Ability, action, and causation: from pure ability to force

Anastasia Giannakidou & Eleni Staraki
University of Chicago
{giannaki, estar}@uchicago.edu

Abstract
In this paper, we show that Greek distinguishes empirically ability as a precondition for action, and ability as initiating and sustaining *force* for action. In this latter case, the ability verb behaves like an action verb, and the sentence has the logical form of a causative structure φ CAUSE [BECOME ψ] (Dowty 1979). The distinction between ability as potential for action and ability as action itself has a venerable tradition that goes back to Aristotle, and is recently implied in a number of analyses (Mari and Martin 2007, 2009b, Thomason 2005). We show first that the phenomenon is not just aspectual (*pace* Bhatt 1999, Hacquard 2006, 2009, Piñon 2003): actualized ability emerges with the ability verb also with imperfective aspect and present tense. They key, we argue is *causation*, which triggers a shift from pure ability, to ability as *force* (in the sense of Copley and Harley 2010, i.e. as action initiating energy). In Greek, the action reading of the ability modal comes about in an apparent co-ordinate causative structure, where the two clauses are connected with conjunction *ke* 'and'— a pattern that we find also in other languages (e.g. Georgian), including English, at least with some action verbs such as *try, allow*. Our analysis implies a meaning of ability richer than mere possibility (*pace* Hacquard); and, by capitalizing on the causative meaning and the presence of force in causative structures, our analysis enables a principled explanation of the shift to action-ability without positing ambiguity for the ability verb (*pace* Bhatt 1999).

1 Background: ability, action, and 'actuality entailment'

Ability in English is expressed through verbs and expressions such as *can, be able to, be capable of,* etc.:

(1)   a.   Ariadne *can* solve this problem.
        b.   Ariadne *is able* to solve this problem.
        c.   Ariadne *is capable* of solving this problem.

Portner (2009: 135) characterizes the modality expressed by ability expressions *dynamic* and considers it a subcase of *volitional* modality— thereby distinguishing ability from epistemic or deontic (Portner's *priority*) modality.[1] Ability verbs tell us that the subject has the ability to do something, i.e., that *if the subject tried* to do what the complement sentence says, *she would succeed doing that* (see especially Thomason 2005, and references therein). The subject of the ability modal is thus agentive (see also Hackl 1998) — in contrast with the subjects of epistemic or deontic modalities. Ability itself is a disposition or precondition for action, though a mere disposition: in the sentences above, Ariadne's ability to solve this problem does not entail that she does, or did solve the problem. Pure ability is thus nonveridical (Giannakidou 2001), and does not trigger *actual* truth of the complement clause.

---

[1] In other frameworks (e.g. Brennan 1993, Hacquard 2006), ability is understood as *root* modality, but we agree with Portner that the term "root" is not specific enough to characterize the diverse modals that it is supposed to group together.

The proper treatment of ability has not been an easy task. One dimension of complication has to do with the quantificational force of the ability modal. Kenny (1975, 1976) agued that ability modality cannot simply be analyzed as a possibility operator within modal logic; likewise Giannakidou (2001) and Thomason (2005) propose analyses of CAN as a universal quantifier. Thomason rejects the existential analysis as weak: "To put it roughly, Cross' theory of the 'can' of ability is based on equivalence between 'I can' and 'If I tried I might'. This doesn't seem right; 'If I tried I would' is a more intuitive conditional explication. This raises a fairly complex and delicate issue, one that is crucial for the logical analysis of ability." (Thomason 2005: 7). The data that we discuss in this paper support this stronger analysis of ability, as we shall see.

Another fact about ability is that is can be understood very broadly in terms of enabling factors. As Thomason puts it: "In general, ability can depend on favorable circumstances, on the presence of appropriate knowledge, and on non-epistemic properties of the agent. I can truly say *I can't write a check* either because my bank balance is negative, or because I don't know where my checkbook is, or because my hand is injured. I believe that the same sense of 'can' is involved in each case." (Thomason 2005: 3). And there is also the contrast between "specific situation" (or *occasional*) and generic readings. "An example like *I can lift that rock* attributes a time-bound, circumstance-bound state to an agent. As usual with such attributions, there are corresponding, related generic sentences. An example like *I can lift a 50 pound rock* would be most plausibly understood as generic; it attributes a property to an agent that holds under a wide variety of times and circumstances—perhaps to all that are "normal" in some sense." (Thomason 2005: 3). J.-H. Lee 2006 further shows that, in Korean, generic and time-bound CAN are realized by two lexically distinct verbs, showing that the difference between generic ability and time-bound ability can be lexicalized in a language.

So, abilities may be generic or time-bound dispositions for action; but neither generic, nor time bound abilities imply *acting* on the ability, they are nonveridical (Giannakidou 1998, 1999). Abilities, however, can also manifest themselves through real actions. Mari and Martin (2007, 2009b), relying on a distinction made by Aristotle, suggest specifically that there are two types of abilities, *generic abilities* (GAs) and *action-dependent abilities* (ADAs). Aristotle expresses this difference in the following way (*On Interpretation* 23a 7-13): "*Possible* itself is ambiguous. It is used, on the one hand, of facts and things that are actualized; it is 'possible₂' for someone to walk, inasmuch as he actually walks, and *in general we call a thing 'possible₂', since it is now realized*. On the other hand, 'possible₁' is used of a thing that might be realized; it is possible₁ for someone to walk, *since in certain conditions he would*." Crucially, Aristotle aims to distinguish two readings of *possible*, and possible₂ expresses an "actualized possibility" (*puissance en acte*, as Mari and Martin put it). "In fact, if possible₂ expresses an actualized possibility, on this reading, ◊p entails p, *since actualizing an ability involves performing an action*" (Mari and Martin 2009b: 9).

This actualized ability, as one may think of it, has been studied recently in a number of works under the label "actuality entailment' (Bhatt 1999). This entailment has been assumed, since Bhatt, to be due to the perfective aspect and past tense on the modal verb. We give below two examples from Greek, which, unlike English, has a perfective-imperfective distinction in the past (as well as in the nonpast; see Giannakidou 2009 for details), and therefore allows us to see the point clearly:

(2)   John was able to escape.
(3)   a. O   Janis   borese   na   apodrasi.   **# ala den apedrase.** [2]
           The John   can.**perf.past**.3sg   SUBJ   escape.perf.nonpast.3sg   (but not escaped)
           John was able to, and he did escape (#but he did not)
         b. O   Janis boruse   na   apodrasi.   (**ala den apedrase**).
            The John can.**impf.past.3sg**   SUBJ escape.perf.nonpast.3sg   (but not escaped)

---

[2] Glosses used in the paper: impf = imperfective, ind = indicative, perf = perfective, subj = subjunctive.

John {could/was able to} escape (but he did not).

The ability modal, like all modals and other nonveridical verbs selects a subjunctive complement, introduced by the mood marker *na* (Giannakidou 1998, 2009). The sentence (3a), with past and perfective aspect *borese,* entails that John escaped— an entailment lacking in (3b) with imperfective aspect. (3b) is a statement of pure ability, and is nonveridical, since it does not imply *p*. The statement in (3a), on the other hand, implies that John engaged in a series of actions the result of which was the fact that he escaped. This fact is the 'actuality entailment' that renders 3a veridical: John did escape.

Bhatt and others (Hacquard 2006, 2009, Piñon 2003) argue that the veridicality entailment with ability is an aspectual phenomenon. In this paper, however, we present novel data from the Greek ability verb *boro* 'can' that challenge the aspectual analysis, and suggest the relevance of *causation* in allowing ability to initiate action to bring about a result. We show that when *boro* appears in a causative structure, headed by conjunction *ke* 'and', it triggers the veridical inference regardless of tense and aspect, i.e. with both present and past, perfective and imperfective. This causative co-ordination frame is found not only Greek, but also in English with some action verbs like *try, allow,* and implicatives. We propose that the bi-clausal structure of actualized ability reflects a logical form [φ CAUSE [become ψ]] (Dowty 1979). We argue that this configuration, and because CAUSE is a relation between events, imposes an eventive meaning on the verb *boro*— ability thus becomes, from pure energy, energy as *force* in the sense of Copley and Harley (2010), i.e. an **input of energy** into some initial situation, which eventually will lead to the result ψ-state.

