Lexicon Uniformity and the causative alternation

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There are two basic questions that an analysis of the English causative alternation, illustrated in (1), must address. First, is one variant of the alternation basic, and, if so, which one? Second, if one variant is basic, is there a lexical rule which derives the other variant?

(1) a. The butler opened the door. (Causative variant)
b. The door opened. (Anticausative variant)

With respect to the first question, the perceived additional semantic complexity of the transitive or 'causative' variant—its explicit association with a notion of cause—may suggest that the transitive variant is derived from the intransitive or 'anticausative' variant[1] by the addition of a CAUSE operator (e.g., Dowty 1979: 91; Härtl 2003; Lakoff 1966; Parsons 1990). This position is reinforced by the additional morphology associated with at least some verbs in this variant in some languages. In contrast, the intransitive variant is taken as derived by others (e.g., Chierchia 2003; Grimshaw 1982: 103ff; Levin and Rappaport Hovav 1995: 108; Reinhart 2002: 241, to appear: 27), most often because its verb is usually morphologically more complex than the verb in the causative variant in many languages, including French, Italian, and Russian (see also Koontz-Garboden 2009).

The second question has also received several answers. Some researchers have suggested that there is a lexical rule which derives one variant from the other (e.g., Grimshaw 1982: 103ff; Levin and Rappaport Hovav 1995: 108; Reinhart 2002: 241, to appear: 27; Williams 1981: 99). More recently, others have argued for a non-derivational approach to the alternation (e.g., Alexiadou, Anagnostopoulou and Schäfer 2006; Doron 2003; Harley 2008; Piñón 2001a, 2001b). On this approach, the verbs in the two variants of the causative alternation are each derived from a common root in the sense of Pesetsky (1995: 70; see also Alexiadou, Anagnostopoulou and Schäfer 2006; Doron 2003; Harley and Noyer 2000), but neither variant is derived from the other by a lexical rule.

[1]The label 'anticausative' is attached to the intransitive variant largely because the verb in this variant often comes with some explicit morphology which is taken to obviate the causativeness associated with the transitive variant (Haspelmath 1993; Nedjalkov and Silnitsky 1973). In English, there is no special morphology on the verb in either variant, so we use the term 'anticausative variant' here to refer to sentences with intransitive verb uses, as long as the same verb has some 'causative', transitive uses. Similarly, we use the term 'causative variant' to refer to sentences with transitive verb uses, as long as the same verb has some 'anticausative', intransitive uses. See Rákosi (this volume: 4) for more on these terms.

In this paper we revisit the English causative alternation[2] and propose an analysis which gives answers to these two questions that diverge from those embodied in our own previous analysis, as well as the analysis in Reinhart (2002, to appear). We argue, contrary to this earlier work, that the anticausative form of the verb is basic. Moreover, we suggest that the causative variant is not derived from the anticausative variant via a lexical rule. We point to a basic asymmetry between the single argument of the verb in the anticausative variant and the cause argument in the causative variant: the former argument is lexically specified by the verb, while the latter is not. Rather, extra-lexical factors determine the properties of the causative variant—that is, when a cause can appear and what qualifies as an acceptable cause. More important, it is not possible to provide a unified characterization of the cause argument in terms of its thematic specification, i.e., in terms of semantic roles or their component notions: what qualifies as a cause varies across verb classes and across choices of causative variant direct object. Thus, an account of the causative alternation will have the widest possible coverage if all alternating verbs are lexically associated with only a single argument, and the causative variant is not derived uniformly by a rule which adds an argument with a certain thematic specification.

We argue that our analysis better brings the causative alternation under the purview of Reinhart's Lexicon Uniformity Principle (2002: 284, to appear: 5, (5)), a principle which articulates an approach to lexical phenomena, certain facets of which we strongly concur with. This principle, which is built on the observation that the lexicon is replete with regularities, reflects the assumption that analyses of the relevant phenomena should capture these regularities as much as possible. We argue that an analysis which uniformly derives the anticausative variant of the causative alternation from the causative variant does not capture the regularities in a perspicuous way. In particular, such an analysis leads to the positing of polysemy where this does not seem warranted, and it fails to capture the existence of anticausative variants which systematically lack causative counterparts.

In the next section we introduce the Lexicon Uniformity Principle, making the assumptions behind it explicit, as part of a larger discussion of some considerations and assumptions relevant to any account of argument alternations, many of which we share with Reinhart. Following that, in section 2 we review data that are problematic for an analysis that takes the causative variant to be basic, deriving the anticausative variant by a lexical rule. In section 3 we introduce our new analysis which instead takes the anticausative variant to be basic, and we propose that a causative variant is available when the cause meets what we call the 'Direct Causation Condition'. We further support this condition by demonstrating its applicability to verbs of sound emission in section 4. Section 5 asks why in some instances only the causative variant is available for verbs which in general show both variants, attributing this asymmetry to what we call the 'Proper Containment Condition'. The con-

[2]Due to the theme of the volume and space limitations, our analysis of the causative alternation is presented in the context of Reinhart's Lexicon Uniformity Principle; concomitantly, we focus on just those facets of the analysis that relate to the better understanding of this principle. We leave for another paper explicit comparisons of our analysis with other analyses, as well as the investigation of the implications of our proposed analysis for the relation between anticausatives and unaccusativity. Furthermore, although the causative alternation is instantiated in many languages and has been intensively studied in various languages, we restrict our attention to English. We recognize we must extend our analysis to other languages in the future.

clusion, section 6, revisits the Lexicon Uniformity Principle in light of our analysis of the causative alternation. We suggest that the notion of lexicalization is useful to understanding what it means to satisfy this principle.

1 The Lexicon Uniformity Principle: A Hypothesis about the Structure of the Lexicon

The following quote encapsulates some basic assumptions which Reinhart makes about the (verb) lexicon.

> I believe the lexicon is the information storage of everything needed for speakers to actually use language to describe the world. In some sense, (almost) everything comes from the lexicon. This view entails also that lexical information is largely universal/innate (except, of course, for the sound coding), has minimum idiosyncrasy, and is governed by generalizations that are relevant also for the computational system. (Reinhart to appear: 4)

As this quote articulates, while the lexicon, as the place for indicating pairings of sound and meaning, is a locus for registering idiosyncracies, it is not at all 'an appendix of the grammar, a list of basic irregularities', as Bloomfield (1933: 274) proposes. Rather, on Reinhart's view the lexicons of natural languages contain, among other things, lexical forms of verbs which are in some way related, and the relatedness between these forms is captured by rule. Reinhart makes this intuition explicit in her Lexicon Uniformity Principle:

(2) Each verb-concept corresponds to one thematic structure. That is, the various thematic forms of a given verb are derived by arity (valence changing) operations from one thematic structure. (Reinhart to appear: 5, (5))

More specifically, if there are morphologically related forms of a verb which differ in their thematic structure, as active and passive forms do, they should be related by a rule, the assumption being that the form of one will be predictable from the other. Indeed, this seems to be why the active and passive forms of a verb are assigned a single lexical entry in the early transformational literature. Chomsky (1957: 42–3) points out that the subcategorization and selection properties of a verb's passive form are predictable from those of the related active form, suggesting that the former can be derived from the latter by rule.[3] As far as we know, this observation is correct. In addition, active and passive sentences with the same

[3] Although in transformational accounts the grammatical relation changes associated with passivization are attributed to syntactic movement, there is still a lexical rule involved: the syntactic movement is triggered by adjustments to the verb's lexical entry, such as a modification in its accusative case assigning properties. In lexicalist theories such as LFG and HPSG, active and passive forms of a verb are given distinct lexical entries related by a lexical rule. This approach seems to be in the spirit of Reinhart's Lexicon Uniformity Principle, to which we assume that lexicalist analyses conform.

verb share the same truth conditions (unless they contain quantified NPs; e.g., Chomsky 1965: 224), and the choice between them is largely due to animacy and information structure considerations (e.g., Bresnan et al. 2001; Krauthamer 1981; Ransom 1977; Thompson 1987). The conclusion that the active and passive forms of a verb are instances of the same verb-concept, to use Reinhart's term, emerges from these facts.

