associated with an argument structure in the lexicon and the morphemes under consideration are agreement morphemes.

We must recall that Baker developed the informal formulation of the Polysynthesis Parameter given in (15) into what he considered to be a 'precise principle' concerning θ-role assignment (Baker 1996, 16). This principle was defined as a visibility condition:

(16) *The Morphological Visibility Condition* (MVC)
A phrase X is visible for θ-role assignment from a head Y only if it is coindexed with a morpheme in the word containing Y via:

a. an agreement relationship with a pronominal affix
b. a movement relationship (or noun-incorporation)
Yes: Mohawk, Nahuatl, Mayali, etc.
No: English, French, Chichewa, etc.

The two types of coindexing relationships, (16-a) and (16-b), were permitted in the standard PP framework wherein Baker's work was developed: (16-a) and (16-b) involve, respectively, coindexing between a DP and an agreement category, and coindexing between a moved element and its c-commanded trace in a thematic position, assuming Baker (1988)'s analysis of noun-incorporation in terms of head-movement. Some languages, like Mohawk, resort to both coindexing relationships, because they display agreement affixes on the verb for several arguments and productive noun-incorporation into the verb, whereas other languages, like Navaho or Warlpiri, show only (16-a), since they display several pronominal affixes and lack productive noun-incorporation. Other lan-

guages do not resort to morphological visibility to make arguments visible for θ-assignment; these languages, for which neither (16-a) nor (16-b) holds, are arguably specified with a negative value for the Polysynthesis Parameter.

Although we follow Baker's intuition that non-configurationality and incorporation may be somehow related to the same mechanism, we differ from his technical implementation for three reasons. One reason is that the MVC does not seem to be 'a precise principle' that appropriately develops the Polysynthesis Parameter. Note that, according to the formulation of the MVC, phrases in a non-polysynthetic language like English would be invisible for θ-assignment; accordingly, they would not receive a θ-role and they should be ruled out as impossible languages by the Theta-Criterion.

(17) The Theta Criterion (Chomsky 1981)
For every θ-role there must be one and only one argument; for every argument there must be one and only one θ-role.

In different words, the MVC does not distinguish polysynthetic languages from non-polysynthetic languages, but languages for which both (16-a) and (16-b) hold from those from which only (16-a) holds. Consequently parameter (15) is not properly developed into the principle MVC, but rather the MVC is a subparameter embedded into the Polysynthesis Parameter that sets apart two sets of languages. Another shortcoming is that the Polysynthesis Parameter is related to every θ-role of a language, whereas the MVC is a condition referred to single phrases. Indeed, if the Polysynthesis Parameter were 'developed' into the MVC, then the Polysynthesis Parameter is not a macroparameter of UG, but a byproduct: the difference between English and Mohawk would derive from a cumulative effect, and not from a principle deeply embedded into each language's grammar, a conclusion that is in contradiction with Baker's position.

A second reason to differ from Baker's implementation is his complete neglect of learnability considerations. As argued in section 2.1, the Polysynthesis Parameter fails to satisfy the Atomicity Condition, the Accessibility Condition and the Positive Evidence Condition. Baker's work on parametric theory is exclusively devoted to Greenberg's problem, with no concern about how parameters may be used in the acquisition process. We are thus compelled by the learnability considerations above given to search for an alternative to the so-called Polysynthesis Parameter.

A third reason is that we find the MVC unprincipled or hard to motivate on independent grounds. It remains unclear why a DP should need to be coindexed with an agreement affix to receive a θ-role from the verb. Given current standard assumptions on the design of grammar and the locus of variation, it is dubious that morphological considerations must intervene in the licensing

of deep semantic operations, such as θ-assignment. Instead, we will adhere to the rationale that linguistic variation affects only surface properties (say, morphophonological properties), and is not involved in the operations taking place in the Conceptual-Intentional component. A more straightfoward account can be attained indeed if we think that agreement affixes directly receive a θ-role, an option noted but not followed by Baker (1996).