The discussion proceeds as follows. In section 2, we discuss the aspectual approaches to the actuality entailment, and then in section 3, we show them to be challenged in Greek—since the actuality entailment arises with both present and past, perfective and imperfective in the unambiguous causative frame. We also show that the actuality effect arises only with the ability modal in Greek, and never with the necessity modal (unlike French, as claimed by Hacquard; but see Mari and Martin's (2009b) for reservations about Hacquard's necessity data). This further confirms that the actuality effect has to do with ability, and it is not due to general modality and aspect interaction, as predicted by the scope analysis of Hacquard. In section 4 we discuss abilities in the causative syntactic frame, and offer an analysis of these as action sentences that involve causation and force. Our analysis of actualized ability as relying on causation and force carries over to implicative verbs too, which also appear in the co-ordinate causative frame. This way we explain why the action-result effect is found with both abilities and implicatives, without saying that the ability verb *boro* is ambiguous—*pace* Bhatt 1999. While implicatives and ability-initiated actions are not the same, there is indeed a connection between 'actualized' ability and implicatives in that they are both causative structures.

2   Aspectual analyses of actuality entailment and problems with them

Bhatt (1999), as we said earlier, suggested that the difference between modal and actuality ABLE must be described as a lexical effect brought about by perfective aspect. Actualized ability has the logical structure *PERF (able p),* whereas pure ability is *GEN(able p). PERF (able p)* lexicalizes as an implicative verb (in the sense of Kartunnen 1971), e.g. like *manage.* A parallel between action ability and implicative verbs certainly seems to be supported—apart from the fact that they both allow the veridical inference to the truth of *p*, also by an additional inference effort: in our earlier example *John was able to escape*, it took some (considerable) effort from John to escape, and the same is true of implicative verbs:

(4)   I Ariadne   {**katafere/borese**}   **na**   ftiaksi   to aftokinito.
       The Ariadne   managed.3sg/could.perf.3sg   SUBJ   fix.perf.3sg   the   car
       Ariadne {managed to/was able to} fix the car.

(5)   Karttunen's 1971
       Manage p entails p, and presupposes that it took (some or considerable) *effort to do p*.

This inference of effort is systematically present with the implicative class: verbs like *get, remember, allow* etc. have it. Effort seems to be a presupposition (a conventional implicature in Karttunen), as it preserved under negation:

(6)   a. John {didn't manage/wasn't able} to fix the car.   Still allows inference that:
       b. John made an effort to fix the car.

At the same time, though, we see that the inference that *p* is true does not hold under negation:

(7)   a. John {didn't manage/wasn't able to} to fix the car.   Does not entail:
       b. John fixed the car.

Hence, both implicative and actualized abilities assert the result (that *p*), while both presuppose a certain noteworthy degree of effort to get to that result.
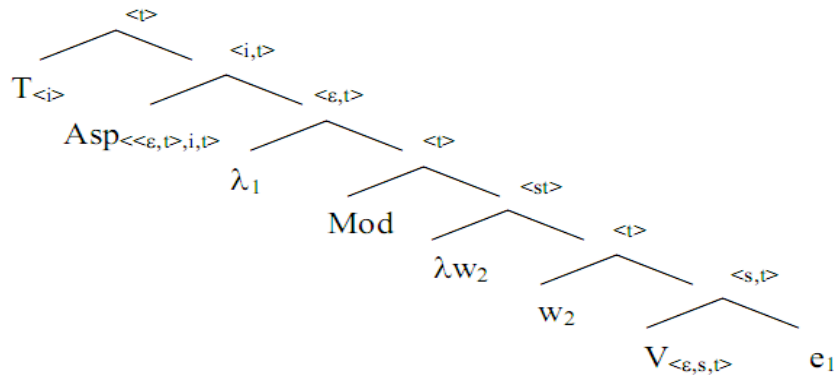   As we see, effort is observed also with actualized ability. Notice that even if we don't have a verb meaning like e.g. *escape* or *fixing the car* (which admittedly imply planning and effort), effort will be accommodated:

(8)   O   Janis   borese   na   **sikothi**.
       The   John   can.**perf.past**.3sg   SUBJ.C   stand-up.perf.nonpast.3sg
       John was able to stand up—it was a difficult thing!

Stand up is normally easy—but with *borese* we need a context in which it is difficult to stand up, i.e. John was sick or John is a 4 months infant. So, as regards both reaching the result *and* effort, actualized ability and implicative verbs are similar. Bhatt (1999) argues that the ability modal in the perfective past is an implicative verb, whereas the pure ability has the structure *GEN(able)*. For him then, perfective aspect is the key in creating a new lexical meaning.
       Hacquard (2006, 2009) and Piñón (2003), on the other hand, argue that there is no lexical effect of aspect. The actuality effect is a case of aspect scoping over the modal verb. In Piñón's words: "the 'descriptive content' of both readings [actualized and non-actualized ability; note ours] is kept constant but a difference is postulated between them <u>in terms of the relative scope of operators</u>" (Piñón 2003: 392). More specifically, "[w]ith ability *able*, tense takes scope over modality, but with opportunity [i.e., implicative] able, modality takes scope over tense". Hacquard presents a similar analysis: When perfective aspect scopes over the modal, we have actualized ability, when the modal scopes over perfective we have pure ability. We illustrate here the former:

(9)   Hacquard (2009): Aspect scoping over modal: 'implicative meaning'

```
                                    <t>
                           _____|_____
                        T<i>              <i,t>
                              _____|_____
                         Asp<<ε,t>,i,t>          <ε,t>
                                      _____|_____
                                    λ₁              <t>
                                          _____|_____
                                        Mod              <st>
                                              _____|_____
                                            λw₂              <t>
                                                  _____|_____
                                                w₂              <s,t>
                                                        _____|_____
                                                    V<ε,s,t>          e₁
```

(10) a. Jane a pu courir.
      Jane was able to run
      b. [$_{TP}$ past [$_{AspP}$ perf [$_{ModP}$ can [$_{VP}$ Jane run]]]]

(11)

$$[[\text{can}_{circ}]]^{w,B,\leq,c} = \lambda P_{<\text{sεt}>}.\lambda e.\ \exists w' \text{ compatible with circumstances in w such that } P(w')(e)$$

(12)   Modal combined with an intensional predicate via IFA

$$[[[_{ModP} \text{ can } [_{VP} \text{ Jane run}]]]^{w,B,\leq,c} = [[\text{can}]]^{w,B,\leq,c} (\lambda w'.\ [[\text{Jane run}]]^{w',B,\leq,c})$$
$$(by\ IFA)$$
$$= \lambda e.\ \exists w' \text{ compatible with circumstances in w: run}(e,J,w')$$

(13)   Actuality entailment by Hacquard (2009):
      $[[10]]^{w,B,\leq,c}$ is true iff $\exists e$ [e in w & $\tau(e) \subseteq t$ {t < t*} & $\exists w'$ compatible with circumstances in w s.t. run(e,J,w')]
      'There is an event in the actual world located in a past interval, and there is a world compatible with the circumstances in the actual world where that event is a run by Jane'

In this approach, as well as in Bhatt's, actualized ability depends crucially on perfective aspect. There is nothing special about ability; the ability verb is just an existential circumstantial modal. And, since it's just about perfective aspect and there is nothing special about ability, Hacquard claims that an advantage of her theory is that actuality also arises with necessity and deontic modals in French if they appear in the perfective:

(14). a. Jane a dû prendre le train pour aller à Londres, #mais elle a pris l'avion.
         Jane **must-perf.past** take the train to go to London, #but she took the plane
      b. Jane devait prendre le train pour aller à Londres, mais elle a pris l'avion.
         Jane **must-impf.past** take the train to go to London, but she took the plane
         Jane had to take the train to go to London, but she took the plane.

(15) a. Lydia a pu aller chez sa tante (selon les ordres de son pére), #mais n'y est pas allée.
        Lydia **can-perf.past** go to her aunt (according to her father's orders), #but didn't go.
     b. Lydia pouvait aller chez sa tante (selon les ordres de son pére), mais n'y est pas allée
        Lydia **can-impf.past** go to her aunt (according to her father's orders), but didn't go.

Lydia could go to her aunt (according to her father's orders), but she didn't go.

Mari & Martin (2007, 2009b) make a couple of empirical points of criticism that are very important. First, they caution that the actualized reading does not arise in perfective sentences on the epistemic and deontic readings, i.e. they question the judgments above. Second, they argue that, at least in French, the actualization with perfective can be cancelled in two cases. First, when the context provides elements making clear that the circumstances (or the ability, the opportunity to reach the goal) are temporally bounded, i.e. with durative adverbs:

(16) La carte a permis pendant dix minutes seulement d'entrer dans la bibliothèque. Mais stupidement je n'en ai pas profité.
The card permitted.**perf** for ten minutes only to enter the library. **But stupidly, I didn't enjoy the opportunity.**

The same is true in Greek: despite the perfective "allowed" below, the continuing sentence cancels the actualization entailment:

(17) I karta mu **epetrepse.perf.3sg** ja misi ora na bo sto internet dorean, ala ego i xazi den ekmetaleftika tin efkeria.
The card allowed me to get internet access for half an hour, but I, stupidly, didn't take advantage of the opportunity.