Languages do not, however, necessarily have to show this property. Nothing, for example, a priori excludes a language whose verbs have distinct, but morphologically related verb forms, which are conceptually related, but not in a way that can be captured strictly by rule. Thus, Reinhart's Lexicon Uniformity Principle can be taken to be an empirical claim or, more in line with her own statement, a guideline which helps explore the extent to which there is regularity in the relation between morphologically related forms of verbs and the nature of this regularity. The specific formulation of the Lexicon Uniformity Principle expresses the claim that the appropriate construct for capturing the regularity is an arity operation, an operation on the thematic structure of a verb. We devote much of this paper to investigating the validity of this claim.

As a case study, Reinhart (to appear: 7–8) examines how the Lexicon Uniformity Principle can be applied to the causative alternation. She takes the verbs in the causative and anticausative variants of the causative alternation to be instances of the same verb-concept. Thus, the Lexicon Uniformity Principle dictates that each such verb pair should share a lexical entry and have a single thematic structure, which we understand to be a lexical specification of the arguments associated with that verb. Since the verbs in each such pair differ in thematic form, one must be derived from the other by an arity operation. To the extent that arity operations can be shown to capture the relatedness between causative and anticausative forms of the verb, the Lexicon Uniformity Principle, in Reinhart's specific formulation, can be taken to be verified as an empirical claim.

In this paper, however, we present another approach to the causative alternation. We argue that although the alternation falls under the purview of the Lexicon Uniformity Principle, it represents a regular relationship between two thematic forms of a verb that is not captured by an arity operation. We support this new analysis following a review of Reinhart's own most recent analysis, which is based on an arity operation (to appear: 27). Deriving the properties of one verb form from those of another by an arity operation, requires a specification of the components of the representation that the rule operates on. In current generative practice, the rule which derives one thematic form of a verb from another operates on an argument structure representation. Although there are various proposals about what needs to be included in an argument structure representation (e.g., Bresnan 1982; Grimshaw 1990; Levin and Rappaport 1988; Marantz 1984; Williams 1981), at minimum, such a representation must make explicit what arguments a verb is associated with. Often, it includes more specific, usually semantic, information about each argument. In Reinhart's Theta System, arguments are classified into semantic types on the basis of two binary features, and the rules operating on thematic structure—an argument structure with semantic role specifications—make reference to these features. Reinhart's general claim is that such a representation is appropriate for the formulation of lexical rules which relate morphologically related forms of the same verb-concept.

This claim is precisely what we argue against as an analysis of the causative alternation. We show that the causative alternation should indeed be brought under the purview of the Lexicon Uniformity Principle, so that the two variants of the causative alternation in English are viewed as involving two forms of the same verb-concept; however, we argue that the regular relation between these forms is not best captured by a lexical rule which operates on a thematic specification of the verb deriving the anticausative form from the causative form.

2 The English causative alternation revisited

Reinhart's analysis of the causative alternation takes the causative variant to be basic, deriving the anticausative variant from it via a lexical arity operation of decausativization (to appear: 27, (52); called 'expletivization' in 2002: 241). This operation applies to verbs whose thematic structure involves two arguments, one of which has the lexical specification [+c(ausing change)]. This lexical specification identifies arguments that fall under a broad notion of cause, subsuming agents, natural forces, and instruments (to appear: 25). The decausativization operation eliminates the [+c] argument altogether, leaving a thematic structure with a single argument—the thematic structure of the anticausative variant. This analysis is similar in spirit to our own earlier analysis of the causative alternation, which takes the anticausative variant to be formed from the causative variant of externally caused verbs (Levin and Rappaport Hovav 1995: 108)—verbs describing eventualities which involve some cause with immediate control over the eventuality. In our earlier analysis the externally caused verbs which participate in the alternation are just those which do not impose semantic restrictions on their cause argument. This makes the class of alternating verbs essentially coextensive with Reinhart's two-argument verbs with a [+c] subject, since the [+c] specification singles out those verbs that simply specify that their subject is a cause.

We contrast our current analysis of the causative alternation with Reinhart's, even though many of our criticisms of Reinhart's analysis can also be leveled against our own 1995 analysis. We do this because Reinhart's analysis provides a backdrop for discussing the Lexicon Uniformity Principle, the starting point for our new analysis of the causative alternation. Furthermore, we take issue with the claim that the conditions which restrict the causative alternation are lexical—specified in the thematic structure of the verb—and Reinhart develops this claim more explicitly than we do.

The following quote from Reinhart makes explicit the observational basis for her account of the causative alternation: the assumed pervasive regularity between the existence of causative and anticausative variants for verbs which take a range of cause subjects when used transitively.

> There are hardly any exceptions to the claim that if an unaccusative entry has a transitive alternate, that transitive can occur with Agent, Cause or Instrument as subject (namely, it selects a [+c] cluster), and vice versa. The correlation is overwhelming. The transitive member of the alternation may be missing

> idiosyncratically in a given language for a few instances. (Reinhart to appear: 26)

We devote this section to showing that many English verbs have single argument—i.e. anticausative—uses and related causative uses, which together constitute a causative alternation, but that these uses are often found with limited choices of arguments. In section 2.1 we show that change of state verbs that may select agents, natural forces, and instruments as subjects may nevertheless not have anticausative uses for some choices of theme. As the relevant verbs participate in the causative alternation, this phenomenon does not contravene the picture in the quote. It is not, however, explained by the decausativization operation, yet it is pervasive enough that it should be encompassed by an account of the alternation. In section 2.2 we show that certain types of verbs have natural causative uses, but these causative uses cannot be instantiated with the entire range of causes allowed by the [+c] specification in the structural description of the decausativization operation. These verbs, then, do not conform to the generalization suggested in the quote above. In section 2.3 we show that the specific nature of the cause argument often depends on the object argument chosen in the causative variant. The data in these sections lead us to conclude that it is more perspicuous to take the verbs in question to be single argument verbs and to formulate the conditions on the appearance of the cause argument. Since the specific semantic role of the cause is not consistent across verb classes and across choices of direct object, we assume that it is not a lexical rule which adds a cause with a particular semantic characterization. Rather, we argue that the nature of possible causes is determined non-lexically.

2.1 Causative variants that lack anticausative counterparts

We begin by considering verbs which meet the criteria for Reinhart's decausativization operation—they have causative uses with [+c] subjects—but they do not allow every noun phrase that can be the direct object of the causative variant to be the subject of the corresponding anticausative variant. Such verbs are significant because they do not show what is taken to be the characteristic pattern of behavior for causative alternation verbs. So not only do previous accounts agree that causative alternation verbs allow a range of subject types, but they also assume that these verbs show the alternation across all choices of themes selected by the relevant verb; in fact, this purported generalization is used as a justification for positing a rule that relates the two variants (e.g., Fillmore 1970; Hall 1965). Thus, the change of state verbs *break* and *melt*, which are taken to exemplify the canonical causative alternation verbs, allow a range of subject types, as in (3), thus meeting the criterion for Reinhart's decausativization operation; further, they manifest the alternation across a wide range of themes, as (4) and (5) show.

