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From additivity to mirativity: The Cantonese sentence final particle *tim1*

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This paper studies the Cantonese sentence final particle *tim1* and more generally the semantics of additive particles. The range of meanings conveyed by *tim1* appears quite broad, covering both scalar and non-scalar additive readings as well as mirative ones. We argue in favor of separating an additive *tim1*-particle and a mirative one. Our claims are based on their semantic differences but also on syntactic and acoustic differences. We formalize the meaning of each of these particles using a probabilistic argumentative framework which helps us define the scale with which *tim1* associates, namely an argumentative scale which is relative to speaker's goal in the discourse. In doing so we also contrast the meaning of each particle with similar elements in other languages. We use these descriptions to claim that the mirative reading is the result of a metonymic semantic shift of the additive reading of the particle, and discuss paths of semantic change for additive particles in natural language from a cross-linguistic perspective.

Keywords: Cantonese; additive particles; mirative particles; probabilistic semantics; diachronic pragmatics

This paper focuses on the interpretation of the Cantonese sentence final particle (SFP) *tim1* (添/添). Cantonese sports a large number of SFPs¹ with various shades of meaning that range from functions related to the management of common ground (e.g. to indicate that an information is shared or not between participants) to expressions indicating the speaker's emotion. The meaning of the particle *tim1* appears intriguing since it seems to convey, depending on its context, a plain additive reading, a scalar additive reading or what we will describe as a mirative reading. Our main claim regarding *tim1* is that the additive and mirative readings correspond to different stages in the evolution of the particle: they can be distinguished on acoustic, syntactic and semantic grounds. More specifically, we take the particle *tim1* to be polysemous in the sense used by Traugott & Dasher (2002): to the linguistic form *tim1* correspond two distinct, but related, meanings one having evolved from the other.

While the bulk of our discussion is related to one particle, much of the observations and hypotheses we make are relevant to the study of scalar additives in general, e.g. to English *even* and its equivalents in other languages. One notable difference with *even* is that *tim1* is not a negative polarity item. This somehow simplifies the study of its distribution and use, and notably the study of the nature of the scale(s) with which *tim1* can associate. As is made clear in the paper, we argue in favor of considering a unique scale, related to the notion of argumentation, i.e. to the fact that speakers speak *to a point*. Such a scale is

¹ The figures given by different authors vary between around 30 distinct particles (Kwok 1984) to 204 (Yau 1965). The wide range of variation notably depends on whether SFP clusters are distinguished as individual particles or not (Matthews & Yip 2010). Whatever the correct number is, it is large among languages that involve SFPs.

related to scales of probability/unlikelihood which are commonplace in the treatment of scalar additives, but also solves a number of problems faced by such scales (Greenberg 2016). Our proposal thus applies to *tim1*, but is also relevant to the general study of scalar additives. Furthermore, our proposal about the scale in question also allows us to explain the semantic change undergone by *tim1*, a change that is predicted to be observable cross-linguistically.

This paper has six main sections. In Section 1 we provide the relevant theoretical background about additive particles, mirative particles and information on the Cantonese elements that convey these values, with a focus on our target particle. Section 2 evaluates previous analyses, focusing on one particular approach which calls for a unified analysis of *tim1*. We show that the analysis has a number of drawbacks. In Section 3 we consider further evidence in favor of distinguishing two meanings for *tim1*. Section 4 then proceeds to give a more detailed characterization of each of the meanings of the particle. Section 5 offers a formal analysis of these meanings, using a probabilistic framework and notions from argumentation theory. Beyond characterizing the meaning of each particle, this section also offers a way to analyze different shades of mirativity. Finally, Section 6 takes a diachronic look at the relationship between the two particles. We argue that the mirative *tim1* is the result of a metonymic semantic shift from the additive one and discuss similar patterns of change in other languages.

1 Background and empirical domain

This section introduces the class of additive particles as they have been described in the semantics literature (Section 1.1) and a summary of their distribution in (Hong Kong) Cantonese (Section 1.2). Then it briefly introduces the notion of mirativity and its links with the domain of evidentiality (Section 1.3). The case of *tim1* and its various interpretations is then examined in detail (Section 1.4).

1.1 Additive particles

Additive particles are elements whose semantics is usually defined with reference to an *associate*: a constituent of the host sentence of the particle that is distinguished in some way, often by prosodic means (which makes such elements belong to the more general class of focus-sensitive particles). Additive particles convey that their associate is not the only element to be subject to its predication, i.e. that there is at least one distinct alternative element for which the predication of the associate also stands (cf. Gazdar 1979; Krifka 1999 or Kripke 2009 among many others). The adverb *too* in English is a prototypical example of an additive particle. In (1-a), the semantic contribution of *too* is the presupposition (1-b), assuming that *too* associates with the noun John (indicated in small caps).

- (1) a. JOHN is coming too.
 b. $\overset{\sim}{\underset{psp}{\rightarrow}}$ Somebody different from John is coming.

A (simplified) description of this particle is given by Krifka (1999) as in (2), where *F* stands for the (focalized) associate and *P* is the predicate which applies to *F*.²

$$(2) \quad \llbracket \text{too} \rrbracket = \lambda P \lambda F. \{ \exists F' \neq F : P(F') \}. P(F)^3$$

² We thus treat *too* as an element which takes two arguments: its associate and its scope, in the same way as König (1991) does.

³ The notation used here is of the form $\{ \text{Presuppositions} \}. \text{assertion}$. This does not correspond to Krifka's notation, but is isomorphic to it.

Thus, in this analysis, additive particles assert the content of their host sentence and presuppose their additive component.⁴ They are also anaphoric, in that they require the identification of the alternative to their associate in order to be felicitously used.

English *too* does not impose any constraint on the scalarity of its associate. Other additive particles such as *even* have been analyzed as *scalar* additive particles, i.e. particles that do impose constraints on the scalar properties of their associate. Typically, the adverb *even* is given a representation as in (3) which crucially involves a constraint on the scale of the *likelihood* of propositions (again referring to, a.o., Krifka 1999).⁵

$$(3) \quad \llbracket \text{even} \rrbracket = \lambda P \lambda F. \{ \exists F' \neq F : P(F'), P(F') <_{\text{likely}} P(F) \}. P(F)$$

Applied to (4-a), this yields the presupposition in (4-b) (with small caps indicating the associate of *even*).

- (4) a. Even JOHN came to the party.
 b. $\overset{\sim}{\text{psp}}$ there is no person different from John whose coming to the party was more unlikely (= John was the most unlikely person to come).

Another property of *even* that has been the subject of extensive discussion is its interaction with negation (cf. among many others Karttunen & Peters 1979; Wilkinson 1996 and the literature they generated). One of the key questions in the debate is whether it is necessary to postulate distinct entries for a negative polarity and a positive polarity *even*, or whether a unique semantic entry can account for all the readings of *even*, including those in negative sentences.