These data suggest that the correlation between perfective aspect and actualization is not perfect: We have perfective on the implicative, as above, with no actuality entailment. In Hacquard's analysis, it is unclear how to exclude this; and we see next more data from Greek showing that the correlation between perfective aspect and actuality is imperfect and in fact distracting.
Another second point Mari and Martin raise is that the action meaning can be cancelled when the infinitival complement contains a stative predicate:

(18) a   T'as pu.**perf** avoir un repas gratuit, et tu ne t'es même pas levé !   French
You could have a meal for free, and you even didn't get up !
b   Boreses.**perf** na exis dorean proino, ki esi i anoiti den ksipnises kan!   Greek
You could have breakfast for free, and you even didn't get up !

(To "have a meal for free", we take it, following Mari and Martin, is a stative predicate, like most *have* predicates).   Again, we see that the second sentence cancels the actualization, despite the perfective aspect on CAN. We must conclude, then, that perfective aspect does not always correlate with actualization, contrary to what the aspectual analyses predict.
Now, notice crucially the sentences below with the complement being introduced by *ke* 'and': unlike with the subjunctive *na,* the expected complement, the actuality reading is forced:

(19) I karta mu {**epetrepse/epetrepe**}   ja misi ora   *ke*   **bika/ebena**
the card my alled.perf./allowed.imperf.1sg, for half hour and got-in.perf/imperf.1sg
sto internet dorean.
to internet free
(#ala ego i xazi den ekmetaleftika tin efkeria)
The card **allowed me and I got** internet access for half an hour (#but I, stupidly, didn't take advantage of the opportunity).

We see here that if we use the *ke*-structure, both perfective and imperfective license the actuality reading as the only reading of the sentence. This is because the structure is causative and asserts the result, we will argue. The actuality of CAN therefore depends on causation, and not on aspect.

Before we proceed with the Greek data, it is important to note one more point of concern for the aspectual scope analysis. This approach fails to derive the effort inference. The meaning of CAN being a regular existential circumstantial modal, it is difficult to see how to build in the presupposition of effort. Recall also what we said at the beginning, namely that even in pure ability a component of action is needed, and a stronger modal force than mere existential circumstantial seems more appropriate (Kenny 1975; Thomason 2005; Giannakidou 2001).

With these facts in mind, let us move on now to examine in more detail the Greek data.

3   The syntax of actualized ability in Greek: causative co-ordinations

In this section, we present data that show that the actuality reading of ability is best understood as depending on causation rather than aspect. We show first that actuality arises in a particular syntactic frame in Greek, one that appears to involve co-ordination. We saw already in (19) that in this frame, perfective as well as imperfective aspect gives rise to actuality, and we present more data to this effect in the present section. The *ke*-frame is causative, and is observed also with implicative verbs, in Greek as well as (but perhaps more marginally) in English. We also present data from Georgian to show that the frame exists in that language too, with properties very similar to Greek. In the causative frame, ability is forced into an action reading, and we offer an analysis in section 4.

First, some background on Greek modals.

3.1 Background on Greek modals

Greek has three modal verbs: *prepi, bori* and *boro*;[3] for earlier detailed descriptions of uses of Greek modals see Staraki (forthcoming), Tsangalidis (2004), Tsangalidis & Facchinetti (2009), Iatridou (1986). All three modals are nonveridical and select subjunctive complements introduced by *na* (Giannakidou 1998, 1999, 2009); indicative complements, introduced by *oti, pu* are unacceptable. (Modern Greek realizes the subjunctive vs. indicative difference in what appears to be the *that* element, the particle introducing the clause. Modern Greek also hacks infinitives). *Bori* and *boro* are impersonal (3rd person singular) and personal variants of the same verb. As we see below, the impersonal *bori* is an epistemic possibility modal, whereas the personal is abilitative or deontic, never epistemic. The modal verb *prepi* is a necessity modal, epistemic or deontic, and is always impersonal:

(20)   a. * Ta pedhia **prepun**   na   ine   sto   spiti.
            The children **must.impf.3sg** SUBJ be.impf.3pl to-the home
            Children must be at home
       b. Ta pedia   **prepi**   na   ine   sto   spiti.
            The children **must.impf.3sg** SUBJ be.impf.3pl to-the home
            Epistemic necessity: As far as I know, the children must be at home.
            Deontic necessity: According to the rules, it is necessary that children be at home.

---

[3] Greek also has a polarity modal *xriazete* 'need", which appears in the 3rd person singular impersonal form as a negative polarity item (Giannakidou 1997). Such polarity modals are common, e.g. German *brauchen*, Dutch *hoeven* (van der Wouden 1994), etc. The crucial thing that Giannakidou notes for *xriazete* is that it is polarity sensitive only in its impersonal variant; as a personal verb, *xriazome* means *need* as in *Ta pedhia xriazonde lefta* 'The kids need money". This, in conjunction with what is said next in the text, suggests that Greek exploits the personal, impersonal distinction as a generalized quasi-lexical means for differentiation in the modality domain.

(21) a. Ta pedia **bori**   na   ine   sto   spiti.
          The children **might.impf.3sg** SUBJ be.impf.3pl to-the home
          Epistemic possibility: As far as I know, it is possible that children are at home

      d. Ta pedia   **borun**   na   pane   sto   spiti mona tus.
          The children **can.impf.3pl** SUBJ go.impf.3pl to-the home alone them
          Ability: The children are able to go home on their own.
          Deontic: The children are allowed to go home by themselves.

Notice that, as expected, in none of these cases do we get the entailment that the *na*-complement is true, since the modal verbs are nonveridical, including the necessity modal (see Giannakidou 1997, 1998, and more recently 2011). At the same time, it is important to note the flexibility of the necessity modal *prepi* with respect to the modality (epistemic or deontic), and the rigidity of the impersonal *bori* as an exclusive epistemic modal. The personal version, on the other hand, *boro,* unlike English *could,* French *a pu*, and Italian *ha potuto* (Mari 2011) never receives epistemic readings, not even with statives. Notice the contrasts below:

(22) Jean **a pu** être malade et c'est pour cette raison qu'il n'est pas venu à la fête.
          'John might have been sick and for this reason he did not come to the party'

(23) a   # O Janis borouse/borese   na   itan arostos, ji' afto den irthe sto parti.
              The Janis **could.impf.3sg**/ **could.perf.3sg**   **na be.past** sick
              (Intended epistemic: John might have been sick, that's why he didn't come to the party.)
      b   # Ta pedia borousan/boresan   na itan arosta, ji' afto den irthan sto parti.
              The kids **could.impf**/ **could.perf**   **na be.past**.3pl sick
              (The kids could have been sick, that is why they did not come to the party.)

Both perfective and imperfective variants of *boro* are odd in the ability reading; as we see, the impersonal *bori* is the only option for epistemic reading:

(24) a   O Janis   bori   na itan   arostos,
              The John   **could.imperf.3sg** na be.past.3sg sick,
              ji' afto den irthe sto parti
              that's why not came.3sg to-the party
              Epistemic possibility only: It is possible that John was sick
      b   Ta pedia   bori   na itan arosta,
              The children **could.imperf.3sg** na be.past.3pl sick
               ji' afto den irthan sto parti
              that's why not came.3pl to-the party
              Epistemic possibility only: It is possible that the children were sick

We can then safely assume a lexical split in Greek between the impersonal *bori*— an epistemic possibility modal form, something like *might* in English—and personal *boro* which is never epistemic, but always abilitative or deontic. Because *prepi* and *bori* are both invariant forms, it is plausible to think of them as higher sentential modals (or even adverbials, as suggested e.g. in Giannakidou 2009). Their behavior and form are at any rate consistent with the literature on the epistemic modals, which claims them to be high, sentential operators (see Portner 2009).

3.2 No generalized pattern: actualization only with ability

According to Hacquard ([2007], 2009) the ability phenomenon is aspectual, and there is a general pattern in which actuality entailments can be found with necessity and deontic modals too. This is not true for Greek. For example, the *prepi* (∀-modal) does not produce the actuality entailment:

(25) a. O Janis **prepi**   na   milisi (but he will not)
          The John   must.**impf**.nonpast   SUBJ.C   speak.perf.nonpast.3sg
          John has to talk (but he will not).
       b. O Janis **eprepe**   na   milisi (but he did not)
          The John   must.**impf**.past   SUBJ.C   speak.perf.nonpast.3sg
          John had to talk (but he did not)

We see here that the necessity modal, in both present (*prepi*) and past (*eprepe)* does not entail truth of its complement. Thus, we observe that in Greek the actuality entailment is limited to the ability modal *boro*.