(3) a. Antonia/the wind/the ball broke the window.
b. Pat/the sun/the microwave melted the chocolate.

(4) a. Antonia broke the vase/the window/the bowl/the radio/the toaster.

b. The vase/the window/the bowl/the radio/the toaster broke.

(Levin and Rappaport Hovav 1995: 85, (7))

(5) a. Kelly melted the butter/chocolate/ice/wax/gold coins.

b. The butter/chocolate/ice/wax/gold coins melted.

However, although *break* is taken to be THE prototypical causative alternation verb, it does not show the causative alternation for every choice of theme. As Levin and Rappaport Hovav (1995: 85) point out, some causative *break* sentences lack an anticausative counterpart, as in (6).

(6) a. He broke his promise/the contract/the world record.

b. ∗ His promise/the contract/the world record broke.

(Levin and Rappaport Hovav 1995: 85, (9))

The asymmetry in available variants illustrated in (6) is pervasive. Consider the deadjectival change of state verb *clear*, discussed by Levin and Rappaport Hovav (1991, 1995: 85–6), which specifies that an entity becomes unobstructed in some way. As the following examples indicate, this verb satisfies the conditions on Reinhart's decausativization operation: its external argument may be an agent, instrument, natural force, or even event.[4]

(7) a. In one case, R v Waterfield, the trial judge had cleared the court while the jury was shown allegedly obscene films. (BNC J78)

b. What they found was that the wipers cleared the windscreen perfectly well. (BNC CFS)

c. On the third morning a gust of wind swept out one final flurry and cleared the sky. (BNC BNU)

d. ... merchant seamen who fought the great naval battles which cleared the seas and made possible future trade with the East ... (BNC FES)

However, *clear* does not have an anticausative counterpart for every choice of causative variant theme, as shown by (8), where unlike in (6), the verb is not being used figuratively.

(8) a. The waiter cleared the counter.

b. ∗ The counter cleared.

What accounts for the unacceptability of sentences like (8b)? It is possible that this kind of clearing can only be brought about by an agent actively involved in bringing about

[4] Abbreviations for sources of corpus examples: 'BNC' — British National Corpus, 'COCA' — Corpus of Contemporary American English, 'LN' — Lexis–Nexis, 'NYT' — *The New York Times*.

this change of state; this contrasts with clearing a windscreen which could be done by an agent, an instrument, or even a natural force such as the rain or wind. One possibility is to attribute the unacceptability of (8b) to the [+c] specification on the decausativization operation, which prevents agents, specified as [+c+m], from undergoing this operation. However, if we attribute the unacceptability of (8b) to its verb having an argument lexically specified as [+c+m], then two verbs *clear* must be posited: an agentive verb, lexically specified as [+c+m], which, thus, disallows decausativization, and a second verb which does not impose an agentivity requirement, i.e. it is lexically specified as [+c], and which, thus, allows decausativization. The first verb would lack an anticausative variant, while the second verb would permit such a variant. This solution, then, takes a verb like *clear* not to conform to the Lexicon Uniformity Principle. As Reinhart notes (2002: 284, to appear: 5), in some instances morphologically identical words may just have to be associated with different concepts; however, this position should be taken only if it can be shown that there is no other generalization that can account for the data.

However, this solution is built on the assumption that the use of *clear* in (8a) is agentive, an assumption which is invalid. The same sense of *clear* is found in (9), which has a natural force as the cause.

(9) The wind was enormous. There was a huge dinner table set-up, and the wind cleared the entire table onto the floor and blew over chairs.
(http://www.sfreporter.com/santafe/article-5480-sfr-talk-the-set-up-man.html)

Thus, positing that there is a verb *clear* which selects an agent—a [+c+m] argument—is unjustified. We conclude that the unacceptability of (8b) cannot be attributed to the lexical specification of the verb.[5] Thus, there are constraints on the application of decausativization to a verb's thematic structure beyond the requirement that the verb lexically select a [+c] argument.

The difficulties with stating the conditions on the decausativization operation are not unique to the verb *clear*; rather, as we now show, the difficulties found with *clear* reflect a much more general phenomenon. Comparable patterns are found with the change of state verbs *lengthen* and *empty*. These two verbs do not require their subject to be an agent, but rather allow various types of causes as their subject, as (10) and (11) show.

(10) a. A low carb diet may lengthen your life.
(http://lowcarbdiets.about.com/b/2010/11/01/)

[5] Any account which claims that a verb's lexical specification constrains the availability of the anticausative variant faces a more serious problem: the apparent influence of context. We also make this point with the verb *clear*, which is unusual in taking an optionally expressed argument describing the stuff that gets removed from the theme (e.g., *I cleared the table of dishes*; Levin and Rappaport Hovav 1991). The entity chosen as this argument can influence how the verb realizes its arguments, even if this argument is left unexpressed. Thus, *The police cleared the yard* has the acceptable anticausative counterpart *The yard cleared*, if people are understood to be leaving the yard, as when a crowd disperses, but it lacks such a counterpart if the police are clearing some type of equipment from the yard. We intend to deal with this issue in future work.

b. Intensive care unit infections can lengthen hospital stays. (http://www.kevinmd.com/blog/2009/12/)

(11) a. It was the failures of those floodwalls that emptied the lake into the rest of the city . . . (http://www.washingtonpost.com/wpdyn/content/article/2005/09/20/AR2005092001894.html)

b. Toyota Hilux conquers the volcano just before its eruption emptied the skies . . . (http://www.globalmotors.net/toyota-hilux. . .)

Thus, on Reinhart's account these verbs should permit the causative alternation generally, yet they too do not show the alternation for some choices of theme, as in (12) and (13).

(12) a. I lengthened the skirt and added some ric-rac. (http://madquilter.blogspot.com/)

b. ∗ The skirt lengthened.

(13) a. I emptied the trash can.

b. ∗ The trash can emptied.

These examples suggest that there is a general problem here and not one idiosyncratic to the verb *clear*. It is not possible to provide an analysis of decausativization which is constrained solely by the specification [+c], but still minimizes polysemy by conforming to the Lexicon Uniformity Principle.

Reinhart introduces the [+c] specification to preclude the decausativization of inherently agentive verbs, such as *murder, write*, or *eat*. Levin and Rappaport Hovav (1995) suggest that this specification is an instance of a more general constraint. The more general constraint prevents the anticausative variant from being used to describe an eventuality which necessarily involves an agent. This constraint restricts the sentence types which can be used in describing certain kinds of happenings in the world. Although the verb *lengthen* is not lexically specified as selecting an agent, this constraint disallows the anticausative variant as a description of a skirt being lengthened, since such a happening can only come about via an agent. Levin and Rappaport Hovav suggest that this same constraint prevents verbs like *murder* and *write* from ever being found in an anticausative variant since all instances of murdering and writing are agentive.

However, Levin and Rappaport Hovav's (1995) solution is not tenable. First, there are certain agentive happenings which can be described using an alternating verb in an anticausative sentence, as illustrated in (14), though a comparable option is never available to verbs like *write* or *murder*.

(14) a. My son wanted to annoy me, so he threw my precious vase against the wall and it broke.

b. Sally kept tugging on the door until it finally opened.

Second, the anticausative variant may be unavailable even with some changes of state that are brought about without the intervention of an agent. Thus, in (9), the wind can clear the table, although the anticausative **The table cleared* cannot be used to describe such a happening.