From a more general perspective, it has been argued that the behavior of additives under negation, the nature of the scale used by scalar additives and the position of their associate on this scale are parameters that differentiate scalar additives both within a given language and also across languages, thus defining the “landscape of additive particles” (Giannakidou 2007; Lee & Pan 2010). These parameters will be relevant in the description of Cantonese additive particles in the section that follows.

1.2 Cantonese additive particles

In Cantonese, additive particles form a varied set that minimally contains:

- the adverbs *dou1* (都), *lin4* (連) and *zung6* (仲/重)
- the verbal particle *maai4* (埋) (Matthews & Yip 2010)
- the sentence final particle *tim1* (添/嘅)
- other less frequent items (e.g. the adverb *jik6* (亦)...))

The precise description of each of these particles is difficult for at least two reasons. First, some of these elements have additional uses besides their additive ones. For example, *dou1* can be used to convey universal quantification, so that (5) is potentially ambiguous between (5-a) and (5-b).

- (5) Ngo5dei6 dou1 hai6 hok6saang1.
 We DOU COP student
 a. ‘We all are students.’
 b. ‘We also are students.’

⁴ It has been shown that this is too simple a picture (Winterstein & Zeevat 2012). For the purpose of this paper, this description will suffice.

⁵ Note that we will defend a weaker analysis for *tim1* later on in the paper.

A satisfactory analysis of *dou1* means that we have to decide whether it is necessary to assume two distinct meaning postulates for *dou1*, or an abstract one from which one could derive both (5-a) and (5-b). We will not address this question here, nor will we attempt at a precise description of the whole system of Cantonese additives.

Second, these elements are seldom used on their own, but are usually used in combination with other additive particles. Different additive particles belong to different parts of speech and occupy different syntactic positions, which makes it natural to use several of them in a single sentence as in (6) which involves three distinct additive elements: *zung6*, *maai4* and *tim1*.

- (6) Aa3mei1 **zung6** sik6 **maai4** wun2 faan6 **tim1**.
 A-Mei ZUNG eat MAAI bowl rice SFP
 ‘A-Mei also finished the bowl of rice.’

As a coarse way to measure the rate of co-occurrence between additive particles, we observed the frequencies of the additive particles mentioned above in the Hong Kong Cantonese Corpus (Luke & Wong 2015). We compared their total frequencies of occurrence with their frequencies when used in combination with at least one other particle in the set. The counts are raw: sentences were not analyzed one by one to filter out potentially irrelevant occurrences. The results are summarized in Table 1.

Apart from *dou1*, these results confirm that additive particles have a tendency to appear in combination with at least one other particle in the studied set.⁶ In the case of *tim1*, most of the co-occurrences are with *zung6* (17 cases), but *dou1* is also present (11 cases). The rest of the cases do not involve an additive considered in Table 1, or any additive at all.

This makes it difficult to tease apart the precise contribution of each particle: when particles are used in combination their meanings combine or unify in a way that is not trivial to decompose. Out of the particles in Table 1 only *lin4* appears consistent in its interpretation. It always denotes a scalar additive akin to *even* and which scopes over noun phrases (Matthews & Yip 2010). The other ones all seem to allow both scalar and non-scalar interpretations. For example depending on its associate, *dou1* will be interpreted in a non-scalar way (7-a) or scalar way (7-b) (reflected in the choice of translation by *too* or *even*).

- (7) a. NGO5 dou1 sik6ZO2 lau4lin4.
 I DOU eat.PFV durian
 ‘I also ate durian.’
 b. Ngo5 LAU4LIN4 dou1 sik6ZO2.
 I durian DOU eat.PFV
 ‘I even ate durian.’

Table 1: Usage of additive particles in isolation/combination.

Particle	Tot. Freq.	Freq. Comb.	% Comb.
<i>dou1</i>	1939	77	4.0%
<i>zung6</i>	196	50	25.5%
<i>maai4</i>	143	35	24.5%
<i>tim1</i>	69	26	37.7%
<i>lin4</i>	13	12	92.3%

⁶ The lower frequency of combination for *dou1* can partly be attributed to its wide range of meaning, notably its universal quantification meaning.

This is not to say that *dou1* is necessarily ambiguous. The scalar reading might just be a by-product of the topicalization of the object (see Section 6.2 for a discussion in a cross-linguistic perspective).

The high frequency with which these particles occur together led some authors to analyze some of these combinations as instances of particular constructions. For example, Law (1990) argues that *zung6...tim1* is a discontinuous construction (a claim largely found in the subsequent literature dealing with the syntax of SFPs). Law argues that *zung6* is optional in such constructions and when it is optionally deleted, the meaning of the construction is unaffected. Tang (2007) also points out that *zung6* and *tim1* are semantically redundant when used in the same clause, and that is one of the reasons why he considers *zung6...tim1* as a discontinuous construction.

The reason we mention that frequent co-occurrence of particles is because it affects the way examples are constructed, especially for the particle that is the focus of this paper. In most cases, the most natural examples are produced by using a combination of particles rather than one in isolation, which makes it hard to pinpoint the contribution of the targeted element. The examples in this paper have been constructed with this in mind, eschewing particle combinations whenever possible for reasons of simplicity, while trying to keep examples as natural as possible.

1.3 Mirativity in Cantonese

Mirativity is defined as the grammatical marking of surprising or unexpected information either on the part of the speaker, or possibly of other discourse participants (Delancey 1997; Aikhenvald 2012). Mirativity is often discussed in tandem with the notion of evidentiality, i.e. the indication of the source of knowledge. This is because both notions have some overlap, and languages that do mark mirativity have a tendency to mark evidentiality as well (Aikhenvald 2012). Nevertheless, mirative markers are considered to form a category that is distinct from evidentials. One of the most convincing arguments for that conclusion is that there exists mirative markers which are compatible with different evidential values, and which can be used in combination with different evidential markers (Aikhenvald 2012; Delancey 2012).

Aikhenvald (2015) notes that Cantonese is one of the very few isolating languages that have an evidential system (albeit a simple one) represented by the hearsay sentence final particle *wo5*. Besides this evidential particle, it has been argued that Cantonese also has a mirative marker: the particle *wo3* which marks information that is unexpected for the speaker (Luke 1990; Matthews 1998; Hara & McCready 2017).⁷ Leung (2009) mentions that *wo3* was initially used as an hearsay evidential, and only later became a mirative particle, in line with the general semantic change paths from evidentials to miratives discussed by Aikhenvald (2012).

Here, we will argue that Cantonese has more than one mirative marker, i.e. that the sentence final particle *tim1* can also mark mirativity, although of a different type. We turn to the specifics of that particle in the coming section.

1.4 Cantonese *tim1*

The Cantonese morpheme *tim1* is usually considered to have two distinct usages: as a verb meaning *to add* which is restricted to specific objects such as *drink* or *rice*, and as a sentence final particle which is the one that we will focus on.