We thus proceed to illustrate how the Chunking Procedure may be used to shed light on the problem of how the learner infers syntactic properties of the target language from a morphophonological analysis. Assume that, given an amount of linguistic input, the Chunking Procedure has determined that there is a [+bound] head H_1 (attached to the verb) that instantiates a particular θ-role θ_1. The learner should be able to determine on independent grounds whether H_1 is an incorporated noun or an affix agreing with a DP. More precisely, if H_1 can also appear without being incorporated and as a fragment, then it will be a noun, whereas if H_1 is always bound (i.e., it cannot appear freely or as a fragment), then it will be an affix. Consider now the latter situation, in which H_1 is an affix agreing with a maximal projection. In virtue of the bootstrapping mechanism above formulated (14-a), it follows that the maximal projection which the affix agrees with can be omitted and can have a relatively free distribution.

From a typological perspective, if the target language displays several [+bound] heads H_1, ..., H_n, each receiving a particular θ-role θ_1,..., θ_n, then the language will be described as predominantly polysynthetic. And if each θ-role were assigned to a different [+bound] head, then the language would be considered purely polysynthetic.

This illustration adapts, like Baker's work on polysynthesis, a traditional view in Amerindian linguistics that goes back, according to Foley (1991), at least to Wilhelm von Humboldt's analysis of Aztec (see also Baker (1996, 11) and references therein). According to this view, inflectional affixes count as pronouns and they provide the true subject and object of the verb; as a consequence, full DPs become optional and have the status of 'some kind of adjunct'. This provides a path to link morphosytactic properties to the morphophonological analysis of heads. A consequence of the piecemeal procedure we propose is that there is no Polysynthesis macro-Parameter coded in UG, a situation that would also emerge in Baker (1996), as noted, if one relates the informal Polysynthesis Parameter to the precise principle MVC.

4.1.1 On mixed languages

It must also be mentioned that the top-down parameterization dynamics of the macroparametric approach seems far from offering an elegant account to Green-

berg's problem, given the existence of 'mixed languages': indeed it is worth keeping in mind that pure types of languages are rare, if they exist at all. This issue is developed in Trask (2002)'s review of *The Atoms of Language*. In Trask's words, "the existence of (apparently numerous) 'mixed' or 'compound' languages, with complicated combinations of properties that seemingly cannot be neatly fitted into any sets of parameters at all, represents an enormous obstacle for B[aker]'s parametric account [...]" (Trask 2002, 78).

In the course we are developing, there is no parameter that sets the polysynthetic typological class of a language. That a language is predominantly polysynthetic is a cumulative effect of most of its functional heads being analyzed as [+bound]. This directly predicts the existence of mixed or non-pure languages, i.e., languages that display polysynthetic effects only to some extent. Consider, as an illustration, an instance of clitic doubling in Spanish. In certain varieties of Spanish, the dative clitic is mandatory, whereas the correferential PP can be omitted and appear in different positions, depending on pragmatic factors. The dative clitic behaves thus like an agreement affix of a polysynthetic language (Kayne (2005), among others), although Spanish is not a predominantly polysynthetic language:

(18) **Le** pedí que viniera
Clitic.DAT.3SG asked that come.SBJV.3SG
'(I) asked him to come'

(19) **Le** pedí a Juan que viniera
Clitic.DAT.3SG asked to John that come.SBJV.3SG
'(I) asked him John to come'

(20) A Juan **le** pedí que viniera
To John clitic.DAT.3SG asked that come.SBJV.3SG
'To John (I) asked him to come'

(21) *Pedí a Juan que viniera
Asked to John that come.SBJV.3SG
'(I) asked John to come'

The global two-valued Polysynthesis Parameter plays no role in the description of this simple pattern. One could be tempted to postulate a minor parameter relative solely to goal arguments, according to which the goal argument can be

either realized by a dative affix, as in Spanish, or by a PP; similarly, we could postulate a parameter relative to patient arguments, and another relative to locative arguments, and so forth, but this would be no more than an unprincipled way of providing uninteresting descriptions with no theoretical risk or value.

The pattern illustrated above can be more neatly explained if we assume a mechanism like the Chunking Procedure which explores the PLD and uses the resulting information to trigger bootstrapping. In this case, the relevant H, the dative *le*, is analized as [+bound] and the availability of the omission of the PP and its free distribution follow from the bootstrapping mechanism (14-a). Consequently, it seems to us that exploring mechanisms of morphophonological analysis in combination of bootstrapping mechanisms may provide a more principled and restrictive way to explore also Greenberg's problem.