3.3 Generalized actualization in the causative frame

3.3.1 Causative co-ordinate structure

Now notice the example below. This example has the actualized ability reading, only instead of the expected subjunctive complement (*na*), the complement is introduced by the co-ordinator *ke* 'and', as we indicate in the translation:

(26)   I Maria **borese**   **ke**   eftiakse   to aftokinito.
       Maria   could.perf.past.3sg   <u>and</u>   fixed.perf.past.3sg   the   car
       Mary could, and did, fix the car.

We already saw an example like this earlier (19). The use of *ke* 'and' is crucial in deriving actualization, and the structure, is also observed with implicative verbs, and verbs of trying [4]:

(27)   O Janis **katafere**   **ke** ipje   10 bires.
       The John **managed.perf**   **and** drunk. perf.past.3sg ten beers
       John managed to drink ten beers.
(28)   O   Janis prospathise   **ke**   pire   to   epidoma.
        The   John **tried.perf**   **and**   took. perf.past.3sg   the   bonus
       John tried and got the bonus.
       =John made efforts and got the bonus.
(29)   O   jatros mas   epetrepse   **ke**   idame   ton   astheni.
       The   doctor us   **allowed.perf and**   saw. perf.past.1pl   the   patient

---

[4] We will not address the syntax of these structures in detail in the present paper, but it is important to note that they are not obligatory control structures; nor are the *na*-complements (Terzi 1992, Roussou 2000 among others):

(i)   O   Janis prospathise **ke**   pire/pirame   to   epidoma.
       The   John **tried.perf and**   took.perf.past.{3sg/1pl}   the   bonus
       Control: John tried and got the bonus.
       Obviating: John tried and *we* got the bonus.

The *boro ke*-frame, however, seems to involve control only:

The doctor allowed us to see the patient, and we did.

The occurrence of *ke* 'and' seems unexpected—since the verbs select normally a *na*-complement, as we said. At least syntactically, then, these structures seem 'spurious'. Notice, however, that the occurrence of conjunction is not just a 'peculiarity' of Greek. Georgian too, appears to have to license this peculiar co-ordination after the same class of verbs. Compare the following Georgian examples in (30) – (32) with the Greek examples in (27) – (29). In example (30), the ability reading derives from the co-ordinate structure with *da* 'and' like the same example in Greek (26): Maria had the ability to change the wheel, acted on that ability, and she actually did change the wheel. [5]

(30)   Merim   shesdzlo   **da**   gamotsvala   borbali.
        Mary.ERG   could.perf.3sg **and**   fix.perf.3sg   wheel
        Mary was able to and did change the wheel

(31)   Venom   moakherkha   **da**   dalia   10   botli   ludi.
        Vano.ERG   manage.perf.3sg   **and**   drink.perf.3sg 10   bottles   beer
        John managed to drink ten beers.

(32)   Venom   etsada   **da**   premia   moigo.
        vano.ERG   try.perf.3sg   **and**   bonus   win.perf.3sg
        John tried and got the bonus.
        =John made efforts and got the bonus.

Georgian derives actualization by using *da* 'and', and like in Greek, the co-ordinate structure is also used with verbs that imply some or a considerable amount of effort, like verbs meaning *manage* and *try*— both of which presuppose that the subject showed a certain effort to achieve a result. John made a considerable effort to drink, and the effort caused the result of drinking 10 bottles of beer in (31), or get the bonus (32). Thus, the use of a co-ordinate structure with a causative/action reading appears to be more not just a peculiar feature of Greek. English has this structure too, at least with the verbs *try* and *allow* (see Larson et al. 1997).

(33)   Bill tried **and** got himself an appointment.

We will call this the 'causative co-ordinate structure' (or frame) from now on. Importantly, the causative co-ordinate structure arises only with action verbs; factive, epistemic or assertive verbs are not compatible with it:

(34)   a   O Janis pistepse   {*ke/oti} i   ji   {ine/itan}   epipedi.
             The John believed.perf.past.3sg {*and/that} the earth is.impf.non-past/past flat
             John believed that the earth is flat.
        b   O Janis ipe   {*ke/oti}   i ji   {ine/itan}   epipedi.
             The John said.perf.past.3sg   {*and/that} the earth is.impf.non-past/past   flat
             John said that the earth is flat
        c   O Janis xarike   {*ke/pu}   i Maria ton {agapai/agapuse}.

(i)   O   Janis borese   **ke**   pire/??pirame   to   epidoma.
        The   John **could.perf and**   took.perf.past.{3sg/??1pl}   the   bonus
        Control: John could, and did get the bonus.
        Obviating: ??John could and *we* got the bonus.

The John was-glad.perf.past.3sg   {*and/that} the Mary him loves.impf.non-past/past
John was glad that Mary loves him.

If the *ke-* frame is a causative/action frame, as we suggest, then the incompatibility with the assertive, factive and epistemic verbs is no surprise: believing, saying, or being glad that *p*, cannot be coerced into action meanings.

Negation and its interaction with the paratactic frame offer one more argument in favor of idea that we are dealing with a causative structure. The frame cannot be negated:

(35)   * O   Janis **dhen katafere**   **ke**   ipje   10   bires.
       The John not **managed**.**perf.past**.3sg   **and** drunk ten beers
       John did not manage to drink ten beers.

(36)   * O Janis   **dhen prospathise**   ke   pire   to   epidoma.
        The John   not **tried**.**perf.past**.3sg   **and**   took   the   bonus
       John did not try to get the bonus.
       =John made efforts and got the bonus.

(37)   * O   Janis **dhen borese**   **ke** ipje   10 bires.
       The John not **could**.**perf.past**.3sg   **and** drunk ten beers
       John didn't manage to drink ten beers.

Because we have co-ordination, for the sentence to be true it must be the case that both conjuncts are true. Since the second conjunct asserts the result, if you negate the first one, you destroy the causation relation.

So, apparently, the triggering of the *ke*-clause is related to, and can be used as a diagnostics for an action component in the verbs that allow it. Because we have conjunction, and the second conjunct is a sentence, the simplest thing to assume is that syntactically, the *ke*-structure is indeed a co-ordination. This is the hypothesis we will follow here.[6]

Another possibility would be, as a reviewer suggests, that maybe *ke* is an aspectual marker, i.e. a perfectivity marker DID. The reviewer suggests that "in English DID is lexically incorporated in *manage* and *allow*, thus we can say *John managed to fix the sink* and *Bill allowed us to see the movie* with an actuality entailment but this is not the case with *John tried/hoped/wanted to fix the sink*. *To* adds imperfective aspect, while DID creates perfectivity (that is, temporal closure), and can be incorporated in a verb. No syntactic conjunction is necessary then." We do welcome the

_____

[6] A reviewer suggests that maybe *ke* is an aspectual marker, i.e. a perfectivity marker DID. The reviewer further suggests that "in English DID is lexically incorporated in *manage* and *allow*, thus we can say "John managed to fix the sink" and "Bill allowed us to see the movie" with an actuality entailment but this is not the case with "John tried/hoped/wanted to fix the sink". *To* adds imperfective aspect, while DID creates perfectivity (that is, temporal closure), and can be incorporated in a verb. No syntactic conjunction is necessary then." We do welcome the suggestion, but we find it highly implausible, for many reasons. First, we must remind the reader that *ke* is morphologically a coordinator; proposing that it doesn't function as such would be quite extraordinary. We would have to present considerable evidence to show that *ke* actually *doesn't* function as a co-ordinator, and we simply don't have such evidence. And even if we adopted, without evidence, the idea that it functions as an aspectuality marker, we would still need to explain how the complement clause is introduced, and we would have to say that is *not* introduced by *ke*. This strikes us as counterintuitive. We would then have to posit a covert complementizer, but Greek is not a language that generally allows complementizers to be dropped, so this would be an additional exceptional property of the analysis. We also find the reviewer's interpretation of "aspect" problematic: it is quite loose, since it does not rely on the usual morphological criteria. If we go that route, we worry that we are talking about aspect so generally that it becomes almost vacuous. Notice, in this connection, that the verb in the *ke*-clause contains aspect (perfective or imperfective), so if *ke* were an aspectual marker, we would have two aspect markers in a clause. Plus, and this is worse, *ke* is possible with imperfective in the sentence, hence the aspectual markers would be conflicting, something that doesn't normally happen—e.g. we cannot have a *for*-adverbial with perfective aspect. Finally, the very fact that ke *is* compatible with imperfective aspect is a problem for this type of analysis. If it were a perfectivity marker, *ke* simply shouldn't be possible with imperfective. But it is. Our conclusion will therefore is that *ke* cannot be an aspectuality marker. Since *ke* looks like a co-ordinator, the most plausible course of action is, in the absence of evidence to the contrary, to assume that it also functions as such.