⁷ All *wo* SFPs share the same character independently of the tone they carry (唔), making them indistinguishable in written form even though they are clearly distinguished in spoken form.

As an SFP, *tim1* appears at the end of utterances, possibly with other SFPs, forming clusters. The order of particles in SFP clusters is not free. It has been observed that when an utterance involves a cluster of SFPs, *tim1* appears as the first element of that cluster (Matthews & Yip 2010), suggesting that it occupies a syntactic position that is different from other SFPs (Law 2001; 2002). This will be discussed further in Section 3.2 where it is shown that this description is not entirely accurate.

As mentioned above, the semantic contribution of *tim1* ranges between a non-scalar additive meaning to a purely mirative meaning, which we illustrate below.

In (8), the use of *tim1* appears to be purely non-scalar and indicates that the addressee had at least one other bowl of rice before, without any overtone that would convey that the bowl of rice is (for example) an unexpected thing to have.

- (8) Sik6 WUN2 FAAN6 tim1 laa1.
eat bowl rice SFP SFP
'Eat one more bowl of rice.'

In (9), *tim1* can be interpreted as a non-scalar additive, i.e. as indicating that Bob knows other languages besides Portuguese, with no apparent ranking of the languages. A scalar interpretation is also possible, though not mandatory, e.g. if it is forced by context, by using a specific intonation on *pou4man2* 'Portuguese', or by combining *tim1* with an optional scalar additive like *zung6*.⁸

- (9) Bob (zung6) sik1 POU4MAN2 tim1.
Bob (ZUNG) know Portuguese SFP
'Bob also/even knows Portuguese.'

As expected, the additive usages of *tim1* in (8) and (9) involve the identification of an associate, i.e. *tim1* appears to be a focus particle in the sense of Krifka (1999). This associate can be of various types: a noun phrase as in (9), or a predicate as in (10).

- (10) Aa3mei1 m4 hai6 gei2 leng3. keoi5 HOU2 BAN6 tim1.
A-Mei NEG COP quite pretty she very stupid SFP
'A-Mei is not very pretty. She's also very stupid.'

The only constraint that seems to bear on the nature of the associate is that it cannot be the subject of the host sentence of *tim1*, cf. (11).⁹

- (11) *John hou2 ban6. BOB hou2 ban6 tim1.
John very stupid Bob very stupid SFP
'John is very stupid. Bob is very stupid too.'

Besides these additive readings, the contribution of *tim1* can also mark a form of surprise of the speaker. Thus in (12) the speaker is surprised at the fact that it's raining, i.e. they did not expect it to be the case.

- (12) Lok6jyu5 tim1.
Rain SFP
'It's raining!'

⁸ As mentioned above, Law (1990) and Tang (2007) consider that *zung6...tim1* is a construction in which both elements are semantically redundant. We prefer to consider that in an example like (9), *tim1* is underspecified (in a way that will be made clearer along the way), and that *zung6* further constrains the range of possible interpretations for it.

⁹ However (11) is acceptable provided that *tim1* associates with the whole sentence.

The use of *tim1* in (12) is intuitively different from the additive readings. For a start, it does not seem to require an antecedent of some sort for its interpretation, i.e. it is not anaphoric as other additive particles are. In both (8) and (9), the interpretation of *tim1* requires the identification of a contextually accessible element that belongs to the set of alternatives to the associate. In (12), this does not seem to apply, and (12) can felicitously be uttered as a discourse initial segment.

In Section 3, we present more systematic evidence of the differences between the additive and mirative *tim1*, but the main puzzle about *tim1* can already be seen from the data presented so far. Given the variety of meanings that can be conveyed by the use of *tim1*, it is fair to ask whether it is possible to give a single unified description to the particle. If it is an additive particle, its meaning need to be characterized more finely (is it scalar? what kind of scales does it associate with? etc.), and its anaphoric or not properties need to be accounted for. First, we turn to previous analyses of this particle.

2 Previous analyses

The SFP *tim1* is mentioned in nearly all the inventories of Cantonese sentence final particles. However, the description of its meaning is usually rather cursory and limited to a single aspect of its semantics.

Kwok (1984), Cheung (2007) and Matthews & Yip (2010) only consider the additive meaning of *tim1* (glossed either as *also* or *even*) with no specific discussion of its (non-) scalarity nor of its mirative reading.

Law (1990: 65–79) provides a more detailed description and analyzes *tim1* as an inherently scalar item. She argues that *tim1* is always part of a discontinuous construction formed with the adverb *zung6* which sometimes get elided. Her claims are based on the observation that *zung6* and *tim1* “frequently appear together” (though that assertion is not quantified) and the similarities between the *zung6...tim1* and the *lin4...dou1* constructions. While the latter only scopes over NP, the one involving *tim1* would be the equivalent construction for scoping over VP. The mirative reading is not mentioned.

Some works mention the duality of *tim1*. Zhan (1958) distinguishes the additive meaning of the verb and a “mood” particle. More recently, Lee & Pan (2010) proposed a unified analysis of the semantics of *tim1* as an attempt to further refine the cross-linguistic landscape of additive items. This is by far the most sophisticated account of the particle, and we turn to it now.

2.1 The Lee & Pan (2010) analysis

Lee & Pan (2010) (L&P) propose a single unified analysis for *tim1*. They argue that the additive and mirative readings are derived from one and the same lexical entry, and that their semantic differences arise as the result of using different scales and associating with elements of different semantic types. Beyond their description of *tim1*, their work is also an attempt to further make precise the cross-linguistic typology of scalar additives by showing that *tim1* occupies a unique position in this landscape.

Their main claim is that *tim1* has to be considered as a *scalar additive* (cf. Section 1.1). They claim that, like other elements of its class, its meaning involves:

- i. The assertion of its prejacent.
- ii. An existential presupposition that conveys that a contextually accessible alternative to the associate is subject to the same predication as the associate of *tim1*.

- iii. A scalar presupposition which conveys that the associate is higher on its scale than its alternative.¹⁰ The nature of the scale depends on the nature of the associate of *tim1*. In all cases, the scalar presupposition indicates an “upward movement” on the scale (e.g. by indicating a higher degree than the antecedent, or an increase in quantity). That upward movement is what ties all readings of *tim1* together in L&P’s analysis.

They further claim that *tim1* is distinct from other scalar additives (both in Cantonese and cross-linguistically) for three reasons. First, it does not constrain the type of scale it associates with (e.g. unlike Cantonese *lin4* or English *even* which are restricted to the scale of (un)likelihood). Second, it does not constrain the position of its associate on the scale (e.g. unlike *even* in English or *oute* and *akomi ke* in Greek, cf. Giannakidou 2007), meaning that the associate of *tim1* is not necessarily the low extremum of the scale it belongs to. Third, it is not sensitive to polarity (again unlike *even*).