4.2 Pronouns and dropped arguments

In this subsection we will be concerned with Neeleman and Szendrői (2007)'s proposal relating the morphology of pronouns with radical pro-drop phenomenon, and we will try to derive some of their results from the analysis obtained by the Chunking Procedure.

Neeleman and Szendrői's study examines the relation between the morphology of pronouns and the possibility of having or not radical pro-drop; they propose what they call the Radical Pro-Drop Generalization, which states that: radical pro-drop requires agglutinating morphology on pronouns.

The techninal machinery they use in order to derive this generalization is related with some independently motivated assumptions, namely, that null arguments are regular pronouns that cannot be spelled out at PF, that spell-out rules for pronouns target both terminal and non-terminal nodes and, finally, that the Elsewhere Principle regulates competing spell-out rules. It is not our objective here to review the technical implementation of their study, but we want to pay close attention to the predictions they make. As the authors claim, the proposed correlation between the form of pronoms and the availability of radical pro-drop makes two predictions. One is the weak prediction, which states that fusional morphology or invariant morphology on pronouns is incompatible with radical pro-drop. The other is the strong prediction, according to which all languages with agglutinating morphology on pronouns show radical pro-drop.

Regarding the weak prediction, Neeleman and Szendrői examine languages with fusional or invariant pronominal morphology, including classical pro-drop languages as well as creole languages. Their sample includes Swedish, Dutch, Afrikaans, Italian, Pashto, Greek, Papiamentu or Tok Pisin, and their predic-

tion is confirmed in all of them. For the sake of concreteness, let us consider the case of Swedish. Its pronominal paradigm is shown in the following table:

	Nominative	Accusative	Possessive
1 sg	jag	mig	min
2 sg	du	dig	din
3 sg M	han	honom	hans
3 sg F	hon	henne	hennes
1 pl	vi	oss	vår
2 pl	ni	er	er
3 pl	de	dem	deras

Table 1: Swedish pronominal paradigm

The paradigm in table 1 is completely fusional in the sense that case and number suffixes cannot be identified separately from the stem. This does not mean that some patterns could be extracted, like the string hVn in third person singular forms, for example. However, as the authors note, this is not enough to establish an agglutinating paradigm. The prediction is borne out, since Swedish does not allow pro-drop of subjects, objects and possesors.

The learner, obviously, needs to discover the full grammatical content of heads. Accordingly, the LAD, by means of the Chunking Procedure, should be able to determine, given the relevant amount of linguistic data, that pronominal heads like those listed in table 1 are synthetic, because they convey not only personal features but also case and number. However, we will not explore any bootstrapping mechanism to implement Neeleman and Szendrői (2007)'s weak prediction. The reason is that, provided that we understand bootstrapping as the positive implication that could be established between more easily detectable (morphophonological) properties and the presence of high-order (syntactic) properties, we avoid formulating negative implications, according to which the absence of a syntactic pattern is derived from a morphophonological analysis. In different words, the learner does not need to infer from the synthetic nature of pronouns that rules involving radical pro-drop are unavailable in the target language; in general, the learner does not need to learn what rules are unavailable in the target language, although they may be available in other natural languages. By restricting bootstrapping to positive implications the acquisition of syntactic properties is simplified.

With respect to the strong prediction, according to which all languages with agglutinating morphology on pronouns have radical pro-drop, Neeleman and Szendrői consider a great number of typologically unrelated languages as Korean, Burnese, Assamese, Hindi/Urdu, Chinese, Kokota, Cheke Holo and Turk-

ish. Leaving aside the complexities in the analysis of the pronominal paradigms of these languages, the strong prediction is also confirmed with respect to the sample, although Finnish seems to be a counterexample (it is agglutinative for case but only allows subject drop in the first and the second person). We take as an illustration the case of Korean. In this language, pronouns carry the same case particles that nouns do as suffixes. We reproduce below (some of) the pronominal stems in table 2 and the case endings they could be related to in (22):

	1 p	2 p	3 p
Sg	/na/	/ne/	/ku/
Pl	/wuli/	/ne-huy/	/ku tul/

Table 2: Korean pronominal stems

(22) Korean case endings
- a. Nom: /ka/
- b. Acc: /(l)ul/
- c. Gen: /uy/
- d. Dat: /ey/; /eykey/; etc.