suggestion, but we find it highly implausible, for a number of reasons. First, we must remind the reader that *ke* is morphologically a coordinator; proposing that it doesn't function as such would be require justification; we would have to present considerable *syntactic* evidence showing that *ke* doesn't function as a co-ordinator. We simply don't have such evidence. And even if we adopted, without evidence, the perfectivity marker analysis, we would still need to explain how the complement clause is introduced. We would be forced to say that is *not* introduced by *ke*—since *ke* would be aspect, and aspect markers don't generally introduce clauses. At a more general level, we fear that such 'loose' interpretation of "aspect", not relying on the usual morphological criteria, reduced aspect to a category so general that it becomes almost vacuous. Notice, in this connection, that the verb in the *ke*-clause contains aspect (perfective or imperfective), so if *ke* were an aspectual marker, we would have two aspect markers in a clause, something otherwise impossible in Greek. Plus, and this is worse, *ke* is possible with imperfective in the sentence, hence the aspectual markers would be conflicting, something that, again, doesn't normally happen—e.g. we cannot have a *for*-adverbial with perfective aspect. Finally, the very fact that ke *is* compatible with imperfective aspect is a problem for this type of analysis. If it were a perfectivity marker, *ke* simply shouldn't be possible with imperfective. But it is. Our conclusion will therefore be that *ke* cannot be an aspectuality marker. Since *ke* looks like a co-ordinator, the most plausible course of action is, in the absence of empirical evidence to the contrary, to assume that it also functions as such.

3.3.2   Actualized ability with perfective-imperfective, past-nonpast

Now notice that once we use the causative frame, we get the actualization entailment not just with past tense and perfective aspect (as in the examples above), but all over the place, e.g. also with imperfective and present. Recall our example in (19). It is instructive to consider here again these cases:

(38)   O Janis **borouse**   **ke** epine   10 bires kathe vradi tin epoxi ekini
       John could.**impf.past.3sg**   and drank.**impf.past.3sg** 10 beers every night that time
       John used to be able to, and did, drink 10 beers every night at that time.
       # Ala den (tis) epine.
       #And he didn't.

It is true that every night, in the relevant past period, John was able and, in fact, he did drink ten beers:

(39)   EVERY t: night (t) & t<n; <u>John drinks 10 beers at t</u>

Now consider the non-past:

(40)   O Janis **bori**   **ke** pini   10 bires kathe vradi (# ala den pini)
       John   drinks.**imperf**.nonpast.3sg **and** drink.imperf.3sg   ten beers every night.
       John can drink ten beers every night (#but he doesn't)

(41)   EVERY t: night (t); <u>John drinks 10 beers at t</u>

Here John is able, and he in fact drinks, ten beers every night (in the relevant nonpast interval). Therefore, once we use the coordination frame, actuality entailments arise with imperfective and present. Thus, it is simply false to say that perfective and past tense are the decisive factors for the actualized ability reading in Greek. The past perfective does facilitate actualization, but this, we

believe, is epiphenomenal. The true nature of the phenomenon is revealed in the causative co-ordinate structure, which otherwise indeed may seem peculiar.

3.4 Causative frame: ability modals, action verbs, and meaning shifts

We now want to show that the co-ordinate frame allows the veridical inference (that the result *p* is true) with the other verbs of action that we observed earlier such as *try* and *allow*—again, regardless of aspect or tense:

(42) O   jatros mas   **epitrepi**   ke **vlepoume** ton astheni.
     The   doctor us   allows.**impf.nonpast.3sg** and see.**impf.nonpast.3sg** the patient
     The doctor allows us to visit the patient, and we do.

(43) GEN t: the doctor allows us to see the patient at t; <u>we see the patient at t</u>

(44) O   Janis **prospathi**   ke   **troi**   ena milo   tin   imera.
     The   John tries.**impf.nonpast.3sg** and eats.**impf.nonpast.3sg**   one apple the day
     John tries to eat an apple per day, and he does.

(45) GEN t: John tries to eat an apple at t; <u>John eats an apple at t</u>

The verbs *try* and *allow* are nonveridical— they select the subjunctive *na*-complement (Giannakidou 1998, 1999), which does not denote a true proposition. *John is trying to fix the car* does not entail that John did fix the car, or that he will succeed after trying. Likewise, *allow p* does not entail *p*. But in the co-ordination frame, we do get entailment to the truth of. The same thing in the imperfective past:

(46) O   jatros mas   **epetrepe**   ke **vlepame** ton astheni.
     The   doctor us   allowed.**impf.past.3sg** and saw.**impf.past.3sg** the patient
     The doctor used to allow us to visit the patient, and we did.

(47) O   Janis **prospathuse**   ke   e**troje**   ena milo   tin   imera.
     The   John tried.**impf.past.3sg**   and ate.**impf.past.3sg**   one apple   the   day
     John tried to have an apple per day, and he dis.
     (= John made sure to eat one apple a day).

One way to interpret these data is to say that in the co-ordination frame the veridicality of the verb is affected because a new verb meaning is created: e.g. aside the classical *allow and try* we would have the veridical *allow$_2$*, something like "permission granted, and agent acted on that permission"; veridical *try$_2$* would shift to something like "make sure". Such meaning shifts are well-known with mood choice, sometimes also with negation, in Greek, Romance and Balkan languages (see Giannakidou 1998, 2009, 2010; for Romance Giorgi and Pianesi 1997, Quer 1998, 2001, Laca 2010; for Balkan languages Siegel 2009). To see the point, consider the example below:

(48) O   Janis arnithike   **na**   pai.   (Giannakidou in press)
     The   John   refused   SUBJ go.3sg.pnp
     John **refused to** go.
(49) O   Janis arnithike   **oti**   pije.
     The   John   denied   IND.C went.3sg.past

John **denied that** he went.

We see here the same verb *arnithike* to translate in English as 'refuse' when selecting a subjunctive complement, and 'deny' when selecting an indicative *oti* complement. In other words, a lexical choice in English between *refuse* to *deny* becomes visible in Greek through choice of the complement the verb will take. Here is another example:

(50)   a   O Janis lei   **oti**   efijan noris.   (Giannakidou 2011)
           The John says   that-IND   left.3pl early
           John says that they left early.
       b   O Janis lei   **na**   figoun noris.
           The John says   that-SUBJ   leave.3pl early
           John {**wants/is planning**} them to leave early.

Lei oti is an assertive verb in the *a* example, but *lei na* loses its assertive meaning, and acquires a volitional meaning. Again, these might be explained in terms of lexical ambiguity. However, we believe it is more profitable to envision these systematic correlations between verb meaning and form of syntactic complement as interactions where the syntax affects the meaning of a verb by bringing about components in the verb meaning that were there already—but which, without the syntactic trigger, would remain invisible. The hypothesis we develop for the verb *boro* in this paper will be guided by this idea: the causality of the co-ordination frame affects the interpretation of ability. By asserting the result of an action (in the *ke*-clause), causality forces an action component in the ability clause; but this would not have been possible if ability itself did not contain an action component.

We are ready now to focus on the semantics of the *ke*-frame, for which we assume the following syntactic structure:

(51)   I Ariadne **borese**   **ke**   eftiakse   to aftokinito.
       Ariadne   can.perf.past.3sg   and   fixed.perfective.3sg   the   car
       Ariadne tried [to fix the car], and she did fix the car.

(52)   [I Ariadne borese [e: ~~fix the car~~]] and [Ariadne fixed the car]

So, we have a bi-sentential structure, with a null complement in the ability clause corresponding syntactically to the TP of the *and*-sentence. As the focus of our paper will be the semantic analysis of such structures, we will not offer further arguments for the syntax— our main thrust is, as we mentioned in earlier, that the surface syntax gives us a co-ordination, and unless we have reasons to believe that this is not a co-ordination of two sentences, we will remain faithful to the surface syntax. The syntax, we argue, translates directly into a causative logical form in the sense of Dowty (1979): [φ CAUSE [become ψ]], thereby forcing realization of the action component of the ability. In other words, we suggest that the *ke-* structures provides actual syntactic evidence for the bi-clausality of causation the way Dowty envisioned it.