In section 3, we present another solution to the problem of specifying when causative alternation verbs cannot appear in the anticausative form. Verbs like *murder, write*, and *eat*, never alternate and are necessarily agentive. In addition, as pointed out by Alexiadou, Anagnostopoulou and Schäfer (2006), their counterparts across languages lack an anticausative variant. Based on these properties, we propose that these verbs are lexically specified for two arguments, a theme argument and a cause argument; that is, they are inherently dyadic. Furthermore, they lexically restrict their cause argument to being an agent. We propose that this additional lexical restriction prevents the cause argument from being removed by an arity operation.[6] In contrast, verbs showing the causative alternation do not impose any selectional restrictions on their cause subjects—as Reinhart claims—and we take this property to indicate that these verbs are inherently monadic.[7] This approach requires the formulation of the necessary conditions for the addition of a cause argument, which we set out in section 3. In section 5 we present a condition which delineates when the cause must appear and, thus, an anticausative variant is impossible. We futher show that this condition cannot be subsumed under the condition which precludes anticausative variants of inherently agentive verbs.

In the next two sections we provide further evidence that change of state verbs are lexically specified for a single argument. We show that this proposal allows an account of two further sets of verbs which apparently show a causative alternation, but which cannot be given a unified analysis if all causative alternation verbs are taken to basically have two arguments.

2.2 Unexpectedly available causative variants

There are several classes of verbs which are often said not to participate in the causative alternation because they are found predominantly as intransitives. Yet subsequent research has shown that these verbs do have causative uses, although usually with a restricted set of non-agent causes as the subject. Thus, they deserve a more prominent place in the development of a unified theory of the causative alternation. As we show, the range and nature of the causative uses of these verbs bear on the proper analysis of the causative alternation. Specifically, they also suggest that an account that states the conditions under

[6] Koontz-Garboden suggests that analyses of the causative alternation should meet what he calls the Monotonicity Hypothesis (2009, 80, (8); see also Rappaport Hovav and Levin 1998: 111): 'Word formation operations do not remove operators from lexical semantic representations'. Our analysis of the alternation meets this desideratum, though in a different way than Koontz-Garboden's analysis; however, it may be that our analysis is appropriate for English, while Koontz-Garboden's is appropriate for say Romance languages.

[7] Rákosi (this volume) also argues that the verb in the anticausative variant is monadic on the basis of the distribution of ablative causes in Hungarian; nevertheless, he takes the anticausative variant to be derived by Reinhart's decausativization operation.

which a cause subject is allowed may be preferable to one that states the conditions under which a cause subject can be omitted. These data, then, further support our claim that the causative variant is not basic.

We begin with so-called 'internally caused change of state verbs', such as *blossom*, *decay*, *wilt*, and *wither*. These verbs describe changes of state brought about by internal properties of their themes, as reflected in the label 'entity-specific change of state verbs' in Levin (1993: 246–7). Levin (1993) and Levin and Rappaport Hovav (1995) claim that these verbs do not show the causative alternation. In Levin and Rappaport Hovav (1995) we suggest that they inherently take one argument, and since for Reinhart the causative alternation arises from a decausativization operation, there is no reason to expect them to have a causative form. The perception that these verbs do not participate in the alternation may arise because these verbs almost never appear with animate subjects—the type of subject most often used to illustrate the causative variant.

(15) a. The fruit trees blossomed.

b. $*$ The farmer/the new fertilizer blossomed the fruit trees.

Nonetheless, McKoon and Macfarland (2000) and Wright (2001, 2002) show that these verbs do allow causative uses, although with a narrow range of subjects. In naturally occurring examples, such as those in (16) and (17), the subject is a natural force, and perhaps sometimes an event or a circumstance, but it is not an agent or an instrument.

(16) a. Early summer heat blossomed fruit trees across the valley. (LN1999)

b. Salt air and other common pollutants can decay prints.

c. Raindrops selectively erode clay particles. (LN 1982)

d. The onset of temperatures of 100 degrees or more, on top of the drought, has withered crops. (NYT 1986)

(Wright 2002: 341, (6))

(17) a. Light will damage anything made of organic material. It rots curtains, it rots upholstery, and it bleaches wood furniture. (LN)

b. Salt air rusted the chain-link fences. (LN)

c. Bright sun wilted the roses. (LN)

(Wright 2001: 112, (24), 113, (27a), 115, (32a))

Internally caused change of state verbs pose a different problem than verbs like *clear, lengthen*, and *empty*, whose agentive causative uses lack anticausative counterparts. Internally caused change of state verbs only allow a restricted range of causative uses, and they typically cannot select an agent subject. An attempt to extend Reinhart's analysis of the causative alternation to internally caused change of state verbs, then, encounters a new problem: assigning their causative subject the [+c] specification misses the generalization

that their causative uses only have a restricted set of causes as subject, yet the [+c] specification is assigned to canonical causative alternation verbs precisely to indicate that a wide range of subjects is compatible with their causative use. In fact, the internally caused change of state verbs might instantiate a class of verbs whose existence Reinhart speculates about (2002: 233, n. 3): 'In Reinhart (2000), I assumed that the role **cause** is the cluster [+c–m], i.e. that **instrument** and **cause** realize the same feature cluster, and the relevant interpretation is determined contextually. [+c] was assumed to be a special feature cluster which is consistent with the three roles (**agent**, **cause**, **instrument**). However, I did not find subsequently any verb which selects an argument which is obligatorily only a **cause** (i.e. cannot be realized also by an **instrument** or an **agent**). Hence, this assumption is not justified.' We point out, however, that it is not clear that the feature cluster [+c–m] uniquely picks out just the set of semantic roles which are associated with the subjects of these verbs. For example, Potashnik (this volume) suggests that emitters also have the feature cluster [+c–m], but clearly, internally caused change of state verbs do not appear with emitter subjects. Furthermore, if we give these verbs a dyadic lexical representation with a [+c–m] subject, these verbs will not fall under Reinhart's decausativization operation. Finally, since these verbs overwhelmingly appear in non-causative sentences, it seems counterintuitive to assign them a causative lexical representation. (Some of these verbs appear in transitive sentences which are not causative, as in *The shrub blooms white flowers in the summer*.)

An alternative is to argue that the alternation these verbs display is not an instance of the same causative alternation as change of state verbs such as *break* show. The causative use could be taken to be the result of a causativization operation, instead of a decausativization operation. However, this account runs into the same problems as the decausativization account. First, it does not fit in with the well-established arity operation of causativization which Reinhart (2002: 242–4; see also Horvath and Siloni to appear: 21) describes, as her causativization operation uniformly adds an agent, and, as we have just shown, these verbs do not normally appear with agent subjects. Second, if the feature cluster [+c–m] does not uniquely pick out the kinds of subjects compatible with these verbs, a causativization operation will suffer from the same shortcomings as the decausativization operation.[8]

Thus, we take these internally caused change of state verbs to take a single argument. In section 3, we propose that the range of subjects that they allow follows from the interaction of a semantic constraint on the causative variant with the inherent semantics of the verbs themselves.

[8]There are even finer semantic restrictions on the subjects of internally caused change of state verbs which are not easily captured using the features available in the Theta System. Although these verbs may take subjects which may be considered events, as in *The onset of temperatures of 100 degrees or more*, not all phrases construable as events are possible subjects of these verbs. In particular, phrases such as *the gardener's digging* or *planting the trees early*, which represent the activities of agents, are not compatible with them: **The gardener's digging blossomed the trees early this year.*

2.3 Subject–object interdependencies: The verb *skyrocket*

In this section we show that certain verbs only have a causative variant for certain subject–object combinations; in this variant, their choice of subject largely depends on their choice of object. We introduce these interdependencies and illustrate their pervasiveness by examining yet another class of verbs, the verbs of calibratable change of state (Levin 1993: 247). These verbs have not figured in previous discussions of the causative alternation probably because like internally caused change of state verbs, they are most often used intransitively, yet they bear strikingly on our concerns. Their subject–object interdependencies are left unexplained under an analysis where a decausativization operation applies to verbs with a certain thematic structure.

