Causativization and Aspectual Composition

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1. Introduction: the puzzle

In this paper, we are solving a puzzle of aspectual composition (AC) in indirect causatives in the Tuba dialect of Altai (Oyrot). The puzzle is illustrated by the paradigm in (1)-(3):

(1) a. vasʲa eki minut-xa aš-tɨ tʲe-n.
V. two minute-DAT soup-ACC eat -PST
'Vasja ate [(all) the soup] in two minutes.'
b. vasʲa eki minut aš-tɨ tʲe-n.
V. two minute soup-ACC eat -PST
'Vasja ate [∅ soup] for two minutes.'

(2) a. vasʲa eki minut-xa aš-tɨ tʲe-**se**-n.
V. two minute-DAT soup-ACC eat-PFV-PST
'Vasja ate [(all) the soup] in two minutes.'
b. *vasʲa eki minut aš-tɨ tʲe-**se**-n.
V. two minute soup-ACC eat-PFV-PST
'Vasja ate [∅ soup] for two minutes.'

(3) a. petʲa eki minut-xa vasʲa-nɨ aš-tɨ tʲe-**dir**-**se**-n.
P. two minute-DAT Vasja-ACC soup-ACC eat-CAUS-PFV-PST
'Petja made Vasja eat [(all) the soup] in two minutes.'
b. petʲa eki minut vasʲa-nɨ aš-tɨ tʲe-**dir**-**se**-n.
P. two minute Vasja-ACC soup-ACC eat-CAUS-PFV-PST
'Petja made Vasja eat [∅ soup] for two minutes.'

(1a-b) illustrate AC in simple past clauses whereby telicity of a clause co-varies with the interpretation of a direct object. (1a) is telic, as the common test on co-occurrence with a time-span adverbial indicates, and DP *aš-tɨ* 'soup' refers to a specific portion of soup that has been completely consumed in the course of the event. (1b) is atelic, and the object receives the bare interpretation. As will be discussed shortly in section 2.1, this pattern is exactly the same as in English (cf. translations of (1a-b)) except that in English DP interpretations are flagged by overt determiners.

In (2a-b), perfective past clauses are illustrated, in which perfectivity is expressed by the *-sa-* morpheme, diachronically related to the light verb *sal* 'put'. In this type of clause, AC in Tuba resembles that in Russian and other Slavic languages (see section 2.2). The characteristic property of this type of AC is that perfective clauses are obligatorily telic, and their direct object cannot receive the bare interpretation: whereas (2a) corresponding to (1a) is felicitous, (2b), unlike its simple past counterpart in (1b), is ungrammatical.

In (3), the puzzle we are going to solve comes: if verbs like 'eat' are causativized, they consistently demonstrate English-type AC despite the presence of the perfectivizing affix. In (3a-b), the causative verb combines with the same *-sa-* morpheme as in (2a-b), hence is expected to pattern with (2a-b) in being obligatorily telic and in restricting the interpretation of the direct object. Yet, this does not happen: (3a-b) rather pattern with (1a-b) where no perfectivizing morphology is attested: not only the telic sentence in (3a) and its atelic counterpart in (3b) are grammatical. Moreover, semantic interpretation of the direct object in (3a-b) is exactly the same as in corresponding examples in (1).

Examples like (1)-(3) motivate two main goals of this study: to account for the difference between non-derived verbs and corresponding causatives in terms of type of AC and to derive compositionally the whole range of relevant interpretations. The rest of the paper is organized as follows. In Section 2 we provide a brief overview of two types of aspectual composition attested cross-linguistically. Section 3 offers an outline of our proposal in which basic assumptions about the structure of clauses in (1)-(3) are introduced. Sections 4-6 contain a detailed discussion of these type of clauses: we start in Section 4 with the semantic derivation of aspect-free clauses like those in (1), and in Section 5 examine the contribution of the aspectual morphology in perfective clauses like (2a-b). Section 6 accumulates main results of the preceding discussion and provides a solution for the puzzle of indirect causatives exemplified in (3). Wider theoretical implications are briefly discussed in the concluding Section 7.

2. Typology of aspectual composition

Aspectual composition, an interaction between properties of a verbal predicate and properties of its arguments in determining telicity of VP and/or a clause, is discussed systematically at least since Verkuyl 1972. Cross-linguistically, two major types of AC are attested that will be referred to as English-type AC and Russian-type AC throughout this paper.

2.1. English-type aspectual composition

In English and in a variety of other languages, eventuality type of verbal predicates like *eat an apple/eat apples* depends on reference properties of their internal arguments: undetermined

plural and mass arguments produce atelic predicates, while singular and determined plural arguments lead to telicity, as (4a-b) illustrate:

(4) a. John ate an apple/the apples in ten minutes/??for ten minutes.
b. John ate soup/apples for ten minutes/??in ten minutes.

In what follows we rely on Manfred Krifka's (1989, 1992, 1998) mereological theory of AC (see Verkuyl 1972, 1993, 1999, Hay et al. 1999, Rothstein 2004 for alternatives). Basic notions of this theory are cumulativity, quantization, and incrementality.[1] The former two are second order properties characterizing any predicates of logical type $\langle\sigma, t\rangle$. A predicate is cumulative iff whenever it applies to entities *x* and *y*, it also applies to their mereological sum $x \oplus y$. A predicate is quantized iff whenever it applies to an entity *x*, it does not apply to any proper part of *x*. For instance, NPs like *apples, people, water, soup* are cumulative and not quantized: combining two portions of soup yields soup, and any part of soup is soup. NPs like *apple* or *bowl of porridge* are quantized and not cumulative, since a sum of two apples does not fall under the denotation of *apple*, and no proper part of apple is an apple. Similarly, event predicates denoted by *stare, walk, ate apples, eat porridge* are cumulative and not quantized: a sum of two events of eating apples is also an event of eating apples, and a proper part of eating apples is still eating apples (down to individual apple-eatings). Predicates denoted by VPs such as *explode* and *eat an apple* are quantized and not cumulative: eating an apple plus eating an apple do not count as eating an apple, and a proper part of an event of eating an apple is not an event of eating an apple.

