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## **Non Alternating Argument Structures: The Causative/Inchoative Alternation in Dictionaries \***

### **Abstract**

Argument structure alternations, and specifically the causative/inchoative alternation, cannot be defined in syntactic terms only, by abstracting away from the lexical set of possible arguments an alternating verb can take; in order to account for it, semantic restrictions on the arguments of the verb should also be considered. First, the paper illustrates the theoretical necessity for more granular specifications, taking into account both the verb and its possible arguments. Secondly, a survey of the way dictionaries treat this kind of information is provided; stress is laid on whether dictionaries can be considered an exhaustive source in this respect.

### **0. Introduction**

A crucial problem in lexicon design and construction is how to unify related uses of a lexical item in a single entry. This is the problem one encounters in dealing with alternations in argument structure, where the same verb can appear in a variety of argument structures which are related to one another through valency alternations. Typical examples are:

- (1) a. John ate the cake  
    b. John ate
- (2) a. John broke the glass  
    b. The glass broke

In cases like these, the creation of distinct entries for each argument structure the verb can enter into is unnecessary insofar as the verb entry contains enough information to derive the remaining uses by means of lexical rules. The reason for avoiding the explicit stipulation of the different argument structures associated with the same verb is two-fold. On the one hand, this solution is linguistically motivated as it establishes an explicit link between alternative uses of the same verb, rather than producing seemingly unrelated entries. On the other hand, from the computational point of view, it considerably reduces the size of the lexicon, delaying the expansion of the different entries till parsing time.

This strategy is possible as long as the basic lexical entry of the verb (from which the others are derived) contains the linguistic information triggering the lexical rule application. What are the properties that lexical rules should be sensitive to? There have been a number of suggestions in this respect (see

Katz & Levin 1988; Pinker 1989, among others). For all of them, the criteria governing argument structure alternations are associated with properties of the verb only.

The point of this paper is that properties of a verb represent only necessary conditions on whether a verb may undergo a given alternation. However, they are not sufficient conditions as well. I will contend that necessary and sufficient conditions on argument structure alternations must include restrictions on the possible arguments the verb can take. The claim, for what concerns us here, is restricted to the so-called causative/inchoative alternation (also known as ergative alternation or anti-causative alternation); however, I think it might be extended to other kinds of alternation as well.

In what follows, I will show how accounts of argument structure alternations that concentrate on the verb only appear to be too coarse-grained: finer-grained specifications – including conditions on the arguments – are required. First, the theoretical necessity for more granular specifications, taking into account both the verb and its possible arguments, is illustrated. Secondly, a survey of the way dictionaries treat this kind of information is provided; in particular, stress is laid on whether dictionaries can be considered an exhaustive source in this respect or whether the information extracted from them needs to be supported and integrated by evidence emerging from textual corpora.

### **1. Argument structure alternations, thematic roles and selection restrictions: theoretical background**

Let us consider the causative/inchoative alternation and some theoretical accounts that have been proposed for it. This alternation involves two argument structures: an intransitive and a transitive one. For example, a verb such as *roll* can be used both in transitive structures like (3a) below, and in intransitive structures like (3b) below:

- (3) a. John rolled the ball down the hill  
 b. The ball rolled down the hill

where *the ball* plays a different syntactic role, as the object of the verb *roll* in (3a), but its subject in (3b). Yet, *the ball* plays the same thematic role, that of theme, in both sentences. This is confirmed by the fact that, as Radford points out (1988), the object of *roll* in (3a) and the subject of *roll* in (3b) obey to the same selection restrictions, as exemplified by (4a) and (4b) below:

- (4) a. John rolled the ball/the rock/\*the theory/\*sincerity down the hill  
 b. The ball/the rock/\*the theory/\*sincerity rolled down the hill

where *theory* and *sincerity* are excluded from both the object position of the transitive reading and the subject position of the intransitive one. On the basis of the above example, the relation between the two argument structures involved in the causative/inchoative alternation can be pictured as follows: the object of the transitive reading of the verb undergoing this kind of alternation and the subject of the intransitive one bear the same thematic role, that of theme; this implies that they are subject to the same selection restrictions.