Levin (1993: 247) states that verbs of calibratable change of state do not participate in the causative alternation, having only an intransitive use. However, like internally caused change of state verbs, the verbs in this class appear most often intransitively but still show causative uses. Consider the verb *skyrocket*. Although this verb is overwhelmingly found as an intransitive, it is not difficult to find causative instances, as in (18).

(18) a. Surrounding myself with mentors like this literally skyrocketed my game to a higher plateau.
(www.theattractionforums.com > ... > Classic Writings > Daxx)

b. That [receiving compliments] made me feel very good and has skyrocketed my confidence level. (www.skinbright.com/successstories.html)

c. Solving this issue skyrocketed my personal growth, for it also changed my view towards life, work, success. (lovesagame.com/about)

d. I've decided to reveal my marketing tips and marketing secrets that skyrocketed my businesses to the level of success that I enjoy today!
(http://www.streetsmartmarketer.com/)

e. Mentions by larger blogs ... really skyrocketed my readership and profile.
(zenhabits.net/happy-1st-birthday-zen-habits-celebrating-one-wonderful-year/)

f. I wouldn't say being on Tara has skyrocketed my career.
(out.com/detail.asp?id26671)

g. But it was his feud with the anti-establishment Austin that would skyrocket his company past Ted Turners [sic]. (www.spartyandfriends.com > WWE)

The subjects of the examples in (18) all qualify as events or states, rather than agents, instruments, or natural forces. The verb *skyrocket*, then, resembles the internally caused change of state verbs in taking a narrow range of subjects. Yet the attested subjects differ from those found with internally caused change of state verbs since they do not include natural forces, at least not in the examples we have found.

These examples, however, do not provide the full picture. The verb *skyrocket* also allows agent subjects, as in (19).

(19) a. When he heard it was for a Catholic church he skyrocketed the price to $6000. (www.sanctacruce.org/.../History_of_ Mexican_American_Missions.htm)

b. Well, I skyrocketed the volume until my ears about blew out. (www.spheredev.org/smforums/index.php?topic(2.1385;wap2))

c. Gavin not only skyrocketed his company to the top of its industry in record time, but became a student of the business. (www.hardballproductions.com/flash/main.swf?button0)

The examples in (18) and (19) differ in their choice of theme. Although *company* is found in both sets, the examples with agent subjects in (19) have a more restricted range of objects than those with event and state subjects in (18). Specifically, the subjects of many of the examples in (18) are properties inalienably possessed by an animate, such as *confidence, growth*, or *success*, while those in (19) are not. It seems, then, that agent subjects are incompatible with themes that represent such inherently possessed properties.

Furthermore, *skyrocket* is representative of the entire class of verbs of calibratable change of state, a class which includes the verbs in (20). (21) presents causatives involving other members of this class. The verb *fluctuate* is singled out in (22), as it is quite easily found in causative sentences with both agent and non-agent subjects.

(20) appreciate, balloon, climb, decline, decrease, depreciate, differ, diminish, drop, fall, fluctuate, gain, grow, increase, jump, ?mushroom, plummet, plunge, rocket, rise, skyrocket, soar, surge, vary, . . . (Levin 1993: 247)

(21) a. I woke up this morning to rain and strong winds that have plummeted the temperature . . . (rummage.typepad.com/rummage/2009/08/index.html)

b. It [massive job loss and debt] didn't create jobs, it just ballooned the deficit. (motherjones.com/kevin. . . /quote-day-spending-cuts-and-elections)

c. The Broncos 6-0 start is considered the NFL's biggest early surprise and has soared the value of McDaniels high school card to $30. (COCA 2009 NEWS Denver)

d. The nation had once numbered about 200 but wars and small pox had dwindled the tribe. (www.niobrarane.com/trail.htm)

(22) a. 'I admire how you fluctuated the music giving it a soft opening and increases the volume and tension as you play . . . ' (www.youtube.com/user/xoVanillas)

b. Last April Fool's Day, someone fluctuated the price up and down by fifty dollars and half the staff had coronaries. (www.wired.com/wired/archive/2.01/microserfs_pr.html)

c. It [= the algae control product] greatly fluctuated the temperature in my tank from day to night . . . (www.tetra-fish.com/forums/archive/index.php?t-10195.html)

The objects found with these verbs also describe properties inalienably possessed by animates, and again the attested examples do not have agent subjects.

(23) a. The two attendants exchanged disbelieving looks, which further plummeted my confidence.
(binkyandjube.blogspot.com/2008/07/minor-mishap-9.html)

b. Embarrassment dwindled my self-esteem until I alienated myself.
(blogs.myspace.com/index.cfm?fuseactionblog.view&friendId...)

The choice of subject for these verbs, then, varies with the choice of object and cannot be independently specified. This interdependency is not explained by the lexical constraint on Reinhart's decausativization operation. Although it could be argued that the decausativization operation should not account for these facts, in the next section we suggest that these subject–object interdependencies follow from the non-lexical factors which determine when a cause can be found with a basically monadic verb. Therefore, an analysis which takes the anticausative variant of causative alternation verbs to be basic and accounts for possible causative variants through a combination of lexical and non-lexical factors can provide a unified analysis of a wider range of data than accounts which take the causative variant to be basic.

3 Direct causation: A constraint on the causative use

We have shown that the specification [+c] for the external argument of the causative variant—a key component of Reinhart's analysis of the causative alternation—leaves much data unexplained. Suppose, then, that all the verbs we have considered have a root associated with one argument, with none of them lexically selecting for a cause argument. Since all of them specify a particular change that an entity undergoes, the constituent representing this entity is clearly an argument of the verb. If the subject of the causative variant is not lexically determined, we need to formulate a general, non-lexical, condition delineating when a subject representing the cause of the change can appear.[9] (Such an analysis must be supplemented by a condition specifying when a cause subject must appear; we introduce such a condition in section 5.) Previous studies of lexical causatives have established that such causatives must describe instances of direct causation, contrasting with periphrastic causatives, which can describe instances of either direct or indirect causation (e.g., Fodor 1970; McCawley 1978; Shibatani 1976; Wolff 2003; but see Neeleman and van de Koot this volume for another view). Therefore, we propose that the causative variant must meet the condition in (24), where 'direct causation' is defined as in (25) from Wolff (2003).

(24) The Direct Causation Condition: A single argument root may be expressed in a sentence with a transitive verb if the subject represents a direct cause of the eventuality expressed by the root and its argument.

[9] In this respect our analysis is in the spirit of Harley and Noyer (2000), who argue for non-lexical conditions on the licensing of subjects in nominalizations that involve the nominal analogue of the causative alternation.

(25) Direct causation is present between the causer and the final causee in a causal chain (1) if there are no intermediate entities at the same level of granularity as either the initial causer or final causee, or (2) if any intermediate entities that are present can be construed as an enabling condition rather than an intervening causer. (Wolff 2003: 5)

An important component of Wolff's definition of direct causation is the inclusion of a 'no-intervening-cause' criterion. Other attempts at capturing the essence of direct causation introduce criteria that are similar in spirit. Thus, Piñón includes a constraint that a causal chain should have a single agent (2001a: 353), where agents include 'organisms that engage in 'goal-directed' behavior, whether or not they do so intentionally or consciously' (2001a: 351). We prefer Wolff's formulation in (25) as it is more specific about the nature of direct causation, while allowing for a broader range of causers than Piñón's does.[10]

The Direct Causation Condition explains many properties of the causative variant: the wide range of subjects compatible with canonical causative alternation verbs, the varying ranges of subjects observed across different types of verbs, and the subject–object interdependencies shown by some verbs. As mentioned, the last two phenomena are not explained by Reinhart's thematically constrained decausativization analysis. Perhaps most significantly, the Direct Causation Condition allows a unified analysis of a much wider spectrum of alternating verbs than an account which derives the alternation by a rule of causativization or decausativization.