Combining stems with case endings results in inflected pronouns, like *ku-tul-ka* '3p-pl-Nom'. As expected, Korean allows omission of subjects, objects and possessors, that is, shows radical pro-drop.

The relation that could be established between Neeleman and Szendrői's strong prediction and the analysis obtained by the Chunking Procedure is the following. Assume the learner has detected in the linguistic input that there is a head instantiating the category of case or number, analyzed as a [+bound] head. Crucially, the relevant recognized head must be analyzed as bound precisely to pronouns to trigger the bootstrapping postulated in (14-b). This means that LAD should keep track of the grammatical category of lexical units, such as pronouns, a task that is independently motivated for language acquisition and that arguably cooperates with the Chunking Procedure.[11] Note that case or number heads in languages like Korean could appear bound both to nouns and to pronouns, being only the later case relevant for Neeleman and Szendrői's generalization and for the bootstrapping we are exploring here. Once the relevant head instantiating case or number is recognized in the linguistic input and is

[11] This may differ from other cases where the analysis obtained by the Chunking Procedure is enough to trigger bootstraping. To make this point consider consider for example the case of pronominal clitics. If (pronominal) clitics instantiating a particular θ-role can only be bound to verbs, then analyzing the relevant head/clitic as [+bound] would be enough to trigger bootstrapping (cfr. section 4.1).

analized as bound to pronouns, the LAD follows the bootstrapping mechanism formulated in (14-b) and infers that the target language allows radical pro-drop, in which case verbal arguments and possessors can be grammatically omitted.

4.3 The satellite-framed/verb-framed distinction

In this section we will consider Talmy (1985, 2000)'s famous division between satellite-framed languages and verb-framed languages. In his influential work Talmy determines a typological distinction between languages depending on how they express the morpheme *path* in events of motion: "Path appears in the verb root in 'verb-framed' languages such as Spanish, and it appears in the satellite in 'satellite-framed' languages such as English" (Talmy 2000, 117-8).

The postulated distinction could be observed in the following examples in English and Spanish:

(23) The rock rolled down the hill
(Talmy 2000, 29)

(24) La botella salió de la cueva (flotando)
the bottle moved.out from the cave (floating)
'The bottle floated out of the cave'.
(Talmy 2000, 49)

In example (23) the verb *roll* expresses motion and manner of motion and it is the preposition *down* what encodes the morpheme path. But in example (24) the verb *salir* ("to go out") expresses both motion and path, whereas manner must be lexicalized in a different word, in this case in the gerund *flotando* ("floating"). Following this criterion English is classified as a satellite-framed language and Spanish as a verb-framed language.

Acedo-Matellán (2010) argues that satellite-framed languages must be subdivided into two types according to how they morphophonologically realize path in the satellite of the verb. Following his terminology, in strong satellite-framed languages path is not affixed to the verb, but is expressed in another word, like in English, Dutch, Hungarian or Finish. Weak satellite-framed languages show path affixed to the verb, like in Latin, Slavic or Ancient Greek. Therefore according to Acedo-Matellán (2010)'s work three linguistic types arise from the morphophonological realization of path in natural languages, namely, verb-framed languages on one side and strong satellite-framed languages and weak

satellite-framed languages on the other:[12]

(25) En Joan **sortí**
the Joan go.out.PRF.3SG.
'Joan went out'.

(26) John danced **into** the room

(27) Flatus arbusta **e**-volvens
gust(M)NOM shrub.ACC.PL out-roll.PTCP.PRS.NOM.SG
'A gust of wind rolling shrubs out'.
Lucr. 6, 141, (Acedo-Matellán 2010, 97).