L&P consider three kinds of scales that *tim1* can rely on: degree scales, for example as expressed by gradable predicates, the scale of (un)likelihood, and what they call the “quantity” scale. The quantity scale is invoked for the seemingly non-scalar uses of *tim1*. In an intuitive way, the resort to this scale indicates that the cardinality of some contextually salient set is increased. The type of scale that can be used by *tim1* depends on the semantic type of its associate. All types can rely on the quantity scale, which corresponds to a default when no other scale is accessible. Besides this, propositions (i.e. elements of type *t*) can use the (un)likelihood scale and elements that denote entities can also rely on the degree scale. We discuss and illustrate each of these scales below, using (13) for the degree scale, (12) for the unlikelihood one, and (9) for the quantity scale.

In (13), the associate is a gradable predicate which is associated with the scale of smartness.

- (13) John hou2 lek1. BOB lek1 GWO3 keoi5 tim1.
 John very smart Bob smart COMP him SFP
 ‘John is smart. Bob is even smarter.’
Existential presupposition: there is a contextually salient individual *y* such that $y \neq \text{Bob}$ and *y* possesses smartness to a certain degree
Scalar presupposition: the degree to which *y* is smart is smaller than that of *x* (which is trivially verified given (13)).

In (9), the associate is the NP *pou4man2* and the scale is the quantity scale.

- (9) Bob sik1 POU4MAN2 tim1.
 Bob know Portuguese SFP
 ‘Bob also knows Portuguese.’
Existential presupposition: there has to be a language/skill *y* such that Bob knows it and $y \neq \text{Portuguese}$
Scalar presupposition: the set of languages/skills known by Bob is incremented by one.

Note that if there is a contextually accessible scale on which Portuguese ranks higher than some other language (e.g. in terms of prestige), then that scale can be used for the inter-

¹⁰ Note that not all authors make the choice of separating the existential and scalar presuppositions when describing the semantics of scalar additives cf. Section 1.1. This choice reflects those of Giannakidou (2007). We mostly agree with this choice, although we will argue the scalar component is a conventional implicature rather than a presupposition.

pretation of *tim1*. In that case the meaning of *tim1* would better be paraphrased by *even* and its semantics would be similar to those of (13). In (13), L&P claim that the resort to the quantity scale is blocked by the fact that the nature of the associate primes the access to a degree scale.

In (12), the associate is the whole sentence (type *t*) and the scale is that of unexpectedness (triggered by the type *t*).

(12) LOK6JYU5 *tim1*.

rain SFP

'It's raining!'

Existential presupposition: there must exist a proposition *p'* such that *p'* is contextually accessible and *p'* is true.

Scalar presupposition: raining is more unexpected than *p'*.

2.2 Issues with the L&P analysis

The L&P analysis is attractive in that it is economical because it proposes a unified analysis to *tim1*, and because it makes explicit the factors that trigger the different readings associated with *tim1*. We also agree with many of its features, notably their separation of the existential and scalar component. However, it suffers from a number of problems which we present in this section, most of which are not specific to their analysis, but problematic for many approaches to additives.

2.2.1 Anaphoricity of *tim1*

The semantics proposed by L&P necessarily involve an existential presupposition. This presupposition entails the identification of a salient alternative to the associate of *tim1*. This makes *tim1* an element with anaphoric properties similar to those already observed for other additive elements, notably *too*. Kripke (2009) observed that the use of *too* in a discourse initial utterance as in (14) is not permissible, even though it is obvious that John is not the only one to dine in Hong Kong. In other words, the existential presupposition of *too* cannot be *accommodated*. This is because the antecedent of *too* needs to be identifiable in the context of (14).

(14) #John is having dinner in Hong Kong too.

This property is true for the additive uses of *tim1*. For example, when *tim1* associates with an NP, it cannot be used in a discourse initial utterance, and a contextually salient alternative must be accessible to render the discourse acceptable (either because it was mentioned, or because it is directly recoverable from a previous utterance). Thus, by itself an example like (9) with the additive reading of *tim1* (or, in the terms of L&P, using the quantity scale in this case) is not acceptable: there needs to have been a previous mention that Bob speaks a different language than Portuguese. The crucial point here is that the required element cannot be accommodated for additive *tim1*, just like the antecedent of *too* is usually not accommodated (van der Sandt & Geurts 2001; Kripke 2009).

This last property does not hold in the case of mirative *tim1* (as already observed in Section 1.4). An example like (12) needs no context nor salient antecedent proposition to be uttered, and can be uttered as a discourse initial segment (and in most cases, would usually be discourse initial).

By itself, the L&P proposal does not distinguish between the two sorts of presuppositions: the accommodable and non-accommodable ones; so it minimally needs to be augmented in a way that ensures that in the additive cases the presupposition needs to be contextually

accessible and present, whereas in the mirative cases it can be accommodated. Such a move would have the advantage of keeping a unified structure for the meaning of *tim1*.

Under such assumptions, in a case like (12), the use of *tim1* would necessitate the accommodation of a presupposition distinct from the prejacent, truth-compatible with it, and such that it contrasts with it and that the prejacent is more unlikely than this accommodated presupposition. It might be the case that such an accommodation takes place for (12), though the identification of the content that proposition is not self-evident. By itself, this is not problematic: one could assume that the interpretation of *tim1* in (12) relies on an unstated, underspecified, *ad-hoc* proposition. This proposal also entails that the mirative *tim1* should always be felicitous discourse-initially, since one should be able to accommodate the right presupposition for its use. While this might be on the right track (theoretically a speaker might choose to express surprise about nearly anything), we will not explore these predictions here.

Another way to account for the data is to assume that in the mirative cases, *tim1* does not presuppose the existence of another proposition whose (un)likelihood is compared to its prejacent. This is the option we will favor, and in Section 6.1 we will motivate it by arguing that the mirative *tim1* is an evolution of the additive one which lost its presupposition and increased its subjective nature by restricting itself to conveying an expressive content.

2.2.2 Issues with the unlikelihood scale

Another issue of the L&P analysis is related to cases involving the unlikelihood scale (which correspond to the cases we identify as miratives). By itself, the issue is not specific to their analysis, but is problematic for most accounts of scalar additives that rely on scales of unlikelihood or unexpectedness.

L&P, along with other authors, are not explicit about how notions like unlikelihood or unexpectedness should be formalized, most likely because these are very intuitive notions to deal with. The most natural way to formalize these notions is to give them a probabilistic interpretation: a proposition p will be more unlikely than a proposition q iff $P(p) < P(q)$, where P represents a (subjective) probability measure which aligns with the speaker's belief (in Bayesian fashion). Similarly, the unexpectedness of a proposition is related to the speaker's prior belief in it. There might be differences in perspective between them; for example unexpectedness is probably more speaker oriented than unlikelihood, but both can be handled with probabilistic apparatus. It can be shown that if one considers common-sense axioms about how notions like "plausibility" or "likelihood" behave, then one ends up defining a probability measure that respects Kolmogorov's axioms (Cox 1946, see also Jeffrey 2004 for an in-depth discussion). We therefore consider that whenever L&P and other authors mention an unlikelihood scale, a probabilistic interpretation of that scale is appropriate.