An apparent difficulty of this generalization is highlighted by Chomsky (1986) with respect to *break*, another typical verb undergoing the causative/inchoative alternation. Consider the following examples:

- (5) a. John broke the window
- b. The window broke
- (6) a. John broke his arm
- b. \*His arm broke (in the sense of 'he broke his own arm').

The examples above behave differently with respect to the alternation; as pointed out by Chomsky, in (6) it is impossible to construct the intransitive version of the (a) sentence. It would be difficult to contend that *window* and *arm* play two different thematic roles in (5a) and (6a), and that this is the reason why (6a) does not undergo the causative/inchoative alternation. If both *window* and *arm* are themes of *break*, how do we account for their different distribution in (5b) and (6b)? Chomsky explains this difference by assigning different argument structures to the sentences (5a) and (6a): "*John* is the Agent with the Object *the window* and also in one interpretation of *John broke his arm* (e.g. 'John broke Bill's arm'). But there is a second interpretation of the latter with the sense 'John's arm broke', in which case *John* is not the Agent" (Chomsky 1986:59). Thus, *John* is assigned the thematic role of agent in (5a) only, whereas in (6a) he bears the role of experiencer. Following Chomsky's line of reasoning, we can conclude that the alternation in question is sensitive to the **whole** argument structure of a verb. It is simply not enough to say that the theme of *break* is realized as an object of the transitive reading of the verb, and as a subject in its intransitive one: in fact, this is true if and only if the subject of the transitive reading bears the agent role.

To sum up, examples in (3), (5) and (6) show that similarities in thematic structure are reflected in similarities in selection restriction in alternating argument structures: i.e., the same thematic role in alternating argument structures of the same verb is supposed to be subject to the same selection restrictions. Whenever the selection restrictions are not the same, then a different argument structure must be hypothesized, as with *break* in Chomsky's account. The latter example demonstrates that criteria relevant for discriminating alternating from non alternating argument structures should consider the whole argument structure, rather than concentrate only

on the argument whose expression alternates between different syntactic realizations.

## 2. What formalization for defining argument structure alternations?

Let us now consider other verbs undergoing the causative/inchoative alternation, whose behaviour differs with respect to the cases considered above. Consider the sentences:

- (7) a. John began his career/the lesson/the concert/the show/the book  
 b. his career/the lesson/the concert/the show/\*the book began
- (8) a. John gathered his friends/the animals/his papers/his maps/berries  
 b. his friends/the animals/\*his papers/\*his maps/\*berries gathered
- (9) a. Mary rang the bell/\*the telephone  
 b. The bell/the telephone rang

Once again, these examples show that the same verb does not always undergo the alternation. For each example, possible and impossible alternations are contrasted. Two different cases can be distinguished: (7) and (8) show that not all possible objects of the transitive reading can play the role of subject of the intransitive reading of the same verb; conversely, (9) illustrates the opposite case, in which not all possible subjects of the intransitive reading can be the object of the transitive one. In the following, I will discuss in detail only the first case, as the kinds of problem posed by the two are similar.

Let us consider first how Chomsky's solution works with the sentences in (7) and (8). It could be argued that the subject of *begin the book* bears a different thematic role from the subject of, say, *begin the career*. What distinguishes *break the arm* in (6) from *begin the book* in (7) and *gather papers / maps / berries* in (8) is the thematic role associated with their subject: whereas the subject of *break the arm* cannot be assigned an agentive interpretation, in the other cases the subject is understood as the argument bearing the agent role. This different semantic interpretation associated with the subject of these verb-object combinations is also supported by the fact that the sentence in (6a) cannot be passivized, while all sentences in (7) and (8) can be. Therefore, the fact that *begin the book* or *gather papers / maps / berries* do not alternate cannot be accounted for by assigning a different thematic role to their subject, as Chomsky proposed for (6a).

Having excluded the possibility of a different thematic interpretation associated with the subject of *begin the book* and *gather papers / maps / berries*, the problem which arises at this point is how to define the conditions for the causative/inchoative alternation to be possible in cases like (7) and

(8). In order to account for it, the focus of the attention should be shifted from the subject to the object of the transitive reading.