Sentence (25) is an example of a classical verb-framed language, Catalan, where path is expressed within the verb as usual. In examples (26) and (27) we could appreciate the difference between a strong satellite-framed language, with path expressed by a word different from the verb by means of the preposition *into*; and a weak satellite-framed language as Latin, where path is expressed using a prefix *e-* on the verb.[13]

What is particularly interesting of Talmy's typological distinction is that it has been proposed that satellite-framed languages show some constructions that are banned in verb-framed languages. Acedo-Matellán (2010) demonstrates that Latin is correctly classified as a (weak) satellite-framed language insofar as it shows these constructions. We illustrate this phenomenon by considering Complex Directed Motion Constructions (CDMCs), Unselected Object Constructions (UOCs) and Complex Effected Object Constructions (CEOCs) (borrowing Acedo-Matellán (2010)'s terminolgy) in English, Latin and Catalan.

In CDMCs a directed motion event is expressed by some element in the structure, whereas the verb expresses a manner co-event:

(28) They danced out of the room

[12] As noted by Real-Puigdollers (2011), these three linguistic types are parallel to the unergative verb types defined by Hale and Keyser (1998):

1. Catalan: *parlar* ("speak") To speak
2. Basque: *lo egin* ("sleep do") To sleep
3. Jemez: *sae'a* ("work-do") To work

[13] In Latin, as Acedo-Matellán (2010) argues and exemplifies, path is very frequently expressed by means of a verbal prefix, but it could also be expressed through a PP, a combination of a prefix and a PP, a combination of a prefix and a DP and, marginally, a case-marked DP.

(Zubizarreta and Oh 2007, 128).

(29) Simulatque e navi e-gressus est
as-soon-as out ship.ABL out-walk.PTCP.PRF AUX.3SG
dedit
give.PRF.3SG
'As soon as he walked out of the ship, he handed it over'
Cic. Verr. 2, 2, 10 (Acedo-Matellán 2010, 111).

(30) *Els nois ballen fora de la cuina
the boys dance.PRS.3PL out of the kitchen
'Boys dance out of the kitchen'

Whereas in English (28) and Latin (29) CDMC are possible constructions, in Catalan they are ruled out (the sentence in (30) is possible in Catalan without meaning a directed motion event, that is, with the meaning of 'Boys are dancing outside the kitchen').

In UOCs an internal argument not semantically selected by the verb and not omissible is present, as well as some predicative element which is the licenser of the unselected argument:

(31) Sue shouted John deaf
(McIntyre 2004, 525).

(32) [Serpentes] [ova] solida hauriunt,[...] atque
snake(M)NOM.PL egg.ACC.PL whole.ACC.PL swallow.3PL and
putamina ex-tussiunt
shell.ACC.PL out-cough.3PL
'Snakes swallow the eggs whole and expel the shells through cough'.
Plin. Nat. 10, 197 (Acedo-Matellán 2010, 122).

(33) *La Sue cridà en John sord
the Sue shout.PRF.3SG to+the John deaf
'Sue shouted John deaf'.
(Acedo-Matellán 2010, 120).

As can be observed, the Catalan counterpart of the UOC in English is impossible, whereas Latin does show UOC.

CEOCs are predicates that involve an object interpreted as a created object and a verb that expresses how the event is carried out:

(34) John baked the cake

(35) Qui alteri misceat mulsum
who.NOM another.DAT mix.SBJV.3SG (honeyed)wine.ACC
'He who makes honeyed wine for someone else'.
Cic. Fin. 2, 5, 17 (Acedo-Matellán 2010, 149).

(36) *En Joan fornejà el pastís
the Joan bake.PRF.3SG the cake
'Joan baked the cake'.

Sentences in (34) and (35) express predicates of object creation, whereas the sentence in Catalan (36) is only possible with a change-of-state interpretation, not with a creation reading.

According to this data, it seems that Talmy's intuition is on the right track: when the morpheme path is realized not synthetically with the verbal stem (as in satellite-framed languages), then all these types of complex constructions are available. In other words, it is the lexicalization of the morpheme path separately from the verbal stem what enables the presence of the relevant constructions.