This raises a number of interrelated problems for an analysis of scalar additives. Given the way L&P set up the semantics of *tim1*, they predict that the use of mirative *tim1* is felicitous if there exists a contextually salient proposition which is more likely (i.e. less unlikely) than the prejacent of *tim1*. This entails that as long as a seemingly trivial proposition is stated, anything less trivial that follows should be a felicitous host for the particle *tim1*. Example (15) is one such example.

- (15) #Aa3mei1 hai2 hoeng1gong2 ceot1sai3 ge3. Keoi5 hai2 aa3gan1ting4
 A-Mei in Hong-Kong born SFP she in Argentina
 duk6gwo3syu1 tim1.
 study.EXP SFP
 (int.) 'A-Mei was born in HK. She studied in Argentina!'

In (15), the first part of the discourse is low on the scale of unlikelihood, especially if it is uttered in Hong Kong (i.e. the statement should not be surprising). The second part, however, is far more unlikely: not many Hong-Kongers go study in Argentina. Thus the conditions of use stipulated by L&P are met: the first part of the discourse is an accessible proposition which is less unlikely than the host of *tim1*. Nevertheless, as indicated in (15) the resulting discourse is not felicitous, precisely because the use of *tim1* is not natural.¹¹

This problem is not specific to L&P, and not specific to an analysis of *tim1*: it applies to all analyses of scalar additives that rest on a scale of probability and which assume that the prejacent of these elements has to be less likely than its alternative(s) (starting from the proposal of Karttunen & Peters 1979, and later ones like Rooth 1992). Greenberg (2016; 2018) summarizes various criticisms of this hypothesis for the case of English *even*, and offers new counter-examples which involve an antecedent with the proper likelihood properties, but which does not license its use (similar to (15) above). Such an example is given in (16).

(16) John had tea or coffee. Bill (# even) had tea.

Having tea or coffee is necessarily more probable than having tea, yet the use of *even* is not licensed in (16). The same observation applies to the case of *tim1*: (17).

(17) John jam2zo2 caa4 waak6ze2 gaa3fe1. Bill jam2zo2 caa4 (# tim1).
 John drink.PFV tea or coffee Bill drink.PFV tea SFP
 (int.) ‘John had tea or coffee. Bill even had tea.’

Another case in point is (18) which involves two unlikely situations, the latter one being (objectively) less likely, without licensing *tim1* (or *even* in its English translation).

(18) John gaan1 uk1 bei2 toi4fung1 cui1lam3zo2, keoi5 zi1hou6
 John CL house by typhoon destroy.PFV he afterwards
 zung3zo2 luk6hap6coi2 (# tim1).
 win.PFV lottery SFP
 (int.) ‘John’s house was destroyed by the typhoon, afterwards he even won the lottery.’

To summarize, what this series of examples shows is that a full account of the mirative cases cannot rely on a scale of unlikelihood which uses simple probabilities as its degrees. This matches the conclusions of Greenberg (2016) about *even*. This is also what justifies our proposal, outlined in Section 5, to use an argumentative scale. Argumentative scales can be given a probabilistic interpretation which matches the unlikelihood properties of *tim1* (or *even*) in most cases, but also involve a consideration of the goal the speaker is aiming at in his discourse. This property of orientation is what allows our account to

¹¹ One might argue that the discourse is unnatural on other grounds, notably because without *tim1*, it would be natural to conjoin the two discourse segments with an adversative connective like *daan6hai6* ‘but’ rather than by simple asyndetic coordination. However even with an overt adversative connective the use of *tim1* still leads to an unacceptable discourse:

(i) #Aa3mei1 hai2 hoeng1gong2 ceot1sai3 ge3. Daan6hai6 keoi5 hai2 aa3gan1ting4
 A-Mei in Hong-Kong born SFP but she in Argentina
 duk6gwo3 syu1 tim1.
 study.EXP SFP
 (int.) ‘A-Mei was born in HK but she studied in Argentina!’

predict the degraded nature of sentences like (17) or (18). It also serves at the starting point to explain the evolution of *tim1* from a scalar additive to a mirative marker.

2.2.3 Non-scalar cases

In their discussion of *tim1*, L&P point out that in some cases, a parallel can be made between *tim1* and non-scalar additives like English *too*. One example they discuss is (19).

- (19) Keoi5 sik1 POU4MAN2 tim1.
 s/he know Portuguese SFP
 ‘S/he also/even knows Portuguese.’

As shown by L&P, (19) can get at least two readings: one scalar reading in which knowing Portuguese is more unlikely than knowing some other language, and what in English would correspond to a non-scalar use, i.e. one that simply indicates that the referent of *Keoi5* ‘s/he’ knows another language than Portuguese. It is this second reading only that we will be interested in here.

At first glance, this reading is problematic for a unified analysis of *tim1* since it appears to be non-scalar, in contrast to the other uses of *tim1*. L&P’s solution to this problem is to analyse all additives as scalar elements, including elements like English *too* (which are treated as paradigmatic cases of non-scalar additives in the literature, e.g. König 1991; Krifka 1999). Their proposal is that, besides their usual existential presupposition, these elements also convey a scalar presupposition that involves an operation of their invention: the “+ -operation”. This operation “is performed by adding the associated item to a presupposed set” and it “represents another way through which the scalar presupposition of *tim1* can be satisfied.” (see L&P: 1795).

Formally, for a case like (19), L&P assume *tim1* comes with two presuppositions (cf. L&P: 1796).

The first is an existential presupposition conveying that the referent of *s/he* in (19) knows a language different from Portuguese (we will not discuss this presupposition here).

The second is a scalar one, that L&P formalize as in (20), using the + -operation mentioned above (cf. their (62a)) and the following notation:

- x is the associate of *tim1* (Portuguese in (19))
- y is the alternative to x
- C is a predicate ensuring that an element is contextually accessible
- Q is the “quantity scale”
- N is a set such that $x \in N$, and which can be contextually accommodated, in (19) the number of languages known by the referent of *s/he*.

$$(20) \quad \exists y \exists Q_{\text{scalar}} \exists N [C(Q) \wedge y \in N \wedge [Q(|N|) + Q(x)]]$$

The gist of the scalar presupposition is that “(e)ventually, the relevant addition would lead to an increase normally by “one” in quantity or by the quantity denoted by the associated x .”, which would correspond to the “move upward” that L&P claim ties all readings of *tim1* together. For (19), L&P paraphrase this as “Portuguese is an additional language known by [the referent of *s/he*]”.