4   Syntax and semantics: ability, action, causation, and force

We start with describing the pure ability meaning of the verb *boro* in Greek (section 4.1). We will rely on the strong analysis of ability as a universal quantifier and as precondition for action (Giannakidou 2001, Thomason 2005). In section 4.2, we offer an account of what it means to be an actualized ability. First, we propose that actualized ability sentences involve a biclausal structure [φ

CAUSE [become ψ]] (Dowty 1979). In Greek, as we just saw, the [become ψ] clause is given as a conjunct, hence we have evidence that here we are dealing with two clauses. Then we argue that in this configuration, the verb *boro* shifts from pure ability—as a precondition for action—, to ability-as-*force* in the sense of Copley and Harley, i.e. as **input of energy**; in other words, in the causative frame ability initiates action, and because of causation, the second conjunct will be the result.

4.1   Ability as potential for action

As we mentioned at the beginning, it has been common to admit that the semantics of mere possibility is too weak for ability verbs (see Portner's 2009 recent discussion and references therein; Chierchia and McConnell-Ginet (1990: 238) also claim that the analysis of *can* as a possibility modal is "certainly not right"). The problem with mere possibility is that it conceptualizes ability as occasional, i.e. it makes *Can x φ* true in case there is *some* (and possibly random) outcome associated with a manifestation of *x*'s ability (see Thomason 2005; Kenny 1975, 1976; and Mari and Martin 2009b; Mari 2011 on this point). However, intuitively *Can x φ* has to do with what *must* happen if *x*'s ability materializes in action. The basis of our discussion, then, is that ability is a prerequisite for action, and the mere possibility circumstantial modal analysis cannot capture this.

Giannakidou (2001) proposes an analysis of the ability CAN as a universal modal. The reasoning is justified as follows. "In an example like *John can swim*, for each world *w* we consider, John will have the ability to swim in that world. Though this definition seems to work fine in worlds where John knows indeed how to swim (and he knows that he knows that), due to training or natural talent, in worlds where John did not learn how to swim, or has not discovered his natural talent yet, *p* is clearly not true. [...] What we need to do is *restrict* the set of worlds so that it includes only those worlds in which people have abilities to do things *(because of proper training, natural talents*, or whatever other reason*), and where people are aware of these abilities*. Let us call these worlds the *ability*-modal base, and let's think of it as a function from w to worlds w', at least as normal as w, compatible with what an agent x is capable of doing at w":

(53) $K_{ability}(x)(w) = \{w': \forall p \, [x \text{ is capable of } p(w) \to p(w')]\}$ (Giannakidou 2001: 702).

The ability modal base, so restricted, contains worlds in which an agent *has tried and therefore knows* that he has the ability to do *p*. Notice that the modal base is defined in a world with respect to an agent *x*, not just abstractly in a world—so the ability modal differs from the epistemic or deontic ones in that it (and its modal base) is agent dependent. In Greek, the relevance of the agent is suggested clearly by the fact that the ability modal is a personal verb, contrary to epistemic and deontic *bori* which have impersonal syntax.

So ability *is* defined via an action component, since only worlds where the ability has been acted upon will be included in the modal base. *Boro*, in this set up, is defined as follows:

(54)   *Boro p* is true in a world w with respect to an ability modal base $K_{ability}(x)(w)$ and an ordering source $<_w$ ("be at least as normal as") iff:
For all worlds w' in $K_{ability}$, there is a world w" in $K_{ability}$ such that w"$<_w$w', and for every other world w'''$<_w$w" in $K_{ability}$, p is true in w'''.
(ABILITY CAN; Giannakidou 2001: (132))

Recall also Mari and Martin's (2009b) category of 'action-dependent ability'. Thomason (2005) pushes the view of ability as potential for action even further: *Can x φ* is equivalent to a conditional 'If *x* tries to bring about φ, then φ'. Thomason tries to formalize ability "in a way that could be carried out in most formalisms for reasoning about action and change" (Thomason 2005: 12). He uses a Situation Calculus, with a many-sorted first-order logic, and offers the following

analysis of CAN. We rely here on Thomason's discussion in sections 9 and 10.

Thomason's Situation Calculus has actions, fluents (or states), situations, and individuals. There is also a function *r* from actions and situations to situations such that $r(A,s) = s'$ means that s′ is the situation that results from performing A in s. (The existence of *r* presupposes a deterministic sort of change, at least as far as action- induced change goes.) The formal language contains a function letter Result denoting the function *r*.

In this set up, Thomason proceeds to "revise the causal axiom of the classical Situation Calculus for a constant A denoting an action as follows: we are interested in the results of trying to do an action, rather than the results of doing the action itself." Planning knowledge is indexed to actions, in the form of causal axioms linking conventional effects and preconditions with actions. The causal axiom for an action A denoted by A is the following:

(55) $\forall xs[Pre(A, x) \rightarrow Post(Result(A, x))]$.   (Thomason 2005: 9.1)

Here, *Pre* is the precondition for action A and *Post* is the postcondition (or effect) of A. Often, a causal axiom of this form is read: "If A is done and Pre(A,s) is true, then Post(A, Result(A,s)) is true." This provides a satisfactory basis for reasoning with actions and plans as long as one is only interested in the successful performance of actions. But it is counterintuitive in more cases where it may be important to reason about unsuccessful "performances"—i.e., about attempts to perform an action which may fail. This is exactly the sort of reasoning in which "trying" is invoked in informal, common sense reasoning.

Ability is added in the system in the following way:

(56) $\forall x_s[Can(A, x) \rightarrow POST(Result(try(A, s), x))]$ (Thomason 2005: 10.2)

Such axioms correspond to paraphrases like:

(57)   If I can open the door, then *after I try to open the door the door will be open.* (Thomason 10.3)

Can can now be characterized in terms of preconditions and constraints on the action denoted by A. For instance, suppose that A denotes an action A of *s*-order 0, where s denotes s. Then the success conditions for A, i.e. the conditions under which trying to perform A (in this case simply performing A) will achieve the effects conventionally associated with A *are simply the preconditions of A*. Here, the definition of *Can(A,s)* is simply this, where A denotes a 0-order action.

(58)   Can(A, s) amounts to Pre(A, s)   (Thomason 2005: 10.4)

Now, trying to perform an action may lead us to try to perform other actions—for instance, trying to open a door may involve trying to turn the doorknob. Suppose, then, that A0 is a 1-order action. For instance, A0 could be opening the door, and *try(A,s)* (i.e., A, s1) could be turning the doorknob and then pushing the door.

The general reduction of CAN, then, for a constant A_0^s denoting an n-order act, is this:

(59)   CAN (A_0^s , s) amounts to PRE (A_0^s , s) ∧ … ∧ PRE (A_0^s , s).

In this analysis, to say that an agent can perform an action *provides a condition that ensures the successful performance of the action;* and according to Thomason, the advantage of the Situation Calculus is that it provides a method of representing knowledge about actions from which we can

recover explicit conditions of success. [7] From this discussion, then, we retain the idea that ability to *perform* an action (CAN) is a precondition for the successful outcome of the action being done, and we proceed now to show that the *ke-* clause in Greek *adds* the successful outcome. This yields the so-called actuality entailment—which, in this system, is simply the assertion of success.

4.2   Ability as *force* and role of causation

Now, recall the basic facts: first, the subject of actualized ability is always agentive:

(60)   # **To nero** borese ke jemise to ipogio.   (agentive)
       # **The water** {was able to/ managed to/was allowed} fill the basement

Something inanimate like *water* is incompatible with the causative frame. Notice that the same is true for implicative verbs like *manage, allow*.
       Second, as we noted, the *ke-*structures are bi-clausal causatives in the sense of Dowty, with the logical form [φ CAUSE [BECOME ψ]]: an **agent** x **is trying to do a set of actions** that cause the result ψ (described by the second conjunct). A first approximation of the action meaning of ability, inspired by Dowty, can thus be as follows:

(61)   Action-*CAN*   (first approximation)
       [[x action-CAN ψ]] = TRY (α_1, [DO (α_1, π_n ((α_1, …,α_n)]]) CAUSE ψ, where ψ may be any non-stative sentence; α is a term, and π stands for arbitrary n-place predicate. (Dowty's Intentional Agentive Accomplishments (1979: 125, 4)).