Incrementality characterizes relations between individuals and events. In *eat an apple* (as well as in *eat apples)*, the relation between the theme and the event referred to is incremental: every part of what is being eaten is mapped onto some part of the event and vice versa. In the course of event, an apple is eaten little by little, and the temporal progress of the event corresponds to the spatial extent of the apple. Since a proper part of an apple is not an apple, eating a proper part of an apple is not eating an apple, hence *eat an apple* is quantized. In contrast, a proper part of *apples* is still *apples*, so if *e* is an event of eating apples, then a proper part of *e* is also an event of eating (a smaller portion of) apples. In this way, incrementality guarantees transfer of reference properties from the incremental argument to the verbal predicate. With cumulative incremental arguments, cumulative verbal predicates are created, while quantization of an argument leads to quantization of a verbal predicate (cf. Filip 1999:94). Dowty (1991:568–571) identifies various types of incremental arguments that undergo change "in distinguishable stages, i.e. subevents" and are subsumed under his general notion of Incremental Theme. Those are, among others, effected objects (*build a house*), destroyed objects (*destroy a presidential finding*), consumed objects (*eat a sandwich*), affected objects (*paint a house*), objects of performance (*play a sonata*). These are main types of predicates dealt with in the present paper.

With arguments that do not stand in the incremental relation to events, no association between their properties and properties of event predicates obtains. In *push a cart*, it is not the case that the more one pushes the cart, the bigger part of the cart is pushed. Therefore, the spatial extent of a cart (unlike that of an apple in *eat an apple*) does not provide a natural point at which a pushing event necessarily ends, and that is the reason why *push a cart* is atelic.

[1] Formal definitions can be found in, e.g., Krifka 1998: 211–213, and for the sake of space we do not reproduce them here, only providing an informal overview of the theory.

In this way, the mereological theory explains how cumulativity/quantization status of the Incremental Theme determines that of a complex verbal predicate.

2.2. Russian-type aspectual composition

In contrast with English, in Russian properties of incremental arguments do not affect telicity and quantization of a verbal predicate. Rather, perfective verbs determine reference properties of the Incremental Theme (see Filip 1993/1999 and subsequent work, Verkuyl 1999, Krifka 1992, Paslawska, von Stechow 2004, and references therein).

In (5), the prefixed perfective verb produces a verbal predicate which is obligatorily quantized (telic), as tests on co-occurrence with adverbials *dve minuty* 'for two minutes' in (5b) and *za dve minuty* 'in two minutes' in (5a) show.

(5) a. Vasja vy-pi-l vod-u za dve minut-y.
V. PFV-drink-PST:M water-ACC in two minute-GEN
'Vasja drank all the water in two minutes.'
b. *Vasja vy-pi-l vod-u dve minut-y.
V. PFV-drink-PST:M water-ACC two minute-GEN
'Vasja drank water for two minutes.'

Besides, the prefixed perfective verb enforces the *unique maximal interpretation* of the undetermined plural and mass Incremental Themes (the term is coined by Hana Filip, see Filip 2005). Thus, in (5a) *voda* 'water' involves a contextually salient quantity of water, and the sentence indicates that all of this water have been drunk. Maximality is an obligatory meaning component of (5a). Explicit indication that there are entities that count as water but are not involved in a situation yields contradiction:

(6) #Vasja vy-pi-l vod-u no osta-l-o-s' es&c&e nemnogo.
V. PFV-drink-PST:M water-ACC but remain-PST-N-REFL more some
'Vasja drank (all) the water, but there is some more (water to drink).'

Given examples like (5)-(6), a natural generalization about prefixed verbs like *vypit'* follows:

(7) Prefixed incremental verbs like *vypit'* in (5) enforce the unique maximal interpretation of the Incremental Theme and quantization of the complex event predicate.

Ultimately, languages with English-type and Russian-type AC obey the same constraint: complex event predicates are quantized (=telic) iff their incremental arguments are quantized. The difference has to do with where quantization comes from. In English and other languages with English-type AC, it comes from the incremental argument. In Russian and other languages with Russian-type AC, it comes from the perfective verb.

Discussing Slavic data, Krifka (1992: 50) relates aspectual peculiarities of these languages to the properties of the perfective aspectual operator, which morphologically is a part of verb (see

Verkuyl 1999, Piñon 2001, Paslwaska, von Stechow 2003 for alternative views). The essential component of the semantics of this operator is a requirement that an event predicate it applies to be quantized. Accordingly, if the event predicate is obligatorily quantized (=telic), its incremental argument cannot escape from being quantized, too. Thus, in a sense, the perfective verb decides what interpretation the incremental argument is allowed to have, and this is exactly what we see in (5a-b) in Russian.

With this background in mind, we are ready to go back to our puzzle discussed in section 1. We see that simple past aspect-free clauses in (1) exhibit the English-type AC, being strictly parallel to (4). Telicity comes side by side with the quantization of the internal incremenal argument, as in (1a) (cf. (4a)). Atelic clauses (e.g., (1b)), on the other hand, involve bare, non-quantized interpretation of the incremental argument (cf. (4b)). Perfective clauses display Russian-type AC, as is clear from (2a-b), parallel to (5a-b): the predicate has to be telic, and its internal argument has to be quantized. Why are perfective causative clauses in (3a-b) different from their counterparts in (2a-b)? An outline of the answer comes in Section 3, and its technical elaboration – in Sections 4-6.