The analysis obtained by the Chunking Procedure could be used to bootstrap precisely this availability in the target language. Let us consider the three relevant possibilities. Assume that the Chunking Procedure has detected a H_1 expressing solely path; then there are two subcases: H_1 is [-bound] if the target language is a strong satellite-framed language, like English, or H_1 is [+bound, -synthetic] if the target language is a weak satellite-framed language, like Latin. In both cases, given the bootstrapping mechanism defined in (14-c), the LAD infers the availability of the relevant set of constructions. Consider now the third possibility, where H_1 is a head synthetically expressing path and further morphemes, such as motion; in this case, the target language would be a verb-framed language, like Catalan. The LAD must conclude that the head 'sort' (the verbal stem of *sortir*, 'to go out') is [+synthetic] insofar as it expresses more than one morpheme, but we do not derive bootstrapping mechanisms from this analysis for the same reason exposed in the previous section concerning negative implications: only the presence (and not the absence) of syntactic properties are derived by our bootstrapping mechanisms. This means that, if the target language is a verb-framed language, the learner does not infer that the syntactic component of the target language cannot generate the set of constructions under discussion, but simply it does not develop the possibility of generating them, whence its ungrammaticality.

5 Discussion

The objective of our study is two-fold. Firstly, we have critically reviewed some macro- and micro-parametric proposals and we have made explicit in which sense they neglect the problem of language acquisition by considering how they fail to satisfy three intuitive learnability conditions associated with three problems: the Atomicity Condition (for the Locality Problem), the Accessibility Condition (for the Linking Problem) and the Positive Evidence Condition (for the Indetermination Problem).

Secondly, we have proposed a particular parametric approach consistent with the learnability conditions under consideration: a mechanism of morphophonological data analysis, the Chunking Procedure, active during language acquisition. We have investigated to which extent the value of perceptually available features obtained by the Chunking Procedure (how they are phonologically packed [±bound] and what their morphological nature is [±synthetic]) eases the acquisition of certain abstract linguistic properties. In other words, we have explored how the analysis obtained by the Chunking Procedure could be used to bootstrap the presence (not the absence) of higher order syntactic patterns of target languages.

A remarkable contribution of such a proposal is to provide a parametric definition of some mechanisms of the morphophonological analizer taking into consideration both learnability as well as some patterns of linguistic variation. Indeed, whereas we capitalize on the former, the latter becomes derivative. By using this methodology, linguistic variation is examined in the very same terms as those used by the LAD when analyzing the PLD and, consequently, morphosyntactic variation is constrained by mechanisms of data analysis active during the process of language acquisition. Furthermore, provided that procedures of data analysis are considered to be elements of Third Factor (Chomsky 2005), this proposal leads to the appealing conclusion that by defining data analyzers in a parametric fashion, linguistic variation could be embodied in certain Third Factor mechanisms. Combining this idea with Chomky's Uniformity Hypothesis, this study emphasizes the invariant nature of the syntactic and the semantic components: linguistic variation is a matter of how languages pack the morphophonological content.[14]

[14]This last consequence agrees with the so-called Borer-Chomsky Conjecture:

(i) All parameters of variation are attributable to differences in the features of particular items (e.g., the functional heads) in the lexicon (Baker 2008b, 353)".

The Chunking Procedure exploits this conjecture insofar as it explores to which extent the differences in the features of particular functional heads would be concerned with its [±bound] [±synthetic] nature.

We remark that the parametric approach we have developed does not formulate parameters that compress multiple syntactic properties, thereby differing from the standard conception of parameter. Instead we directly define mechanisms of data analysis, which must independently be at work, using two atomic morphophonological properties of heads: the [±bound] parameter and the [±synthetic] parameter. The resulting analysis feeds certain bootstrapping mechanisms, used by the LAD to infer the clusters of syntactic properties which traditional parameters compress.

It is relevant to note that the parameterized mechanism of data analysis we explore in this work, the Chunking Procedure, is an instance of a common move in the history of Generative Grammar. Actually, the type of parameters commonly postulated in the literature have a status similar to certain abandoned artifacts, such as constructions, rewriting rules or transformation rules, in asmuch as they describe properties of grammatical byproducts. Nevertheless, in order to understand the nature of UG it is not enough to determine the characteristics of constructs: we must unearth the fundamental components that are behind them.

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