Following the same line of reasoning put forward by Chomsky with respect to *break the arm*, one possible way of differentiating the alternating from the non-alternating cases would be that of differentiating the thematic roles assigned to the objects, on the basis of whether they can be syntactically realized only as object of the transitive reading of the verb, or both as object and subject of the transitive and intransitive readings respectively. For example, in the case of *gather* we might distinguish 'volitional' themes (exemplified by *friends* and *animals* in the case at hand) from 'non-volitional' ones (represented by *papers*, *maps*, *berries*): only the argument structure with the volitional theme undergoes the causative/inchoative alternation. Similarly, with *begin*, only event denoting themes (e.g. *lesson*, *concert*, etc.) seem to alternate between the object and subject syntactic realizations. But there seems to be something fundamentally wrong with packing all this information into the thematic roles, as the set of possible thematic roles becomes open-ended. This way, thematic roles lose their primary function, since they do not anymore lend themselves to useful linguistic generalizations. As a result, the causative/inchoative alternation would be defined for a wide range of different argument structures.

Another possible solution would be that of assigning the same role of theme to all possible objects in (7a) and (8a), to be integrated with selection restrictions operating on the fillers of that role. The specifications in (10) and (11) below, corresponding to the verbs in (7) and (8) above, illustrate this solution. For each argument structure, the syntactically expressed arguments the verb can take, their selection restrictions, and the thematic role associated with them are specified. Only by considering all these factors, it is possible to formally distinguish between the alternating from the non-alternating argument structures, which are represented in (10a) and (11a), (10b) and (11b), respectively.

- (10) a. begin (SUBJ, OBJ<+action,+process>)  
           agent                                  theme  
       b. begin (SUBJ, OBJ<-action,-process>)  
           agent                                  theme
- (11) a. gather (SUBJ, OBJ<+animate,+volitional>)  
           agent                                  theme  
       b. gather (SUBJ, OBJ<-animate,-volitional>)  
           agent                                  theme

This solution looks better than the previous one, since it preserves the generalizing function of thematic roles. On the other hand, it contradicts the assumption (stated with respect to (3) above) that in alternating argument structures identical thematic status with respect to the same verb implies identical selection restrictions. However, its purpose here was mainly

illustrative of the problems which need to be dealt with when accounting for the causative/inchoative alternation.

Thus far, it has been shown that the productivity of argument structure alternations should be defined by considering properties of the verb and of its arguments at the same time. On the basis of the evidence illustrated above, let us now consider how dictionaries treat this kind of information.

### 3. The causative/inchoative alternation and dictionaries

Currently available dictionaries provide an undoubtedly rich source of lexical information, but often omit or do not make explicit salient syntactic and semantic properties of lexical items. This is also the case of argument structure alternations holding for the same verb. One question that arises when dealing with alternations is whether the variants involve the same or distinct lexical entries, that is whether alternating argument structures of the same verb should be recorded within the dictionary under the same sense or whether they should be treated as different senses. In principle, I think that they should be collapsed under the same sense as long as the same syntactic and semantic specifications hold for the two alternating argument structures, including the verb and its arguments. In practice, whether the alternation refers to the same sense is a dictionary internal affair which depends on the organizational strategy adopted.

Some dictionaries, like the *Longman's Dictionary of Contemporary English* (LDOCE) and the *Collins Cobuild English Language Dictionary* (COBUILD), treat them within the same sense, although according to different strategies.

LDOCE provides, for each verb sense, subcategorization information by means of grammar codes, as shown below for the verb *break*:

**break** v 1 [I;T] to (cause to) separate into parts suddenly or violently, but not by cutting or tearing

Here, the code [I;T] indicates that sense 1 of the verb *break* can be either transitive or intransitive; the same code is used to encode the optionality of the object, as with verbs like *eat*. This information, combined with the causative specification, which is conveyed by *cause to* within the definition text, indicates that the verb undergoes the causative/inchoative alternation. Therefore, LDOCE accounts for the alternation by considering syntactic and semantic properties of the verb only. This kind of definition is too coarse-grained and if applied as such may generate ill-formed alternations: in principle, all example sentences illustrating this sense can possibly be turned into the corresponding transitive or intransitive ones. Going back to *break*, sentences illustrating both transitive and intransitive uses of the same sense – e.g. *I dropped my cup and it broke* and *he has broken his leg* – are

provided without distinguishing the cases for which the alternation is possible from those for which it is impossible.