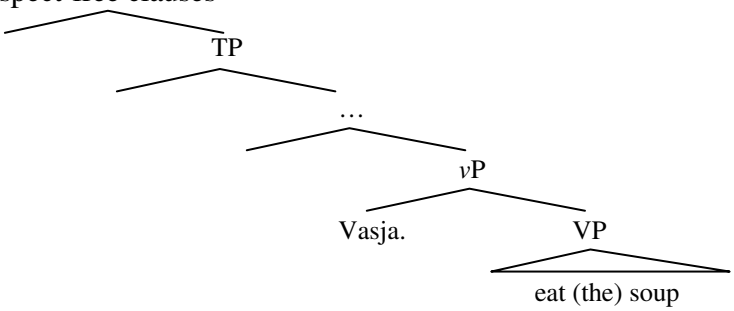
3. The proposal: an overview

We assume that event structures are built syntactically, with different eventive components being tied to different projections. Specifically, VPs denote change of state events that the internal argument in Spec, VP undergoes; at the *v*P level, events are introduced that bring the change of state about, with an appropriate argument being located in Spec, *v*P. This view of *v*P architecture, represented in (8), corresponds to a number of syntactic approaches to event structure recently discussed in the literature (e.g., Hale, Keyser 1993 and elsewhere, Travis 2005, Zubizarreta, Oh 2007, and especially Ramchand 2008).

(8) $[_{vP}$ DP v $[_{VP}$ DP V [...]]]
subject of the activity — activity — subject of the change of state — change of state

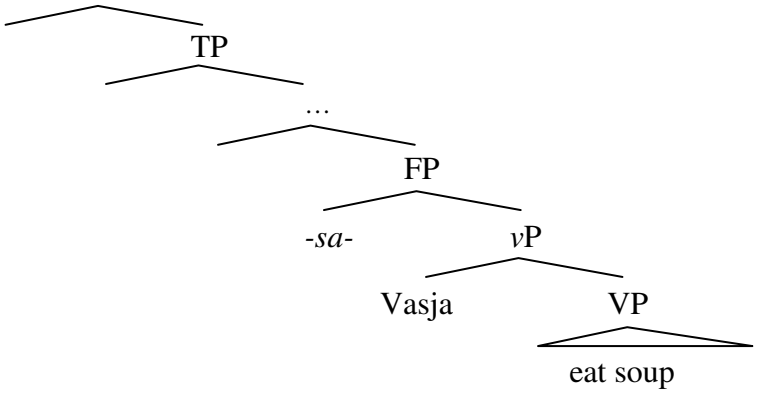
We suggest that both quantized (telic) and non-quantized (atelic) event predicates can fall under the denotation of *v*P, depending on the properties of the internal incremental argument. If aspect-free clauses like those in (1) are built, the minimal amount of functional structure is projected above *v*P. *v*P merges with T and C, (a)telicity of *v*P passes on up to the clausal level, and the English-type AC obtains. The structure of aspect-free clauses we assume is represented in (9); its semantic derivation is discussed in detail in Section 4.

(9) Aspect-free clauses



Another possibility is merging the same *v*P with a functional head F where the aspectual morpheme -*sa*- is located, as represented in (10):

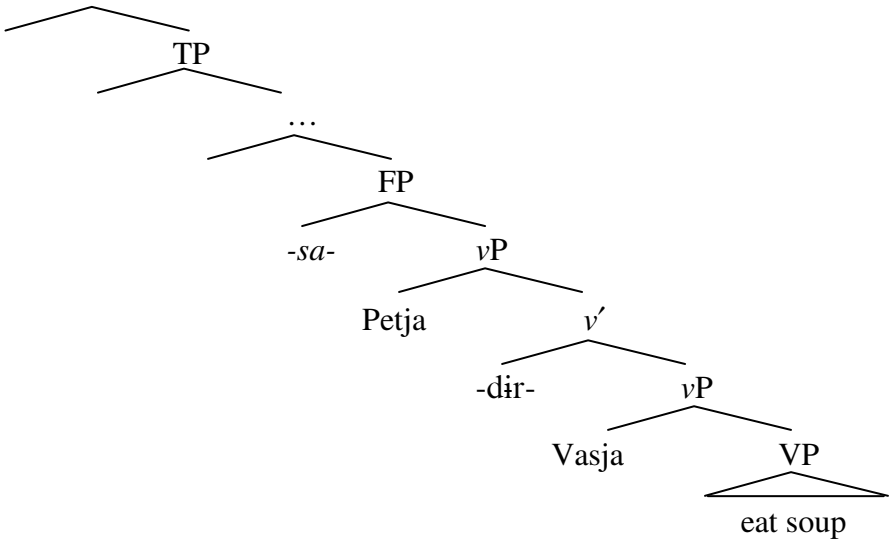
(10) Aspectual (perfective) clauses



We suggest that F restricts the range of possible denotations of *v*P, filtering out atelic predicates like 'John eat apples/soup' available at the *v*P level, but not affecting quantized (telic) predicates like 'John eat an apple/the apples'. This is how aspectual perfective clauses with Russian-type AC (e.g., (2a)) are created. This type of derivation is further discussed in Section 5.

Finally, we take the indirect causative exemplified in (3) to have the structure in (11), where the causative morpheme -*dir*- is the *v* head taking another *v*P as a complement.