(For the complement of TRY being always clausal, see Larson et al. 1997.). This lexical entry makes ability CAN a different lexical item, though, something that we will revise in our final analysis, as we shall see. Now consider an example:

(62)   I Ariadne **borese**   **ke**   eftiakse   to aftokinito.
       Ariadne can.perf.past.3sg and   fix.**perf.past**.3sg the   car
       Ariadne tried [to fix the car], and she did fix the car.
(63)   [[*Ariadne had the ability to perform actions to the effect of fixing the car*] CAUSE
       [[BECOME [car fixed]]]

(64)   [I Ariadne borese [e: ~~fix the car~~]] and [Ariadne fixed the car]

Now, the first conjunct in italics above, contains the ability of Ariadne to perform actions that will result in ψ (where ψ is *fix the car*). As we suggested in section 3 and we repeat above, the LF in the first conjunct contains a null complement identical to the TP of the *and*-clause. The first conjunct, with the ability word and the null complement, is the φ clause and the second one is the ψ clause of the CAUSE relation. Causation must be understood as in Lewis 1973:

(65)   Lewis 1973 on causation:
       An event A causes an event B iff:
       a. When A happens, B happens, and
       b. If A were not to happen, B would not happen

Causation is a relation between two events, such that event A *happening* is a precondition for event B happening. Now, our clause φ contains an ability verb, and recall that Thomason's ability is a precondition for the successful outcome *car fixed*. A precondition is not an action itself, but, on the other hand, in the causative frame we want to say that ability *initiates* action. In addition, not just that: we want to say that ability initiates and sustains action through the successful end result.

The causal relation between the two conjuncts forces an event reading of the ability, and we need to enrich the meaning of CAN with a component that will produce this action initiating ability. Dowty's inertia worlds will not do the job (for various reasons, see Copley and Harley 2010, Grinsell 2010 for an overview); but Copley and Harley (C&H) 2010 provide the notion of *force*, which is, we believe, what we need:

> (66) "A force is an **input of energy** into some initial situation. This energy is either generated by **an animate entity**, or it comes from the motion or properties of an inanimate object. **The application of this energy changes the initial situation** into a different situation, as long as no stronger force keeps it from doing so…. A force's observed final situation is thus contingent on the existence and strength of other forces opposing it.**"** Copley and Harley 2010 (section 3).

In C&H's framework, an event is to be understood as force that brings about a result (provided that nothing external intervenes). Forces are, in the most obvious case, physical forces, i.e. contact forces that result in change in the spatiotemporal properties of the object (i.e. in movement or rest, etc). Forces, in this physical sense, can also be understood as 'tendencies' (in the sense of Aristotle, e.g. in *Physics*), or gravitational forces, and they arise, according to C&H in the 'normal field' of a given topic situation. The innovation in C&H is the idea that *psychological forces*, i.e. desires, intentions, and, we will suggest, *ability*, can also function as physical forces in bringing about change. Surely, though, psychological forces are not ontologically identical to physical forces: intentions and desires involve an agent's beliefs and thoughts, and are not physical themselves.

In order to bridge the gap between action initiation force and psychological force, C&H propose the following *Law of Rational Action*:

(67)   *Law of Rational Action*   (Copley 2010: (16))
        If a volitional entity intends something in a situation *s*, and is not prevented by anything form acting in such a way (according to his/her beliefs) as to achieve it, the being acts (exerts a force on *s*) in such a way (according to his/her beliefs) to achieve it.

This law is itself a tendency of volitional entities, "so when it is saturated with an entity and a situation, it is a force. This is why we say it is included in the normal field." (Copley 2010: 7). It is important to understand what the law of rational action motivates. It says that whenever there is a volitional agent and the agent intents an action, this intention, *if nothing else prevents it,* will become force. In this general sense, the law is admittedly too strong— since in the normal case, it just does not follow from *x* wanting or intending something that *x* will act upon her desire. Desires are, after all, nonveridical (Giannakidou 1998, 1999; see also Heim 1992, Laca 2010, Yoon 2010), and we have good reasons to keep this characterization; i.e. it accounts for presupposition projection, mood choice, negative polarity items, and triggering of expletive negation, among other things. And conceptually, it is simply true that one may never act on a desire even if there are no forces preventing action. Or one may have desires that one knows can never be acted upon due to absence of other requirements, e.g. I may want to be a famous basketball player, but I am only 5 feet and my desire an never be true. Likewise, just having the ability doesn't imply acting on it either. So, it can't be the case that the law of rational action holds as a general law. Psychological forces generally do

not become (or, initiate) forces in the physical sense: there is a difference between the potential (nonveridical) and the actual (veridical) force that needs to be retained.

However, and this is the idea we will pursue, the law of rational action can be *triggered* in certain structures because of properties of the structure. In the case of ability, the causative frame is veridical: it asserts that a result (the second conjunct) holds. This affects significantly how ability is going to function. We argue that the causative frame triggers the law of rational action, thereby triggering a transition of ability from pure energy (a psychological force) to physical force, i.e. applied energy. Ability then, in the causative frame, and because of the law of rational action being triggered by causality, becomes physical force that enables an agent to perform actions that will bring about the result asserted by the second conjunct.

Application of the force causes change, and the measure of change will depend also on opposing forces, as stated in (66). We see then instantly that ability as force captures not just application of energy in initiating action, but also the difficulty component that we mentioned at the beginning. If ability in the causative frame is force, as we argue, and if force's final result partly depends also on opposing forces, then difficulty simply follows. Hence, we can use difficulty as a diagnostics for the existence of force, and we find it with various action verbs, as we noted earlier, in the causative frame.

We will now implement our analysis of ability as force building on C&H 2010. First, a summary of the ontology and basic types:

(68) Copley and Harley's 2010 ontology
   a. Eventive *v*Ps are predicates of forces (type $<f,t>$, that is, type $<<s,s>,t>$, since type f is shorthand for type $<s,s>$); they will be represented by lowercase Greek letters π, ρ..
   b. Predicates of situations, also called propositions, are type $<s,t>$ and are represented by lowercase Roman letters *p, q*, ...
   c. Stative predicates are also type $<s,t>$.
   d. Situations are given by the variables *s, s′, s″*, ...
   e. We refer to situations in a causal chain both with respect to the forces in that chain (i.e., a situation can be referred to as **init(f)** or **fin(f)),** as well as with respect to other situations in the causal chain; i.e., if *s* is a situation, s_1 is its (ceteris paribus) successor, and s_{-1} is its predecessor.
   f. The net force of a situation is **net(s),** and all situations are assumed to have a net force.

As an example, consider the progressive: it takes a predicate of forces (π, the denotation of the *v*P), and a situation (*s*, the topic situation provided by tense), and says that the property "π holds of the net force of s".

(69) [[progressive]] $= \lambda\pi.\ \lambda s_0.\ \pi(net(s_0))$

So, for example, if Mary is baking a cake, the net force of the current situation is one which leads to a situation in which a cake has been baked by Mary, if all else is equal.

Our idea is that ability is the psychological force triggering the initial action init(f) and is maintained through all intermediate stages leading to the final result fin(f). So, ability is a precondition for all actions (Thomason's 10.5) that will bring about the desired outcome. Since causation triggers the law of rational action, ability will force actions to the effect that ψ. At this point, the notion of necessary means (Baglini 2010) is useful. Baglini implements 'necessary means' in her analysis of causative *get*—as in *Ariadne got the car fixed:*

(70)   *Causative get*   (Baglini 2010)
         a. ψ is property of eventualities.

b. **Necessary means**:
An action α is a necessary means ($<$) to ψ in w if the following hold:

(1) There is a path β such that
    a. the first state of β is w;
    b. the last state of β is a ψ-state;
    c. β does α along the way.
(2) Every path β satisfying (1a) and (1b) also satisfies (1c).

A necessary means α is an action—or a series of actions— that remain constant through the path in order to bring about the ψ-state. In other words, every way to a ψ-state involves α. Now, ability to bring about the ψ-state is a precondition for the ψ-state, i.e. the necessary psychological force for bringing about the ψ-state. Because of causation, the ability will become physical force (Law of rational action); hence, it initiates a path to the ψ-state—that is, a necessary series of actions to get to it. Putting all this together, we have the following meaning of the CAN clause embedded under Force:

(71) $[\![$ Force (x CAN $\psi)$ $]\!]$ is true at time t in w iff:
    a. x has the ability do ψ; and
    b. Force initiates a path, i.e., a sequence of eventualities S ($<$init(f),... ,(fin(f)$>$) such that S is a necessary means ($<$) for ψ;
    d. ψ is the fin(f) of S.

This is the abstract logical form of the sentence with the ability modal *boro* in the causative frame. It captures the "transformation' of ability-as potential for action to action via force, but it does so without posing ambiguity in the ability verb *boro*, and without appealing to aspect—since we showed in section 3, that the phenomenon is quite independent of aspect. Rather, our idea capitalizes on the link between causation and force, and the claim above is that force takes ability in its scope, thereby licensing the actualization inference. One could think of the conjunction *ke* as the element introducing force, though syntactically force will have to take scope above the entire structure.