COBUILD, being based on corpus evidence, provides more granular specifications, considering both properties of the verb and its arguments. Therefore, in the case of the verb *break* different senses are proposed:

**break**

1 V-ERG When an object breaks or when you break it, it splits into pieces as a result of an accident, for example because you have dropped it or hit it too hard

2 V-ERG When something long and narrow breaks or when you break it, it snaps into two pieces because it has too much pressure put on it, for example because you are pulling or pushing it at one end

3 V+O When you break a bone in your body, you damage it in an accident so that it cracks or splits

Here, senses are distinguished on the basis of the combined grammatical and semantic properties of the verb and its arguments. Whereas senses 1 and 2 undergo the causative/inchoative alternation (as shown by the V(erb)-ERG(ative) grammar code), sense 3 can only be used transitively (as shown by the V(erb)+O(bject) specification). The different selection restrictions on the object of the transitive reading in the different senses are the discriminating factors accounting for the different behaviour with respect to the alternation; from them, it follows that *break* with bones is excluded from the alternation.

The other possible strategy for dealing with the causative/inchoative alternation is that of assigning a different sense to each possible argument structure the verb can enter into. For example, both the Italian dictionaries which have been considered – *Il Nuovo Dizionario Garzanti* and the Italian DMI Database – split the different senses of a verb according to a transitivity-based organizational strategy. Under this strategy, different argument structures, even those due to transitivity alternations, are treated as different senses of the same verb. Consider the following Garzanti entries:

**abituare** (to accustom, to get accustomed)

(sense 1) v. trans.

far *prendere un'abitudine* (to cause to get into the habit)

(sense 2) v. intr. pron

*prendere un'abitudine* (to get into the habit)

**accagliare** (to curdle)

(sense 1) v. trans.

far *coagulare* (to cause to coagulate)

(sense 2) v. intr. pron.

*coagularsi* (to coagulate)

**alloggiare** (to accommodate, to stay at)

(sense 1) v. trans.

dare *alloggio* a qualcuno (to provide someone with a place where to stay)

(sense 2) v. intr.

prendere *alloggio*, essere ospitato (to have a place where to stay, to be guest)

**cominciare** (to begin)

(sense 1) v. trans.

dare *principio* a qualcosa (to give a start to something)

(sense 2) v. intr.

avere *principio* (to have a start)

**migliorare** (to improve)

(sense 1) v. trans.

rendere *migliore* (to cause to become better)

(sense 2) v. intr.

divenire *migliore* (to become better)

**rompere** (to break)

(sense 1) v. trans.

mandare *in pezzi* con la forza, *infrangere* (to tear to pieces by force, to smash)

(sense 5) v. intr. pron.

andare *in pezzi*, *infrangersi* (to go to pieces, to smash)

Here the alternation may be captured by comparing definitions across different senses, associated respectively with a transitive and an intransitive reading of the same verb. Thus, definitions, combined with grammar codes, appear to be a valuable source of information in this respect. In order to establish whether the different senses can be related through the causative/inchoative alternation, two different aspects of the definition text need to be taken into account: (i) whether the definition corresponding to the transitive reading contains a causativity specification; (ii) whether some aspects of meaning (which are underlined in the examples above) are shared by the two senses.