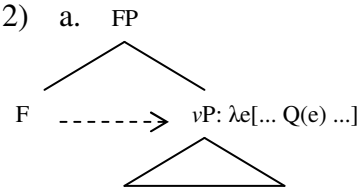
(11) Aspectual (perfective) causativized clauses



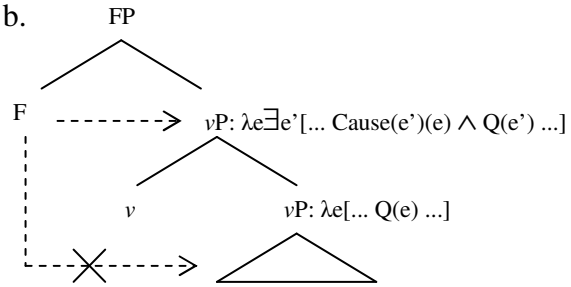
In this configuration, the perfectivizing -*sa*- morpheme takes scope over the outer causing event, introduced by the causative morpheme -*dir*-. The event argument in the denotation of the inner *v*P gets existentially bound and escapes the scope of the perfective operator. Therefore, the inner *v*P exhibits the regular English type of aspectual composition, one it possesses to begin with, and this is the reason why clauses in (3a-b) are the way they are. This line of reasoning is elaborated in more detail in Section 6.

To sum up, we propose that the perfectivizing operator denoted by the *-sa-* morpheme only has effects on events introduced by the adjacent *v* head. More deeply embedded events are not 'visible' for this operator, as represented in (12a-b), where (12a) corresponds to (10), and (12b) to (11):

(12) a.



b.



In the subsequent sections, we elaborate on this in more detail.

4. Aspect-free clauses

As we saw in section 1, aspect-free clauses that possess structure in (9) exhibit the English-type AC. Examples in (1) are repeated as (13).

(13) a. vasʲa eki minut-xa aš-tɨ tʲe-n.
Vasja two minute-DAT soup-ACC eat-PFV-PST
'Vasja ate all the soup in two minutes.'

b. vasʲa eki minut aš-tɨ tʲe-n.
Vasja two minute soup-ACC eat-PFV-PST
'Vasja ate soup for two minutes.'

First and foremost, we are interested in deriving *v*P denotations for (13a-b). Since (13a) is telic, for *v*P that is a part of the clause in (13a) we have to produce a quantized event predicate. Non-quantized event predicate should correspond to the atelic *v*P on which the clause in (13b) is based.

We assume that transitive verbs denote relations between events and two individuals, with neo-Davidsonian association of events with arguments via thematic roles (see Parsons 1990 and much subsequent work). The denotation of the verb *tʲe* 'eat' is shown in (14).

(14) $\| \text{eat} \| = \lambda y \lambda x \lambda e[\text{eat}(e) \wedge \text{agent}(x)(e) \wedge \text{theme}(y)(e)]$ <e, <e, <s,t>>>
where s is a type of events

NPs denote predicates of type <e,t>. In (21) the denotation of NP *aš* 'soup' is represented. Since 'soup' is a mass noun, the corresponding predicate is cumulative and not quantized.

(15) $\| \text{soup} \| = \lambda x.\text{soup}(x)$ <e,t>

NP denotations are mapped onto DP denotations by determiners. We assume that determiners in Tuba are phonologically null. DPs that lack overt dereminers can therefore have a number of readings depending on what null determiner is applied to the NP denotation. (Alternatively, Tuba can be thought of as a language that lack DPs altogether. In this case, predicative NP denotations are shifted to one of appropriate argumental types by type-shifting operators that apply freely only subject to general constraints on type shifting (e.g., Chierchia 1998; Dayal 2004). This choice plays no role in what follows, however.)

For our purposes, we need two D^0s that will be referred to as SIGMA and INDEF. SIGMA denotes Link's (1983) σ-operator of type <<e,t>, e> that applies to a predicate and yields the maximal individual from its extension. INDEF denotes a function that applies to a predicate and yields a generalized quantifier of type <<e, <s,t>>,<s,t>>:

(16) a. $\| [_D \text{ SIGMA }] \| = \lambda P[\sigma x P(x)]$ <<e,t>,e>
b. $\| [_D \text{ INDEF }] \| = \lambda P \lambda R \lambda e \exists x[P(x) \wedge R(x)(e)]$ <<e,t>,<<e, <s,t>>,<s,t>>>

Applying operators in (16) to the NP denotation in (15) creates two DP denotations. The DP in (17a) denotes the maximal individual in the extension of the predicate 'soup'. The DP in (17b) denotes a generalized quantifier, a function that applies to a relation between individuals and events and yields an event predicate, with the individual variable existentially bound. These DP denotations, as we will see in a moment, will play a crucial role in deriving telic and atelic *v*Ps for (13a) and (13b) respectively.

(17) a. $\| [_{DP} \text{ SIGMA soup}] \| = \sigma x.\text{soup}(x)$ e
b. $\| [_{DP} \text{ INDEF soup}] \| = \lambda R \lambda e \exists x[\text{soup}(x) \wedge R(x)(e)]$ <<e, <s,t>>,<s,t>>

Finally, we take the subject of (13a-b) to denote an indidual constant of type e.