On one hand, we agree with the spirit of L&P’s proposal on this issue: we also want to claim that *tim1* is inherently scalar, even in cases which might appear best translated by a non-scalar element in other languages (e.g. by English *too*). So we join them in wanting to capture some form of scalarity in an example like (19). In other words, we agree with

L&P about the fact that there is a difference between English *too* and *tim1*, though we will simply argue that the former is not scalar whereas the latter is. In Section 4.1 we discuss the nature of the scalarity of *tim1* in more detail.

On the other hand, we disagree with their proposed treatment of the scalar presupposition of *tim1* in (19).¹² There are two issues with the way they formulate the scalar presupposition in (20).

First, it is not clear what the $+$ -operation means. Given the form of (20), we should expect that a statement like $[Q(|N|) + Q(x)]$ is propositional, meaning it can be given a truth-value, since it appears in a formula of first order logic. However, an operation like $+$ has no straightforward truth-conditions in that setting: there is no sense in asking whether a statement like $2 + 1$ is true or false. L&P do not give a formal definition for the truth-conditional interpretation of $+$, instead relying on descriptions such as saying it is “performed by adding the associated item to a presupposed set”, further confirming that it indeed corresponds to an action, rather than a proposition that can be evaluated in terms of truth-conditions. Conceivably, one could imagine defining a semantic model that gives sense to such a statement, but L&P propose none. Besides, even if they differ on many aspects, most approaches to presupposition agree on attributing them a propositional content, so analyzing presuppositions as non-propositional is an unconventional move.

Second, even if we assume that there is a way to make formal sense of this notion, the scalar presupposition they attribute to (19), shown in (20), does not meet any of the usual criteria used to characterize presuppositional content. Among these, the most prominent are related to the projective properties of presuppositions, i.e. their ability to remain unaffected by environments which typically modify truth-conditions: e.g. questions, antecedents of conditionals, modal operators (see Langendoen & Savin 1971 for an original statement of the problem). In (21) *tim1* is embedded in an interrogative and in the scope of the modal *ho2nang4* ‘probably’.

- (21) a. Bob sik1 m4 sik1 pou4man2 tim1 aa3?
 Bob know NEG know Portuguese SFP SFP
 ‘Does Bob also know Portuguese?’
- b. Ho2nang4 Bob sik1 pou4man2 tim1.
 probably Bob know Portuguese SFP
 ‘Bob probably also knows Portuguese.’

In neither of the examples in (21) does the use of *tim1* convey that the associated item of *tim1* (here *Portuguese*) is added to a presupposed set (here the set of languages known by Bob). Instead, in (21-a) that addition is precisely what the question is about, and in (21-b) it is also that addition whose probability is hedged by the use of the modal. In contradistinction, the existential presupposition according to which Bob knows at least one language different from Portuguese projects out of these environments, as expected of presuppositions.

To summarize, while we are sympathetic with L&P to unify all readings of *tim1* as scalar, we contend that their proposal offers formal challenges related to the $+$ -operation they propose, and that the way they describe the scalar presupposition of *tim1* when using that $+$ -operation does not behave in the expected manner of presuppositions. This prompts us to propose an alternative way for analyzing the contribution(s) of *tim1*.

¹² Our arguments also apply to their proposed treatment of English *too* as a scalar element, but that is a minor point in their analysis.

3 Distinguishing two *tim1*

The discussion of the L&P analysis shows that the additive and mirative readings of *tim1* stand apart for a number of reasons. First, their meanings are not the same (additive vs. mirative) and their presuppositional profile differ. Supposing that they are distinguished just by the kind of scale they interact with is not enough to account for their differences. Second, unlike the mirative *tim1*, the presupposition of the additive *tim1* cannot be accommodated: the element appears to be anaphoric in that it requires an accessible and salient antecedent to be licensed.

In this section we present two additional and partly novel observations that suggest that the additive and mirative *tim1* need to be distinguished. One is acoustic (Section 3.1), the other one syntactic and related to the distribution of the two *tim1* (Section 3.2).

3.1 Experiment: Acoustic properties of *tim1*

This section reports the results of an experiment which aimed at testing whether there are acoustic differences between the mirative and additive *tim1*. The experiment was prompted by the intuition that the additive *tim1* is longer than the mirative *tim1*, i.e. that in examples like (9) the duration of the particle is longer than in examples like (12).

This was tested in a production experiment. 11 participants (7 female) were recruited. All were students at the Hong Kong Institute of Education, aged between 19 and 25 years old (mean = 22), and were native speakers of Cantonese with no declared hearing problems. Participants listened to an audio stimulus in the form of a dialogue that provided a context for a sentence they were then asked to read out loud in what seemed the most natural sounding way to them.

The experiment tested one single binary condition: the additive or mirative reading of *tim1*. Target items all involved *tim1* in sentence final position in the sentence to be read out loud by the participant. Two lists were produced which used identical target *tim1*-sentences, but used different contexts for the target items, triggering either a mirative or additive reading of the particle. In addition, filler sentences were also included in the experiment. The naturalness of the sequences of utterances was checked with various native speakers beforehand. They reported no significant problems. Participants were debriefed and did not report any naturalness issues either.

An example of item and additive and mirative contexts is as follows:

- **Additive context:**

(22) Nei5 zau6 hou2 laa1 gaa3jan4 lak6.
 You then good SFP marry SFP
 'It's so good for you that you're getting married.'

- **Mirative context:**

(23) Fan6 gung1fo3 nei5 ZOU6 jyun4 mei6 aa3, dang2 zan6 jiu3 gaau1 laa3.
 CL homework you do finish NEG SFP wait a bit must submit SFP
 'Have you finished your homework? We have to turn it in soon.'

- **Target item:**

(24) Ngo5 zung6 nam2zyu6 m4 sai2 zou6 tim1.
 I still think.CONT NEG need work SFP
 'I am/was counting on not having to work SFP.'

A total of 12 different target items and 36 fillers were produced, and each participant produced 6 target items after being exposed to an additive context and 6 in the mirative condition. The items were shown on a computer screen, using a latin-square design

and pseudo randomization (using the IbeXFarm platform, available at <http://spellout.net/ibexfarm/>).

Only the target utterances were analyzed (12 per participant). For each produced utterance, the /t^him/ segment was analyzed on Praat (Boersma & Weenink 2016) and the duration of the rime of /t^him/ was measured (i.e. vowel + coda).¹³ The results are illustrated on Figure 1.

The effects of the tested condition were assessed using model reduction and maximum likelihood ratio test and treating participants and items as random factors. The results show there is a significant effect of the condition leading to longer production of the rime component of /t^him/ in the additive contexts ($\chi^2 = 15.753$, p-value = 7.219e-05).

Therefore the experiment confirmed the initial intuition. There is a significant difference in the production of the additive and mirative *tim1* in sentence final position: the mirative *tim1* is significantly shorter than the additive one, suggesting they might be distinct elements. In Section 6, we argue that mirative *tim1* evolved from additive *tim1*, and use the observed shortening as one supporting observation.