In the examples above, different patterns can be recognized, to be used for the identification and extraction of verbs undergoing the causative/inchoative alternation from the Garzanti dictionary. First, the senses involved are a trans(itive) one (corresponding to the causative alternant), and an intr(ansitive) or intr(ansitive) pron(ominal) one (corresponding to the inchoative alternant). Note that, in Italian, the inchoative alternant can also be expressed by the pronominal form of the verb: this is an idiosyncratic property of lexical items, and, as pointed out by Burzio, there is "no principled way to predict when in such transitive–ergative alternation 'si' will appear" (Burzio 1986:38). Second, as far as the definition text is concerned, a wide range of correspondence patterns can be observed:



- a) far (to make) + verb phrase – verb phrase (whose verb may appear in the intransitive pronominal form);
- b) rendere (to make) + adjectival phrase – divenire or diventare (to become) + adjectival phrase;
- c) dare (to give) + noun phrase – avere (to have) or prendere (to take) + noun phrase;
- d) mandare (lit. to send) + prepositional phrase – andare (to go) + prepositional phrase;

where: the first element of the pattern is to be found within the definition of the transitive alternant, and the second one within the definition of the intransitive one; and, the fillers of the verb, noun, adjectival and prepositional phrase slots are the same within the two definitions. The definitions of *abitare* and *accagliare* have been formulated according to the pattern (a); those of *alloggiare* and *cominciare* follow the pattern in (c); *migliorare* and *rompere* illustrate the patterns (b) and (d) respectively. Patterns (a–d) above represent just a selection of the wide range of possible patterns by means of which the causative/inchoative alternation is implicitly encoded within the Garzanti dictionary; however, all of them can be reduced to the more general pattern 'verb conveying a causativity specification + XP – verb conveying an inchoativity specification + XP', where the category X ranges over noun, verb, preposition and adjective categories, and the inchoativity specification can be directly incorporated in XP when it is realized as a VP (see pattern a).

What is said so far demonstrates that all dictionaries taken into consideration provide the information on whether a given verb undergoes the causative/inchoative alternation or not. However, given the different ways in which this information is encoded, procedures for the automatic acquisition of this kind of information have to follow different strategies. Whereas for Italian dictionaries different definitions of the same verb entry need to be compared, for English dictionaries this information is collapsed within the same verb sense. A procedure for the acquisition of verbs undergoing the causative/inchoative alternation from Garzanti is currently being implemented on the basis of the patterns illustrated above. A similar procedure has been applied to DMI by Antelmi and Roventini (1990), restricted to the class of verbs derived from nouns and adjectives. As far as the English dictionaries are concerned, both of them have been exploited as a source of this kind of information: see Sanfilippo (1992) for LDOCE, and ET10/51 Group (1993) for COBUILD.

However, except for COBUILD, all other dictionaries taken into account supply only partial specifications, which in our opinion cannot be translated as such in a lexical knowledge base. In fact, the information acquired from the Italian dictionaries and LDOCE is restricted to the verb, and thus provides only the necessary conditions for the alternation to be possible. This entails that the evidence provided by these dictionaries needs to be

integrated with evidence emerging from corpora; only by considering actual usage, i.e. the lexical set of arguments with which the alternation occurs, it will be possible to delimit the real domain of alternating argument structures.

#### 4. Final remarks

We have seen that traditional accounts of the causative/inchoative alternation consider properties of the verb only. What emerges from actual usage is that also restrictions on the arguments should be taken into account. Two are the consequences of having established that linguistic properties of the verb and its arguments should both be considered when dealing with argument structure alternations.

From the theoretical point of view, it demonstrates that linguistic generalizations such as argument structure alternations, when formulated in terms of syntactic patterns only, are too general and do not account for actual usage. More specifically, this shows that lexical and syntactic choices correlate in determining alternations, rather than varying independently of each other. Thus, both need to be considered as constraining the alternation, the syntactic properties of the verb on the one hand, and the lexical set of possible arguments it can take on the other. This fact can be seen as providing further evidence against the separation of lexis and syntax; this is one of the basic assumptions behind the design of the COBUILD dictionary (Sinclair 1991), the only dictionary which provides exhaustive information in this respect.

From the practical point of view, this implies that dictionaries and corpora should be combined in the acquisition of this kind of information. What extracted from dictionaries can only be used as the starting point to guide the lexical acquisition from corpora. This way, corpora become indispensable in the acquisition of lexical information relating to the range of different patterns of syntactic realization.

#### Notes

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