(18) $\| \textit{vasja} \| = \text{Vasja}$ e

By functional application, we get a *v*P denotation in (19a) from (15), (17a) and (18). The DP in (17a) (of type e) is interpreted in situ. In (19b), in contrast, the generalized quantifier from (17b) undergoes QR for type reasons, and applies to a relation between individuals and events derived through λ-abstraction in the usual manner:

(19) a. $\| [_{vP} \text{Vasja eat } [_{DP} \text{ SIGMA soup}]] \| = \lambda e[\text{eat}(e) \wedge \text{agent}(\text{Vasja})(e) \wedge \text{theme}(\sigma x.\text{soup}(x))(e)]$
b. $\| [_{vP} [_{DP} \text{ INDEF soup}]_1 \lambda_1 [_{vP} \text{ Vasja } [_{VP} \text{ eat } t_1]]] \| = \lambda e \exists y[\text{eat}(e) \wedge \text{agent}(\text{Vasja})(e) \wedge \text{theme}(y)(e) \wedge \text{soup}(y)]$

(19a) denotes a set of eating events in which Vasja is the agent and the maximal entity that falls under the denotation of soup is the theme. This event predicate is quantized, since no part of an event in which the maximal entity in the denotation of 'soup' is eaten is an event in which the same entity is eaten.

(19b) denotes a set of eating events in which Vasja is the agent and there is an entity in the denotation of 'soup' that stands in the theme relation to these events. This predicate fails to be quantized, since any part of an event in which some portion of soup is eaten is an event in which some (smaller) portion of soup is eaten.

Finally, we assume that durative and time-span adverbials are *v*P adjuncts of modifier type <<s,t>,<s,t>> whose denotations look like (20) and (21), respectively.

(20) $\| \text{for two minutes} \| = \lambda P \lambda e \exists t\, [P(e) \wedge |t| = 2\ \text{min} \wedge \forall t'[t' \leq t \rightarrow \exists e'[e' \leq e \wedge P(e') \wedge \tau(e') = t']]]$
where τ is a temporal trace function.

(21) $\| \text{in two minutes} \| = \lambda P \lambda e \exists t\, [P(e) \wedge |t| \leq 2\ \text{min} \wedge \tau(e) = t \wedge \forall t'[t' \leq t \rightarrow \neg \exists e'[\tau(e') = t' \wedge P(e')]]$

It is easy to see that the durative adverbial in (20) can combine with the cumulative event predicate in (19b), but not with the quantized predicate in (19a). Application of (20) to (19b) yields (22):

(22) $\| [_{vP} \text{for two minutes } [_{vP} [_{DP} \text{INDEF soup}]_1\ \lambda_1\ [_{vP} \text{Vasja } [_{VP} \text{eat } t_1]]]] \| =$
$\lambda e \exists t \exists y[\text{eat}(e) \wedge \text{agent}(\text{Vasja})(e) \wedge \text{theme}(y)(e) \wedge \text{soup}(y) \wedge |t| = 2\ \text{min} \wedge \forall t'[t' \leq t \rightarrow \exists e' \exists y'[e' \leq e \wedge \text{eat}(e') \wedge \text{agent}(\text{Vasja})(e') \wedge \text{theme}(y')(e') \wedge \text{soup}(y') \wedge \tau(e') = t']]]]$

In (22), the durative adverbial requires that at any subinterval of the 2 min. interval some eating event occur. This entails that the event predicate the adverbial modifies has to be divisive, hence not quantized. This requirement is satisfied in (22), since, as we saw above, the predicate in (19b) indeed fails to be quantized.

But the predicate in (19a) *is* quantized, hence combining it with the measure adverbial in (20) will yield an empty set of events: eating all the soup cannot occur at the 2 min interval and at all of its subintervals.

Right the other way round, a time span adverbial in (21) can apply to *v*P in (19a), but not to *v*P in (19b), since this adverbial wants a quantized predicate. The combination of (19a) and (21) is shown in (23):

(23) $\| [_{vP} \text{in two minutes } [_{vP} \text{Vasja eat } [_{DP} \text{SIGMA soup}]]] \| =$
$\lambda e \exists t[\text{eat}(e) \wedge \text{agent}(\text{Vasja})(e) \wedge \text{theme}(\sigma x.\text{soup}(x))(e) \wedge |t| \leq 2\ \text{min} \wedge \tau(e) = t \wedge \forall t'[t' < t \rightarrow \neg \exists e'[\tau(e') = t' \wedge \text{eat}(e') \wedge \text{agent}(\text{Vasja})(e') \wedge \text{theme}(\sigma x.\text{soup}(x))(e')]]]$

*v*P in (23) denotes events of Vasja's eating the maximal individual that falls under the denotation of 'soup'. For any such event there is an interval (2 min or less in length) at which the event runs, and no Vasja's eating all-the-soup occurs at any proper part of that interval.

In contrast, the event predicate in (19b) is not quantized. Therefore, if *e* is an event of eating soup with the running time *t*, a proper part of *e*, *e´*, with the running time *t´* (a proper part of *t*) will also be an event of eating soup. As a result, application of the time span adverbial to (19b) will again result in an empty set of events.

(22) and (23) provide us with all we need to derive the whole range of interpretations an aspect-free clause can have. By hypothesis (see (9) in Section 3), such clauses do not involve any aspectual structure, so after the existential closure of the event variable at the TP (or CP) level, we get either a telic clause based on (23) or atelic clause based on (22). The analysis thus correctly predicts that telicity of aspect-free clauses depends on how the object DP is interpreted.

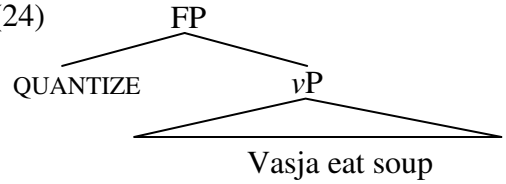
5. Perfective clauses

Unlike aspect-free clauses, perfective clauses like (2a-b) represented in (9) contain a piece of aspectual morphology, the *-sa-* morpheme. As we saw in Section 1, this affix have effects on both telicity and the interpretation of the incremental internal argument: perfective clauses exhibit Russian-type AC.