3.2 Syntax: The distribution of *tim1*

Besides their semantic and acoustic differences, the additive and mirative *tim1* also have differences in their syntactic distribution.

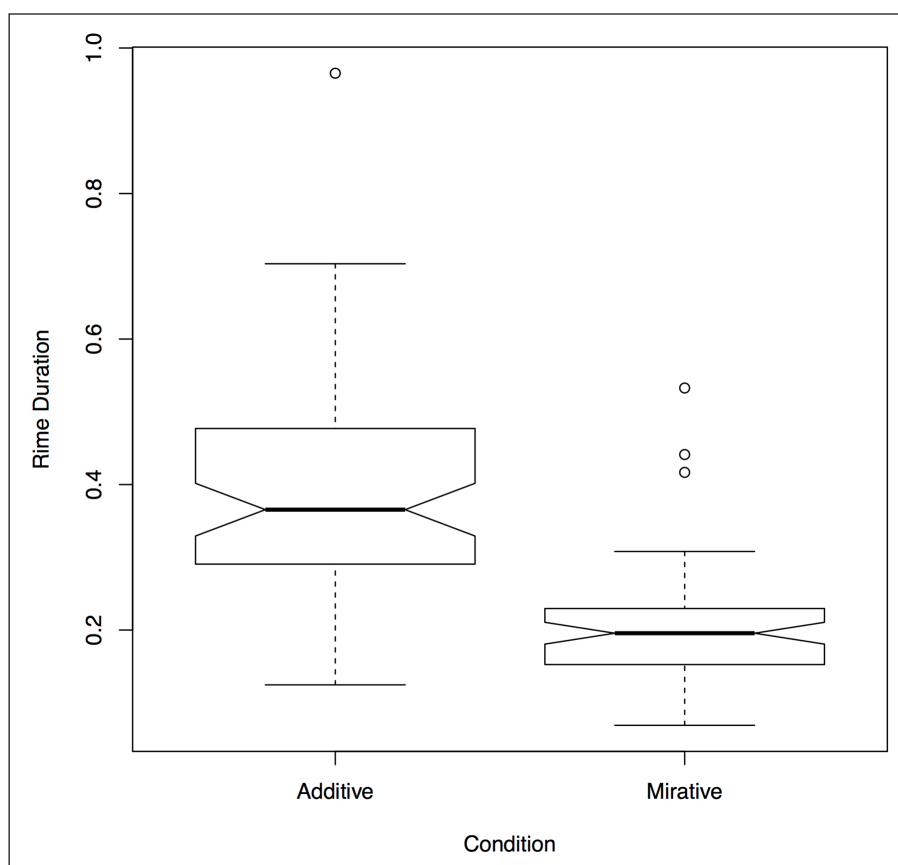


Figure 1: Measured rime length for *tim1* in the ADDITIVE and MIRATIVE conditions.

¹³ Besides the length of the rime, tonal contours were also observed. Matthews & Yip (2010) observe that *tim1* is one of the few elements that retain a high-falling tone in Hong Kong Cantonese. Conceivably, the two *tim1* could then also be distinguished by their tone, one bearing a high-level tone, the other one a high-falling one. The analysis of the results, however, showed no such difference. Generally, only falling contours were observed, in all conditions. A likely explanation is that the particles appear in sentence final position and that the contour corresponds to sentence final falling intonation.

In Section 1.4 we mentioned the common observation that *tim1* always appears first in clusters of SFPs (Matthews & Yip 2010).¹⁴ However, a closer look shows that *tim1* can appear in at least two different positions in SFP clusters. In (25) *tim1* is cluster-initial, but in (26) it is in cluster-final position.

(25) (Matthews & Yip 2010)

Keoi5 lo2zo2 dai6 jat1 ming4 **tim1** ge3 laa3 wo3.
s/he take.PFV number one place SFP SFP SFP WO3
'And s/he got first place too, you know'

(26) A: Ngo5 zeoi3gan6 maan5maan5 sik6 siu1je2 fei4zo2 hou2do1.
I recently every-night eat night-snacks gain-weight a lot
'I recently put on a lot of weight because I eat snacks every night.'

B: Haa2, ngo5 sing4jat6 hou2je6 sik6 siu1je2 ge3 tim1.
EXCL I all-the-time very-late eat night-snacks SFP SFP
'I eat a lot of night snacks (and I realize it might have bad consequences).'

Such observations are consistent with data given by Kwok (1984: 45) when discussing the combination of *tim1* with the particle *ge3* (which she analyzes as a specific construction, a claim we will not discuss here) as in (27).

(27) Zung6 hou2 jau5 dei6wai6 ge3 tim1, zung6 gei2 leng3 ge3
Even very have position GE SFP even quite handsome GE
tim1, gei2 si3zeng3 ge3 tim1.
SFP rather regular GE SFP
'He has a good position, he's also quite handsome and is overall quite nice.'

The additive *tim1* can thus appear in two different positions (cf. (25) and (27)), but the mirative *tim1* can only appear in the final-cluster position, i.e. it is not possible to interpret *tim1* in (25) as a marker of surprise (this was confirmed by several native speakers).

An additional observation is that the additive *tim1* can felicitously be used in interrogatives, whereas the mirative cannot, cf. (21) vs. (28).

(21) a. Bob sik1 m4 sik1 pou4man2 tim1 aa3?
Bob know NEG know Portuguese SFP SFP
'Does Bob also know Portuguese?'
b. Bob sik1 pou4man2 tim1 aa4?
Bob know Portuguese SFP SFP
'Bob also/even knows Portuguese?'

(28) #Lok6jyu5 tim1 aa4?
rain SFP SFP
'Is it raining? (which would be unexpected)'

The data in this section shows that, depending on its interpretation, *tim1* may or may not appear at the initial of an SFP cluster, and is or is not compatible with certain construc-

¹⁴ In the first edition of their grammar, M&Y mentioned two alternative orders for *tim1*, which complicated their original template for SFP order. This was simplified in the second edition of the book.

tions (minimally: interrogatives). This naturally suggests that it should be possible to use *tim1* twice in the same utterance, once in each of these two positions and with possibly two distinct readings. That prediction is actually borne out, as shown in (29) which is a modification of (26) which involves another occurrence of *tim1* as an additive marker:

- (29) Haa2, ngo5 sing4jat6 hou2je6 sik6 siu1je2 **tim1** ge3 **tim1**.
 EXCL I all-the-time very-late eat night-snacks SFP SFP SFP
 ‘I also eat a lot of night snacks (and I realize it might have bad consequences)’.

The possibility of using the same item twice in a sentence with different meanings is a typical test to show that an expression is ambiguous (Gillon 1990), which further strengthens our claim that there are two distinct uses of the particle *tim1*.

4 Characterizing the two *tim1*

Most of the data and discussion presented so far argue for a distinction between the additive and mirative *tim1*. Not only do they differ in meaning, but also in their distributions and acoustic properties. Furthermore, previous attempts to unify the two have proven to be problematic.