First, consider internally caused change of state verbs—verbs such as *blossom* and *wilt* that describe changes of state arising from properties internal to their themes. As discussed in section 2.2, these verbs allow a restricted range of causes, contrasting with the canonical change of state verbs, which describe externally caused changes of state, and allow a variety of causes. Due to their very nature, the most direct causes of internally caused changes of state are the natural forces and ambient conditions which trigger or facilitate them. Only such causes, then, meet the Direct Causation Condition. The sentences in (16) and (17), repeated as (26) and (27), are acceptable because they have natural forces and ambient conditions as causes.

(26) a. Early summer heat blossomed fruit trees across the valley. (LN1999)

b. Salt air and other common pollutants can decay prints.

c. Raindrops selectively erode clay particles. (LN 1982)

d. The onset of temperatures of 100 degrees or more, on top of the drought, has withered crops. (NYT 1986)

(Wright 2002: 341, (6))

[10]For detailed discussion of the notions of enablement and causation see Wolff and Song (2003) and Wolff (2007). We believe that by distinguishing enabling conditions from intervening causers, Wolff's definition of direct causation also has the advantage of dealing with the thorny issues involving which instruments can be subjects (e.g., Alexiadou and Schäfer 2006; Marantz 1984: 247; Van Valin and Wilkins 1996). Wolff's definition in (25) makes reference to the granularity of an event; for discussion of this notion, see Bittner (1999: 19–20), Croft (1991: 163–5), and Truswell (2011: 46–51).

(27) a. Light will damage anything made of organic material. It rots curtains, it rots upholstery, and it bleaches wood furniture. (LN)

b. Salt air rusted the chain-link fences. (LN)

c. Bright sun wilted the roses. (LN)

(Wright 2001: 112, (24), 113, (27a), 115, (32a))

In contrast, constructed examples with agent causes such as **The farmer blossomed the fruit trees*, repeated from (15b), and **The careless gardener decayed the fence with a misplaced sprinkler* are not acceptable. We argue that such examples cannot meet the Direct Causation Condition due to the nature of internally caused eventualities. As ambient conditions and natural forces are the most immediate causes of such eventualities, an agent would have to precede a natural force or ambient condition in the chain of causation. This is only possible, by part (2) of (25), if the natural force or ambient condition does not qualify as an intervening causer—that is, it has a status comparable to an instrument. However, their statuses are not comparable: an instrument is under the direct control of an agent, but an ambient condition or natural force is not. For this reason, causative uses with agent subjects are ruled out. Certain kinds of event subjects, particularly those expressing the action of an agent, are excluded (see note 8) for the same reason: **The gardener's careful digging blossomed the trees early*.

There are exceptions to the generalization that internally caused change of state verbs do not have causative uses with agent subjects. Two such verbs, *germinate* and *ferment*, allow animate causes when used causatively with their literal meaning, as in *The scientist germinated the seeds* and *The wine-maker fermented the grapes* (Wright 2001: 163). Most likely, these verbs are special because they describe processes that may be controlled by agents in the laboratory, factory, or comparable settings.[11] They then comply with part (2) of (25). The verb *grow* also shows comparable behavior.

Verbs of calibratable change of state also do not easily appear with agent subjects in causative uses, and at least Levin's (1993) discussion of these verbs suggests that they are predominantly used intransitively. A hallmark of these verbs is their tendency to select themes that are abstract measurable entities, representing properties of entities with scalar values, such as *price*, *temperature*, or *volume* (of a sound). Other themes include *business*, *career*, *success*, and *confidence*—notions whose instantiations are often ranked in value with respect to each other. In particular, these verbs typically do not select physical objects as themes, but rather properties of such entities.

[11] Such examples raise a more general point. It might be possible to envision scenarios where a range of changes of state which typically occur in the natural world, and, thus, usually do not permit agentive causative uses, are harnessed by scientists, magicians, or the like, either in the real world or in some imagined future or fantasy world. In such instances, the relevant verbs might demonstrate causative uses. Such uses might even be available to externally caused change of state verbs when used to describe natural phenomena, such as skies clearing, so that acceptable agentive causative examples describing these might become acceptable too. While recognizing this possibility, throughout this paper, when we cite causative agentive uses of certain verbs as unacceptable, we are setting such a possibility aside.

As noted, causative uses with event or state subjects have a wider range of objects than those with agent subjects; specifically, when the subject is an agenti, properties inalienably possessed by animates, such as *confidence, growth*, or *success*, do not seem to be possible as direct objects, as illustrated in (28).

(28) a. Solving this issue skyrocketed my personal growth, for it also changed my view towards life, work, success. (lovesagame.com/about)

b. ∗ My mother skyrocketed my personal growth.

In fact, however, this restriction is only apparent. Changes in the values of properties inherently possessed by animates are like internally caused changes of state: they are generally only under the control of the possessor, so an third party cannot directly manipulate them. This explains the unacceptability of (28b), where the agent is not the possessor. In contrast, in (28a), cited earlier as (18c), the understood agent of the event subject is the possessor, who has control over a change in the property. This observation suggests that a causative sentence with *skyrocket* where the possessor of a property is the agent should be acceptable, as indeed illustrated by (29). This attested use of the verb has *career*, another inalienably possessed property,[12] as direct object, but here the possessor himself, rather than some third party as in (28b), is the agentive subject.

(29) Instead, Henderson skyrocketed his career by sinking a choke in the third. (eespn.go.com/extra/mma/blog/_/name/mma/id/5295191)

It is possible that the inclusion of the *by* phrase also contributes to the acceptability of this example. This phrase makes explicit the more immediate cause of the change of state, and, in fact, this example could be paraphrased with an event subject, whose understood agent is the possessor, as in *Sinking a choke hold in the third skyrocketed Henderson's career*, comparable to (28a). T. Siloni (p.c.) notes the acceptability of *Skyrocket your confidence!*, which again has the possessor of the property as the agent. In fact, versions of this example seem to be attested on the Web largely on self-help sites promoting methods people can use to take charge of their own personal development, thus boosting their self-confidence.

Although the subject–object interdependencies exhibited by *skyrocket* are left unexplained on many accounts, at least some follow from the Direct Causation Condition. This condition, which holds of the transitive, causative uses of this verb, requires that the subject be able to directly cause a change in the values of the property described by the object.

Finally, we turn to canonical causative alternation verbs like *break* and *melt*, which generally allow a wide range of subjects in the causative variant. Since the changes of state these verbs describe typically occur through external manipulation of the theme, any type of cause that can appropriately manipulate the theme will qualify as a subject. Such changes, however, need not always arise through external manipulation by an agent. For

[12] Unlike many other inalienably possessed properties, a career might be manipulable by someone other than its possessor. Clearly, more systematic analysis of this entire range of data is necessary.

example, this holds of clearing the sky in contrast to clearing physical objects such as tables or counters, leading to the pair in (30), where only a natural force subject is possible for the causative variant; see note 11.

(30) a. The sky cleared.

b. The strong wind/*our prayers/*the scientists cleared the sky.
(cf. Our prayers/The scientists caused the sky to clear.)

It appears that in (30b) the choice of direct object dictates a narrow range of possible subjects, a pattern reminiscent of verbs of calibratable change of state.