Krifka (1992:50) suggests that one of the meaning components of the perfective operator in Russian is that a complex verbal predicate it applies to is quantized. But a complex verbal predicate based on the incremental relation between events and objects, e.g., 'eat soup' or 'read a book', can only be quantized if its internal argument is quantized. So if the perfective operator forces quantization of the event predicate, it also forces (though indirectly) quantization of its incremental internal argument. Let us discuss this in some more detail.

We propose that the *-sa-* morpheme merges as a functional head F dominating *v*P (see (10) repeated partially in (24)).

(24)



Semantically, this functional head denotes an operator QUANTIZE of the modifier type <<s,t>,<s,t>> which is essentially an equivalence relation with a presupposition:

(25) QUANTIZE(P)(e) is only defined if P is quantized.
where defined, QUANTIZE(P)(e) = 1 iff P(e)=1

According to (25), application of QUANTIZE to an event predicate is only defined if that predicate is quantized. The main difference with Krifka is that the product of the application of perfective morphology to telic predicates is undefined rather logically false. In this way, QUANTIZE works as a filter, filtering out non-quantized event predicates generated at the *v*P level and only allowing quantized ones to pass through FP. FP (and all projections dominating FP up to the CP level) can thus only be quantized, that is, telic.

Since aspect-free and perfective clauses share *v*P, as (9)-(10) indicate, the derivation of the latter up to the *v*P level proceeds in exactly the same way, creating *v*Ps in (19a-b) repeated as (26a-b):

(26) a. ‖ [$_{vP}$Vasja eat [$_{DP}$ SIGMA soup]] ‖ = λe[eat(e) ∧ agent(Vasja)(e) ∧ theme(σx.soup(x))(e)]
b. ‖ [$_{vP}$ [$_{DP}$ INDEF soup]$_1$ λ$_1$ [$_{vP}$ Vasja [$_{VP}$ eat t$_1$]]] ‖ = λe∃y[eat(e) ∧ agent(Vasja)(e) ∧ theme(y)(e) ∧ soup(y)]

Combining *v*P denotations with the denotation of the *-sa-* morpheme via functional application results in (27a-b):

(27) a. λe. QUANTIZE(λe′[eat(e′) ∧ agent(Vasja)(e′) ∧theme(σx.soup(x))(e)′])(e) denotes the same set of events as (26a);
b. λe.QUANTIZE(λe′∃y[eat(e′) ∧ agent(Vasja)(e′) ∧ theme(y)(e′) ∧ soup(y)])(e) is undefined.

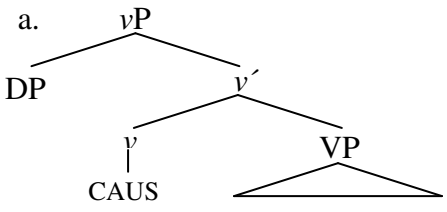
Therefore, given (27a-b), the *-sa-* morpheme removes the atelic (non-quantized) interpretation of *v*P and, consequently, the bare interpretation of the internal argument. But its telic (quantized) counterpart based on definite DP [$_{DP}$ SIGMA soup] survives, and this is how Russian-style AC obtains in (2a-b).

Having discussed how the English-type and Russian-type AC is derived in aspect-free and perfective clauses respectively, now we are in a position of accounting for the puzzle formulated in section 2: why English-type AC in indirect causatives despite the presence of perfectivizing suffix?

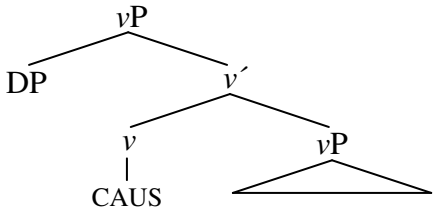
6. Indirect causatives

Following much recent work on causativization (see, e.g., Harley 2006 and references therein) we assume that causatives are built syntactically, with the causative morpheme merging as the *v* head. Causativization of unaccusatives creates a configuration involving *v*P taking (unaccusative) VP as a complement, as in (28a). Cusativization of transitives that project *v*Ps by themselves, results in a configuration with two *v*Ps, as in (11) repeated partially in (28b):

(28) a.



b.



An example of the causative clause derived from transitive *v*P is (29):

(29) men maša-nɨ ajak-tɨ nün-dür-düm.
I M.-ACC dish-ACC wash-CAUS-PST.1SG
'I made Masha wash (the) dishes.'

Semantically, causatives of transitives involve indirect causation. The event *e* of Masha's washing dishes depends causally (in the sense of Lewis 1975) on some activity *f* performed by the agent (descriptive properties of this activity are underspecified). But for (29) to be true *f* need not be an immediate cause of *e*: intermediate causes are allowed in a causal chain connecting *f* and *e*. For instance, (29) is fully compatible with a scenario in which the agent leaves a message for Masha's friend asking her to reach Masha by phone and tell her to do washing up. On this scenario involving indirect causation, (29) is true provided that Masha actually did washing up. With a few exceptions, not relevant for our purposes, causatives of transitives all involve indirect causation, hence the term "indirect causative" used throughout this paper.

A significant advantage of the analysis in (11)/(28b) is that it predicts, correctly, that indirect causatives provide two adjunction sites for *v*P-level adverbials. Specifically, if time-span and measure adverbials are *v*P adjuncts, we expect that they yield ambiguous scope when occur in indirect causative configurations like (28b). This prediction is borne out, as examples in (30), where the adverbial adjoins either to lower *v*P or higher *v*P, indicate:

(30) a. [$_{vP}$ men [$_{vP}$ eki čas-χa [$_{vP}$ maša-nɨ [$_{VP}$ ajak-tɨ
I two hour-DAT Masha-ACC dish-ACC
nün]]]-dür]-düm.
wash-CAUS-PST.1SG
'I made Masha wash the dishes in two hours.'

b. [$_{vP}$ eki čas-χa [$_{vP}$ men [$_{vP}$ maša-nɨ [$_{VP}$ ajak-tɨ
two hour-DAT I Masha-ACC dish-ACC
nün]]-dür]]-düm.
wash-CAUS-PST.1SG
'What I did in two hours is make Masha wash (the) dishes.'