The shift, we argued, from pure ability to implemented energy is present in all co-ordinate structures with action verbs, including implicatives, so we capture the similarity of ability with implicatives (that Bhatt observed) without saying that ability and implicatives are the same. What is common in both cases is the triggering of force that the co-ordinate structure produces.

5   Conclusion

The most important lessons from this paper are two. First, the meaning of ability is richer than mere possibility or circumstantial modality, in containing a potential for action component. This by itself challenges the approaches where the eventive (action) information comes from aspect, and *not* ability itself. We showed that, in Greek and Georgian at least, aspect is not the decisive factor for the so-called actuality entailment— a finding in line with Mari and Martin's (2009b) observations that aspect in French is not the crucial factor for the actuality entailment either. We find past perfectives of *pouvoir* and *boro* without actuality, and past imperfectives and present tense with actuality in Greek, as we showed. The crucial factor, we argued, is causation, which is brought about in Greek with a co-ordinate structure. These causative paratactic structures are also (marginally) possible in English with verbs like *try, allow*—as in e.g. *The doctor allowed us and we saw the patient, John tried and he got us good seats*. The causative structure is important because CAUSE is a relation between two events, the second being a result brought about by the first event (or series of events).

The result brings *force* into action, in the sense of Copley and Harley 2010. This analysis, crucially, does not posit ambiguity in the meaning of the ability verb (unlike Bhatt 1999). Rather, it builds on the existence of an action component in ability, as argued for e.g. in Thomason 2005 and more indirectly in Giannakidou 2001, and postulates an interaction between the co-ordinate structure and lexical meaning that affects the latter. Such interactions are common crosslinguistically when it comes to complementation and mood choice, areas that are affected in the ability case too.

One final question: If the role of perfective aspect is epiphenomenal, as we claim, in triggering the causative reading, then why is it generally so easy to get the actualization with perfective past? Accomplishment verbs in the perfective past, especially those with incremental themes such as e.g. *Ariadne fixed the car, Nicholas wrote a letter,* etc., come with telic interpretation typically, i.e. one that guarantees (usually by entailment) reaching the result. Dowty argues that these telic interpretations are also causatives—though, admittedly, the syntax offers only one clause. If Dowty's idea is right, then there is nothing surprising about the telic perfective past: it is simply another way to create a causative structure. But our co-ordinate causatives are important because they allow us to see what is really doing the work: causation by triggering force, and not aspect.

References

Baglini, R. (2010). *Get* as an implicative verb. Ms. University of Chicago.

Bhatt, R. (1999). *Covert Modality in Non-Finite Contexts*. PhD. University of Pennsylvania

Brennan, V. (1993). *Root and Epistemic Modal Auxiliary Verbs*. PhD thesis, U Mass Amherst.

Chierchia G. and McConnell-Ginet.(1990). *Meaning and Grammar*. MIT Press.

Copley, B. (2010). Towards a teleological model for modals. Paper presented at the *Paris Working Sessions on Modality, Goals, and Events*. Nov. 2010.

Copley, B. and H. Harley.(2010). An ontology for a force-dynamic treatment of events. Ms. Paris 8, and University of Arizona.

Dowty, D. (1979). *Word Meaning and Montague Grammar*. Reidel, Dordrecht.

Giannakidou, A. (1995). Subjunctive, habituality and negative polarity. *Semantics and Linguistic Theory* (SALT) V: 132-150. Cornell University, Ithaca, NY.

Giannakidou, A. (1997). The Landscape of Polarity Items. Ph.D. Dissertation, University of Groningen.

Giannakidou, A. (1998). *Polarity Sensitivity as (Non)veridical Dependency*. Amsterdam and Philadelphia: John Benjamins,

Giannakidou, A. (1999). Affective dependencies. *Linguistics and Philosophy* 22: 367-421.

Giannakidou, A. (2001). The meaning of free choice. *Linguistics and Philosophy* 24: 659-735.

Giannakidou, A. (2009). The dependency of the subjunctive revisited: temporal semantics and polarity. *Lingua* 119: 1883-1908.

Giannakidou, A. Time, polarity and mood. In: R. Musan and M. Rathert (eds), *Tense across Languages*. Mouton de Gruyter. Pp. 59-90.

Giannakidou, A. (2010). The dynamics of change in Dutch enig: from nonveridicality to strict negative polarity. *Natural Language and Linguistic Theory* 28: 861-875.

Giannakidou, A. 2011. The future of Greek as an epistemic modal. Ms. University of Chicago.

Giorgi, A. and Pianesi F. (1997). *Tense and Aspect: from Semantics to Morphosyntax*. Oxford University Press.

Grinsell, T. (2010). Problems of inertia worlds in the semantics of the progressive. Paper presented at the *Semantics and Pragmatics in Europe* 3.

Hackl, M. (1998). *On the semantics of ability attributions*. Ms. MIT.

Hacquard, V. (2006). *Aspects of Modality*. PhD thesis. MIT.

Hacquard, V. (2007). Speaker-oriented vs. Subject-oriented Modals: A Split in Implicative, in E. Puig-Waldmüller (ed.), Proceedings of Sinn und Bedeutung XI.

Hacquard, V. (2009). On the interaction of aspect and modal auxiliaries, *Linguistics and Philosophy* 32 (3): 279-315.

Heim, I. (1992). Presupposition projection and the semantics of attitude verbs. *Journal of Semantics* 9: 183-221.

Iatridou, S. (1986). An Anaphor not Bound in Its Governing Category. *Linguistic Inquiry* 17(4): 766-772.

Karttunen, L. (1971). Implicative Verbs. *Language* 47 340-58.

Kenny, A. (1975). *Will, Freedom, and Power*. Dordrecht, Reidel.

Kenny, A. (1976). Human abilities and dynamic modalities. In: L. Manninen, and R. Tumoela (eds), *Essays on Explanations and Understanding*. Pp. 209-232. Dordrecht, Reidel.

Laca, B. (2010). On the temporal orientation of subjunctive complements in Spanish. Ms. Unversite Paris 8.

Larson, R. K. et al. (1997). Intensional transitive verbs and abstract clausal complementation. Linguistic Inquiry 26. 347–54

Lee, Jung-Hyuck. (2006). *Two kinds of ability modals in Korean: stage level ability and individual level ability*. PhD dissertation, University of Chicago.

Lewis, A. (1973). *Counterfactuals*. Harvard University Press.

Mari, A. and Martin, F. (2007). Tense, ability and Actuality Entailments, in: Dekker, P. et al (eds), Proceedings of the Sixteenth Amsterdam Colloquium.

Mari, A. and Martin, F. (2009b). Perfective and Imperfective in French. Kinds of abilities and Actuality Entailment" (ms).

Mari, A. (2011). Modalités et Temps. Des modèles aux données. Ouvrage pour l'obtention à Diriger des Recherches. Paris-Sorbonne

Piňón, C. (2003). On Being Able to, in: Tsujimura (ed.), *WCCFL Proceedings*, 22: 384 - 397. Somerville, MA: Cascadilla Press.

Portner, Paul. (2009). *Modality*. Oxford University Press. \

Roussou, Anna. 2000. On the left periphery; modal particles and complementizers. Journal of Greek Linguistics 1, 63–93.

Quer, J. (1998). *Mood at the Interface*. PhD thesis, University of Utrecht.

Quer, J. (2001). Interpreting mood. *Probus* 13: 81-111.

Quer, J. (2009). Twists of mood: the distribution and interpretation of the indicative and the subjunctive. *Lingua* 119: 1779-1787.

Siegel, L. (2009). Mood selection in Romance and Balkan. *Lingua* 119: 1859-1882.

Staraki, Eleni (forthcoming). *Embedded tenses in Greek*. PhD thesis.

Terzi, A. 1992. *PRO in Finite Clauses. A study of Inflectional Heads in the Balkan Languages*. PhD thesis, CUNY.

Tsangalidis, A. (1999). *Will and tha: a Comparative Study of the Category Future*. Thessaloniki: University Studio Press.

Tsangalidis, A. (2004). Disambiguating modals in English and Greek, in: R. Facchinetti; F. Palmer (eds), *English Modality In Perspective: Genre Analysis and Contrastive Studies (English Corpus Linguistics)* v.1: 231 - 268

Tsangalidis, A. and Facchinetti, R. (2009). *Studies on English Modality: In Honor of Frank Palmer* (Linguistic Insights. Studies in Language and Communication). Peter Lang.

Thomason, R. (2005). Ability, action, and context. Ms. University of Michigan.

van der Wouden, T. 1994. *Negative contexts*. Groningen Dissertation.

Yoon, Suwon. (2010). *Not in the Mood. The Syntax and Semantics of Evalautive Negation*. PhD thesis, University of Chicago.