The pair in (30) also demonstrates that the verb *clear* can describe either an internally or an externally caused change of state depending on the choice of theme. Thus, with *sky* as theme, the verb describes an internally caused eventuality: the change comes about because of properties of the sky, and, concomitantly, the subject of the causative use must be a natural force, as illustrated in (30). More typically, *clear* describes an externally caused eventuality, as when a table is cleared. In this use various causes are possible, including humans, machines, and even natural forces; see (7) and (9). On either use, the verb is basically monadic, lexically selecting the theme argument only. The choice of theme, however, determines whether the eventuality described is understood as internally or externally caused, and that, in turn, determines the range of available cause subjects. Thus, polysemy is minimized since there is no need to posit that *clear* is monadic when it describes internally caused eventualities and dyadic when it describes externally caused eventualities.

4 Broadening the purview of the causative alternation: Verbs of sound emission

Our approach to the causative alternation receives further support from its ability to shed light on transitivity alternations not always taken to exemplify the causative alternation. We illustrate with verbs of sound emission, which describe the emission of a sound primarily by an inanimate entity.[13] These verbs are often cited as not showing the causative alternation—at least, not systematically.

(31) a. The truck rumbled.

b. $*$ The driver/the steep ascent rumbled the truck.

(32) a. The old car rattled.

b. $*$ The bad driver rattled the old car.

(33) a. The stream babbled.

[13]Many of these verbs, including *babble, groan, hiss, honk, rumble*, and *squeal*, can also be used to describe the emission of a sound with the same acoustic properties by an animate entity via its vocal tract. We ignore these uses as they have somewhat different properties, most likely because they are predicated of animates. See Levin, Song and Atkins (1997) for some discussion.

b. ∗ The stones babbled the stream.

(34) a. The tea kettle whistled.

b. ∗ The boiling water whistled the tea kettle.

Levin and Rappaport Hovav (1995) suggest that these verbs do not show the causative alternation because they typically describe internally caused eventualities. With each verb of sound emission, the sound emitted seems to be tied to the nature of the emitter: water gurgles, vehicles with motors rumble, things with spinning parts whir. Yet, apparently causative, transitive uses of these verbs are found, which have both agent and natural force subjects, as illustrated in (35) and (36).

(35) a. Miss Holly, gently whirring the machine, agreed with him. (A. Thirkell, *The Headmistress*, 1943, p. 224)

b. They are a gregarious lot — talkative, partial to picnicking on candy and rattling paper in time with the music. ('Music: Chamber Society', *The New York Times*, November 9, 1987)

c. Outside the nurses were clattering the teacups. (BNC)

(36) a. The wind crackled the edges [of a piece of paper]. (BNC)

b. By noon, rain still pinged and rattled her window … (J.D. Lamb, *A Question of Preference*, Kensington, New York, 1994, p. 201)

c. The cold wind rustled the sagebrush and thistles … (M. Muller, *Where Echoes Live*, The Mysterious Press, New York, 1991, p. 12)

The existence of such uses is acknowledged by Levin and Rappaport Hovav (1995: 115), but classed as 'spurious'; however, further investigation shows that they arise quite systematically, as noted by Song (1996) and Levin, Song and Atkins (1997), as well as Potashnik (this volume). Actually attested or acceptable constructed causative uses of verbs of sound emission involve the direct manipulation of the sound emitter—the noun phrase expressed as the object in this use.[14] In precisely such instances—i.e. where the sound is emitted as a result of direct manipulation, as with *crackle* or *rattle*—there is direct causation as required since the production of the sound is brought under the control of some entity other than

[14]Our generalization diverges somewhat from Levin, Song and Atkins' (1997). They propose that causative uses are available when the verb expresses the external production of a sound. Some sounds are produced internal to the sound emitter (e.g., *babble*, *gurgle*, and *rumble*), while others are produced external to the sound emitter (e.g., *clatter*, *clink*, and *whir*), and still others may be produced in either way (e.g., *rattle* and *rustle*). Externally produced sounds, by their very nature, are always produced by direct manipulation, so both accounts predict that verbs lexicalizing such sounds will have causative uses. The two accounts make different prediction about verbs lexicalizing certain internally produced sounds, such as buzzes, honks, or rings, which nevertheless involve direct manipulation of emitters such as car horns and doorbells—manipulable devices designed to produce a specific sound. The verbs expressing these internally produced sounds have causative uses when predicated of these emitters, consistent with the direct manipulation generalization but not the externally produced sound generalization.

the emitter—an agent or some natural force. Thus, these examples fall under the Direct Causation Condition.

This analysis of verbs of sound emission bears on the Lexicon Uniformity Principle for the same reason as we discussed for the verb *clear* in section 2.1. Various verbs of sound emission show the causative alternation only for some choices of sound emitter, as illustrated in (37) with the verb *rattle*.

(37) a. The windows rattled./The wind rattled the windows.

b. The old car rattled./*The bad driver rattled the old car. (= (32))

A decausativization analysis of this data would require positing two instances of each such verb. However, since the sound emitted is the same whether or not the verb–emitter combination allows a causative use, there is apparently a unified concept behind all the uses of such a verb. Thus, we suggest that a single verb root is involved in such examples, with the emitter that the root is predicated of determining in conjunction with the Direct Causation Condition whether or not a causative use is available. For instance, it is only in the (a) pair in (37) that the emitter allows the sound to be brought about by direct manipulation.

Using data from English and Hebrew, Potashnik (this volume) argues that the transitive uses of verbs of sound emission—and verbs of emission more generally—are not true causative variants. While Potashnik's arguments for this position merit serious consideration, this goes beyond the scope of this paper. What matters here is that in making this argument, Potashnik suggests that the emitter argument is not a theme—that is, a [–c–m] argument as Reinhart defines this notion—but rather it is a [+c–m] argument, just as an instrument is. The Direct Causation Condition may help explain why the emitter in the transitive variant and an instrument might share this feature analysis: both are directly manipulated by an agent in order to directly cause an eventuality.

5 The obligatory expression of the cause

We have proposed that verbs which participate in the causative alternation are basically single argument verbs.[15] We argued for this position based on the insight that it is more perspicuous to specify the conditions under which the cause argument is added, than the conditions under which it is removed, as in our earlier analysis and Reinhart's analysis. Positing a monadic lexical entry would lead us to assume that these verbs always have an anticausative variant. However, as shown in section 2.1 based on examples such as (8b),

[15] In forthcoming work we show that the assumption that causative alternation verbs are basically dyadic is further undermined by yet another set of alternating verbs which in certain uses are only natural in the anticausative variant. These include change of state verbs based on dimensional adjectives in uses where the change is understood as being along a spatial (rather than a temporal) axis (e.g., *The water deepens two feet from the coast*, *The street widens after the bank*; Gawron 2006), as well as prototypical change of state verbs in particular uses (e.g., *My watch broke right after the warranty ran out*).

repeated as (38), and others like it, some verbs which can in principle alternate must be used in their causative variants when describing certain kinds of eventualities.

(38) a. The waiter cleared the counter.
b. ∗ The counter cleared.

That is, although the Direct Causation Condition must always be met for a cause subject to be possible, in certain instances, as in (38a), there is an additional condition which requires that the cause be obligatorily expressed. We now consider how to formulate this condition.

Some initial insight into the nature of this condition is provided by a minimal pair involving anticausative uses of the verb *open* discussed by McCawley (1978).