In (30a), the adverbial adjoins to the lower *v*P, hence modifies the caused subevent, indicating that it is Masha's washing the dishes that takes two hours. The duration of the causing event is not specified in (30a). In contrast, in (30b), the adverbial takes scope over the causing event, indicating that it took two hours to make Masha wash the dishes.

What we saw in (3) in Section 1 is the low reading of adverbials whereby they take scope over the caused event. These examples are repeated as (31a-b):

(31) a. [$_{vP}$ petʲa [$_{vP}$ eki minut-xa [$_{vP}$ vasja-nɨ aš-tɨ tʲe]]-**dir]-se**-n.
P. two minute-DAT Vasja-ACC soup-ACC eat-CAUS-PFV-PST
'Petja made Vasja eat [(all) the soup] in two minutes.'

b. [$_{vP}$ petʲa [$_{vP}$ eki minut [$_{vP}$ vasja-nɨ aš-tɨ tʲe]]-**dir]-se**-n.
P. two minute Vasja-ACC soup-ACC eat-CAUS-PFV-PST
'Petja made Vasja eat [∅ soup] for two minutes.'

Now, given the above observation, the solution to the puzzle we are after begins to emerge. We see that in (31) the low position of adverbials is still available not only for 'in two minumes', but also for 'for two minutes' despite the fact that the perfectivizing operator in the denotation of the *-sa-* morpheme blocks the atelic interpretation of an event predicate it modifies. The reason why this operator does not block the atelic predicate λe.Vasja-eat-soup-for-two-minues(e) in (31b) is that it is not a predicate it modifies: the higher causative *v* (spelled out as *-dɨr-*) is located

in between the lower *v* and the *-sa-* morpheme. When the *-sa-* morpheme comes into play, the predicate denoted by the lower *v*P is already embedded under the semantic structure introduced by the causative *v*. It is this structure that somehow secures the lower *v*P from being "visible" to the quantizing operator. The crucial question, then, is what happens when the lower *v*P merges with the causative *v* head.

Semantic representation of the causative *v* we adopt is much in the spirit of the event-based analysis in Pylkkänen 2002. Since Turkic languages including Tuba are arguably voice bundling, we suggest that the semantic contribution of the causative head is two-fold: it introduces both a causing (sub)event and an argument of this (sub)event. The causative morpheme thus denotes an operator of type <<s,t>, <e, <s,t>>>, where s is a type of events, as before:

(32) $\|\text{CAUS}\| = \lambda P \lambda x \lambda e \exists e' [\text{causer}(x)(e) \wedge \text{cause}(e')(e) \wedge P(e')]$

In (33), CAUS is a function that takes an event predicate and returns a relation between individuals end events; individuals are causers of events that bring about an eventuality from the original extension of the predicate. The crucial effect the causative *v* has on its complement *v*P is existential binding of the event variable in the semantic representation of that *v*P. It is this binding that makes lower *v*P inaccessible for further semantic operations, including any kind of interaction with operators that come with aspectual functional structure.

To see how this works, let us take a closer look at the semantic derivation of perfective causative clauses in (3a-b). Again, these clauses share a (lower) *v*P with perfectuve clauses in (2a-b) discussed in section 5 and with aspect-free clauses in (1a-b) analyzed in section 4, hence up to the *v*P-level derivations are exactly the same. Relevant *v*P denotations are repeated as (33a-b):

(33) a. $\| [_{vP} \text{Vasja eat } [_{DP} \text{ SIGMA soup}]] \| = \lambda e[\text{eat}(e) \wedge \text{agent}(\text{Vasja})(e) \wedge \text{theme}(\sigma x.\text{soup}(x))(e)]$

b. $\| [_{vP} [_{DP} \text{ INDEF soup}]_1 \lambda_1 [_{vP} \text{ Vasja } [_{VP} \text{ eat } t_1]]] \| = \lambda e \exists y[\text{eat}(e) \wedge \text{agent}(\text{Vasja})(e) \wedge \text{theme}(y)(e) \wedge \text{soup}(y)]$

(3a-b) contain time-span and measure adverbials adjoined to the lower *v*P. This step of derivation is again identical to one discussed in section 4: adjoining a time-span adverbial to (33a) and a durative adverbial to (33b) yields (34a-b) (=(22)-(23)):

(34) a. $\| [_{vP} \text{ in two minutes } [_{vP} \text{Vasja eat } [_{DP} \text{ SIGMA soup}]]] \| =$
$\lambda e \exists t[\text{eat}(e) \wedge \text{agent}(\text{Vasja})(e) \wedge \text{theme}(\sigma x.\text{soup}(x))(e) \wedge |t| \leq 2 \text{ min} \wedge \tau(e) = t \wedge$
$\forall t'[t' < t \rightarrow \neg \exists e'[\tau(e') = t' \wedge \text{eat}(e') \wedge \text{agent}(\text{Vasja})(e') \wedge \text{theme}(\sigma x.\text{soup}(x))(e')]]]$

b. $\| [_{vP} \text{ for two minutes } [_{vP} [_{DP} \text{ INDEF soup}]_1 \lambda_1 [_{vP} \text{ Vasja } [_{VP} \text{ eat } t_1]]]] \| =$
$\lambda e \exists t \exists y[\text{eat}(e) \wedge \text{agent}(\text{Vasja})(e) \wedge \text{theme}(y)(e) \wedge \text{soup}(y) \wedge$
$|t| = 2 \text{ min} \wedge \forall t'[t' \leq t \rightarrow \exists e' \exists y'[e' \leq e \wedge \text{eat}(e') \wedge \text{agent}(\text{Vasja})(e') \wedge$
$\text{theme}(y')(e') \wedge \text{soup}(y') \wedge \tau(e') = t']]]]$