(39) a. The door of Henry's lunchroom opened and two men came in.
b. The door of Henry's lunchroom opened and two men went in.
(McCawley 1978: 246, (1))

McCawley points out that in (39b), it is natural to infer that the men have not opened the door themselves, because if the viewer had seen the men open the door, the anticausative variant would have been an inappropriate description of the eventuality. Put differently, if the viewer witnesses the act of opening the door, the viewer must use the causative variant to describe the scene. McCawley formulates a descriptive generalization about the distribution of *open*, which he ultimately attributes to some form of Grice's conversational maxims: 'Intransitive *open* cannot be used if the speaker has witnessed an ACT of opening, unless he has otherwise indicated that the event is part of an act' (1978: 247). The 'unless' clause is meant to cover instances such as (40).

(40) Getting ready to dine I grabbed the chair, pulled it out, sat down and then the chair broke into kindling while I fell on my hind end.
(http://whatfatpeopledontlike.wordpress.com/2008/05/02/other-peoples-furniture)

However, examples such as (38b) are inappropriate independent of the speaker's perspective. We propose that the more general condition in (41) determines when the causative variant must be used to describe an eventuality.[16]

(41) The Proper Containment Condition: When a change of state is properly contained within a causing act, the argument representing that act must be expressed in the same clause as the verb describing the change of state.

[16]We propose (41) as an initial formulation of the relevant condition, although we believe that this formulation will need to be refined once the conditions under which the anticausative is ruled out are studied further.

(41) will rule out (38b) because the change of state—the counter becoming clear—is properly contained in the act carried out by the agent of removing things from the counter. This act is not part of the verb's meaning, but we can infer what it is from our knowledge of how agents bring about the clearing of dishes from a counter.

Can (41) be reduced to the more general, cognitive principle in (42), which Horvath and Siloni propose as the reason for the constraint against anticausative uses of inherently agentive verbs such as *murder* and *write*?

(42) Conceptualization of eventualities cannot disregard participants (roles) whose mental state is relevant to the eventuality. (Horvath and Siloni to appear: 28, (48))

It cannot. Inherently agentive verbs can never be used in an anticausative variant: the reason is that they are lexically specified for two arguments. In contrast, (41) does not necessarily preclude a causative alternation verb from being used in the anticausative variant to describe a change of state brought about by an agent, a point already made in section 2.1 with (14), repeated here.

(43) a. My son wanted to annoy me, so he threw my precious vase against the wall and it broke.

b. Sally kept tugging on the door until it finally opened.

It only precludes the use of the anticausative variant if the change of state is properly contained within the agent's action. This explains why sentences like the constructed (43) or the attested (40) are acceptable, although the change of state is explicitly asserted to be brought about agentively. Conversely, agentive verbs cannot show anticausative uses, even if the causing act and the change of state are temporally removed from one another, as in (44).

(44) *The assassin aimed well, the bullet hit the politician in the chest and he murdered right away.

Furthermore, the Proper Containment Condition does not apply just to agents, but rather to acts and changes of state. In (9), repeated as (45a), a change is properly contained in a causing act, but here the actor is a natural force, not an agent, yet the anticausative counterpart in (45b) seems not to be an appropriate description of the eventuality.

(45) a. The wind was enormous. There was a huge dinner table set-up, and the wind cleared the entire table onto the floor and blew over chairs. (http://www.sfreporter.com/santafe/article-5480-sfr-talk-the-set-up-man.html)

b. $*$ The entire table cleared.

This account allows a monosemous analysis of the verb *clear*. There is no reason to posit two senses for this verb, one showing the causative alternation and the other not, as already discussed in section 2.1. We can posit a single sense for *clear* by assuming that this verb is lexically associated with a single argument—its theme argument—and proposing that the addition of a cause argument is constrained by two conditions, the Direct Causation Condition and the Proper Containment Condition.

6 Conclusion: Lexicalization as a criterion for concept-unity

We have used Reinhart's Lexicon Uniformity Principle as a context for further exploring the nature of the causative alternation. We argue that the properties of the alternation follow if causative alternation verbs are lexically monadic, selecting the single argument expressed in the anticausative variant, with the causative variant being available when certain extra-lexical conditions are met. Thus, we have proposed, contrary to Reinhart's and our own earlier analyses, that there is no lexical operation which derives the anticausative variant from the causative variant.

We now consider the implications of our proposed analysis for the Lexicon Uniformity Principle, which is intended to apply to different thematic forms of a single verb-concept. Application of this principle requires a criterion for when two forms of a verb represent the same verb-concept. Reinhart's formulation of the principle might suggest that the ability to relate two thematic forms of a verb-concept by an arity operation can constitute a criterion for concept-unity—identifying a single concept. While we agree that the two thematic forms of a causative alternation verb belong to the same verb-concept, we have argued that this is not because there is a rule which derives one form from the other. Rather, the forms are unified as instantiations of the same verb-concept because they share the same root, having the same lexicalized meaning. To clarify this criterion for concept-unity, we elaborate on the notion of lexicalization.

It is challenging to delineate the precise range of situations in the world that a verb can be used to describe. How, then, can we determine what belongs in the lexical entry of a verb root? We suggest that the components of meaning that a verb lexicalizes are precisely those elements of meaning which are entailed in all its uses. These components are to be distinguished from additional facets of meaning that can be inferred from a particular use of the verb in context and from the choice of noun phrase serving as argument of the verb. The semantic restrictions that a verb imposes on its arguments constitute a fundamental part of lexicalized meaning. We can use this criterion to reach the conclusion we have already reached in this paper: causative alternation verbs lexically select a single argument, the argument of the anticausative variant. As we have shown, causative alternation verbs do not impose selectional restrictions on the subject of the causative variant. In contrast, it is possible to isolate an invariant element of change for the theme argument which remains constant across both causative and anticausative uses of alternating verbs. However, the precise change that a verb specifies is not fully determined by the verb itself, but rather by the verb and the instantiation of the argument it selects. The resulting variation is not part

of the verb's lexicalized meaning. Consider, for example, the change of state verb *open*: opening a jar or a bottle means removing its lid or cap, while opening a door or window means moving the door or window so that the aperture they are blocking is now unblocked (see Levison 1993 on opening containers vs. conduits); however, these specifics are not what is lexicalized by *open*. What the verb lexicalizes is removing an obstruction to allow access to a formerly inaccessible space. The distinction between lexicalized meaning and non-lexicalized meaning is important because it allows different uses of the same verb to be unified under a single lexical entry. In contrast to the theme argument, we showed that there is no constant element of meaning associated with the cause argument of change of state verbs participating in the causative alternation, and the properties of the cause are determined fully by context, and, in particular, the choice of noun phrase as theme.

The argument realization properties of a verb like *open* also vary with choice of theme: anticausative variants are only available for some choices.[17]

(46) a. The window opened

b. $*$ The jar opened.

As we first elaborated in section 2.2, insisting that it is strictly the meaning of the verb which determines the availability of the anticausative variant can sometimes lead to positing two senses for alternating verbs, and this reasoning could be applied to *open* based on the pair in (46). In contrast, carefully teasing apart the facets of meaning which are lexicalized from those which are determined in context allows us to provide a more perspicuous analysis of the causative alternation and thus minimize lexical polysemy, in conformity with the Lexicon Uniformity Principle.[18]

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[17] Strictly speaking, (46b) is not unacceptable; it can only be used to describe an eventuality where the jar opens following an attempt by an agent, as in *After trying for five minutes, the jar finally opened*. In contrast, (46a) may be used without such contextual support.

[18] In Rappaport Hovav and Levin (2010) we argue that in a few instances there may be no invariant element of meaning across the various uses of a particular verb, so that a form of polysemy must be posited; however, we also show that the conditions which give rise to such polysemy can be delineated.

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