*v*Ps in (34a-b) merge with the causative *v* head; the causative operator in (32) applies to event predicates in (34a-b), and resulting relations between individuals and events apply to the causer argument that merges in the specifier position:

(35) a. ‖ [$_{vP}$ Petja CAUS [$_{vP}$ in two minutes [$_{vP}$Vasja eat [$_{DP}$ SIGMA soup]]]] ‖ =
λeλe′∃t [causer(petja)(e) ∧ cause(e′)(e) ∧ eat(e′) ∧ agent(Vasja)(e′) ∧
theme(σx.soup(x))(e′) ∧ |t| ≤ 2 min ∧ τ(e′)= t ∧ ∀t′[t′< t →
¬∃e″[τ(e″)= t′ ∧ eat(e″) ∧ agent(Vasja)(e″) ∧ theme(σx.soup(x))(e″)]]]

b. ‖ [$_{vP}$ petja CAUS [$_{vP}$ for two minutes [$_{vP}$ [$_{DP}$ INDEF soup]$_1$ λ$_1$ [$_{vP}$ Vasja [$_{VP}$eat t$_1$]]]] ‖ =
λeλe′∃t∃y [causer(x)(e) ∧ cause(e′)(e) ∧ eat(e′) ∧ agent(Vasja)(e′) ∧
theme(y)(e′) ∧ soup(y) ∧ |t| = 2 min ∧ ∀t′[t′ ≤ t →
∃e″∃y′[e″ ≤ e′ ∧ eat(e″) ∧ agent(Vasja)(e″) ∧ theme(y′)(e″) ∧
soup(y′) ∧ τ(e″) = t′]]]

(35a) denotes a set of events (in which Petja is the causer) that cause Vasja's eating all the soup in two minutes. (35b) denotes a set of causing events that bring about Vasja's eating soup for two minutes. The crucial fact about (35a-b) is that **both** predicates are quantized: not only (35a) in which the internal argument is [SIGMA soup], but also (35b), where the internal argument is [∅ soup]. Neither predicate denotes eating events anymore, since a corresponding event variable is existentially bound. Instead, both predicates denote causing events introduced by the CAUS operator. But predicates denoting causing events are quantized. No proper part of an event that causes Vasja eat all the soup in two minutes is an event that causes Vasja eating all the soup for two minutes, hence (35a) is quantized. In the same way, no proper part of an event that that causes Vasja eat soup for two minutes is an event that causes Vasja eat soup for two minutes, hence (35b) is quantized, too.

This means that both (35a) and (35b) satisfy the presupposition of QUANTIZE in (25). When causative *v*Ps merge with the functional head F hosting QUANTIZE, resulting event predicates will denote the same events as (35a-b), given that QUANTIZE is an equivalence relation:

(36) a. ‖ [$_{FP}$ QUANTIZE [$_{vP}$ Petja CAUS [$_{vP}$ in two minutes [$_{vP}$Vasja eat [$_{DP}$ SIGMA soup]]]] ‖ =
‖ [$_{vP}$ Petja CAUS [$_{vP}$ in two minutes [$_{vP}$Vasja eat [$_{DP}$ SIGMA soup]]]]] ‖

b. ‖ [$_{vP}$ petja CAUS [$_{vP}$ for two minutes [$_{vP}$ [$_{DP}$ INDEF soup]$_1$ λ$_1$ [$_{vP}$ Vasja [$_{VP}$eat t$_1$]]]] ‖ =
‖ [$_{vP}$ petja CAUS [$_{vP}$ for two minutes [$_{vP}$ [$_{DP}$ INDEF soup]$_1$ λ$_1$ [$_{vP}$ Vasja [$_{VP}$eat t$_1$]]]] ‖

(36a-b) complete our story about why English-type AC emerges in indirect causative despite the presence of the quantizing operator: this happens because the event variable introduced by *v*P [V. eat (the) soup] gets existentially bound, hence quantization status of a corresponding event predicates becomes 'invisible' for the quantizing operator. In effect, this operator can only check properties of event predicates available locally: those denoted by its complement *v*P, but not those associated with more deeply embedded eventive heads. Crucially, to achieve this result we have not introduced any machinery (event-based semantics of uninflected *v*Ps, semantics of the perfective operator, semantics of the causative operator) that is not required independently. Thus, puzzling aspectual properties of indirect causatives we presented in section 1 are accounted for in a principled way.

7. Wider theoretical implications

Data discussed in the present paper strongly suggest that that in Tuba Russian-type AC originates at the level of functional structure projected above *v*P. At the *v*P-level, English-style AC only exists. If the analysis of Tuba presented above is on the right track, it can shed a new light on Russian-type AC in general. A theoretically attractive cross-linguistic hypothesis that emerges at this point is that all languages in which Russian-type AC is attested resemble Tuba: effects associated with this type of AC emerge at later stages of syntactic derivation, when aspectual functional structure comes into play. At the *v*P level, languages universally have English-type AC. Pazelskaya and Tatevosov (2006) present preliminary evidence that this hypothesis makes right predictions even for Russian, a paradigmatic instance of a language with Russian-type AC. Evaluating the hypothesis against wider cross-linguistic material is a task to be accomplished in the future.

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