These differences have been noted in recent proposals (notably at the 20th international conference of Yue dialects, see Chen 2015 and Kwok 2015, as well as Liu 2013 and Tang 2015) and there seems to be a consensus that, at least on a descriptive level, the two particles need to be distinguished, even though most descriptions have remained largely intuitive rather than formally precise.

In this section, and based on the data seen so far, we clarify each of the two meanings attributed to *tim1*. This will serve as the basis for the formal proposals given in Section 5.

4.1 The additivity of *tim1*

There is little room for doubting that the additive reading *tim1* is indeed additive. Not only is it etymologically related to a verb meaning *to add*, but virtually all its descriptions in the literature describe it as an additive.

However, given the data covered so far, especially in the discussion of the L&P analysis, it is fair to ask whether the additive *tim1* is non-scalar, in the manner of English *too*, scalar, or possibly ambiguous between the two readings. Examples such as (19) do not carry scalar overtones unless supplementary markers or context force a scalar reading (e.g. *zung6* as in (9)). The remaining cases fall in two categories. On one hand are those that involve a reading of unexpectedness, and we argue that those belong to the mirative *tim1*, not the additive one. On the other hand are cases that involve an associate which is inherently scalar. It is those cases that we will rely on to show that the additive *tim1* is indeed scalar, in line with the spirit of the L&P proposal. To illustrate we will use (30).

- (30) Ngo5 gam1jat6 tai2zo2 loeng5 bun2 syu1. Kam4jat6 TAI2ZO2 SAAM1
 I today read-PFV two CL book yesterday read.PFV three
 BUN2 tim1.
 CL SFP
 ‘Today I read two books. Yesterday I even read three.’

Example (30) is acceptable. However, if we minimally modify it by changing the quantity of books the speaker read yesterday, its acceptability degrades: if the quantity is equal to the number of books read today the sentence is borderline acceptable (31-a), and if it is inferior it becomes plainly degraded (31-b).

- (31) a. ?N_{go}5 gam1jat6 tai2zo2 loeng5 bun2 syu1. Kam4jat6 tai2zo2
 I today read.PFV two CL book yesterday read.PFV
 loeng5 bun2 tim1.
 two CL SFP
 ‘Today I read two books. Yesterday I (also/even) read two.’
- b. #N_{go}5 gam1jat6 tai2zo2 loeng5 bun2 syu1. Kam4jat6 tai2zo2
 I today read.PFV two CL book yesterday read.PFV
 jat1 bun2 tim1.
 one CL SFP
 ‘Today I read two books. Yesterday I (also/even) read one.’

Note that this behavior crucially differs from the case of non-scalar additives like English *too* which are not sensitive to the quantity denoted by its associate:

- (32) a. Today, I read three books. Yesterday, I read three too.
 b. Today, I read three books. Yesterday, I read one too.

Therefore, we take those examples as indicative that the additive *tim1* does encode a form of scalar constraint.¹⁵

The case of (31-a) deserves a bit more attention. In Section 1.4 when discussing example (19) we mentioned that *tim1* does not necessarily carry scalar overtones, i.e. it does not entail that its associate is strictly higher than its alternative on some scale. The examples above showed that *tim1* does not allow the associate to be lower on the scale. But what about equality? Although the acceptability of (31-a) is disputable, other examples show that *tim1* is tolerant of equality. For example, one can modify (9) as in (33-b).

- (33) a. A-Mei really knows a lot of language.
 b. Keoi5 sik1 faat3man2, pou4man2, tung4 pou2tung1waa2 tim1.
 she know french Portuguese and Putonghua SFP
 ‘She knows French, Portuguese, she can also speak Putonghua.’

If *tim1* required strict superiority of some sort, as English *even* does, then (33-b) should sound degraded in the same way (34) does. This is because knowing Putonghua is not really surprising for A-Mei (assuming her to be a Hong Konger), or at least it should be less surprising than knowing French or Portuguese.

- (34) ?A-Mei knows a lot of languages. She knows French, Portuguese, she even speaks Putonghua.

What appears in (33-b) is that all elements have equal status regarding the speaker’s point, i.e. that A-Mei knows a lot of language. In Section 2.2 we showed that the scale of unlikelihood was not an appropriate scale to work with *tim1*, echoing other work about scalar particles like *even* (Anscombe 1973; Kay 1990; Greenberg 2016). We will argue that the only scale that is relevant for the interpretation of *tim1* is an argumentative scale. The constraint encoded by the additive *tim1* is a scalar constraint of equality or superiority of its associate. In Section 5 we give a formal treatment of argumentation in terms of the relevance of a proposition to the goal defended by the speaker. This will naturally handle cases like (34) as well as other examples we have seen so far.

¹⁵ L&P attribute the differences between *too* and *tim1* in those examples to the fact that when the associate of *tim1* is inherently scalar, it cannot access their *+*-operation and uses another one instead, whereas this is the only option for *too*. Given our discussion of that operation in Section 2.2 and all the issues we mentioned about it, we will pursue another route here.

4.2 The mirativity of *tim1*

When discussing mirativity, Aikhenvald (2012) makes it clear that:

“[w]hen analysing a language, it is no longer enough to say that it has “mirativity”: a grammarian would need to specify the values of the category.”

She proposes to distinguish five flavors of mirativity, each of which can be defined with respect to the speaker, the addressee or the main character in a narrative.

- i. sudden discovery, sudden revelation or realization;
- ii. surprise;
- iii. unprepared mind;
- iv. counterexpectation;
- v. new information.

In order to characterize the mirative component of *tim1*, we will compare it to the *wo* particles described by Matthews (1998) as mirative elements. Matthews mentions two mirative *wo* in Cantonese: *wo3*, described as a marker of “noteworthiness” (Luke 1990), and *wo4*, which indicates “unexpectedness” (Kwok 1984). Matthews analyze the latter as a derived form which combines *wo3* and a falling intonation toneme that strengthens the illocutionary force of *wo3* (Law 1990), which is why we will focus on *wo3* alone here.

The range of uses of *wo3* is rather wide, covering reporting and story-telling, informing, reminding, suggesting, challenging positions, indicating noteworthiness, etc. (Luke 1990). Its core meaning was recently formalized by Hara & McCready (2017) as an expressive particle which indicates that its prejacent is either unexpected or corresponds to an unexpected discourse move. They define unexpectedness as the negation of the consequent of a *normality conditional*, i.e. a conditional which specifies conclusions that can be drawn under normal circumstances (Reiter 1980).

The following monologue shows a typical use of *wo3* as a marker of unexpectedness. In the context, the speaker is talking about her child.

- (35) Luke (1990: 201)
- a. Me and my husband are both very straight and we don’t like to lie and cheat others.
 - b. Daan6hai6 keoi5 le1 zau6 hou2 zung1ji3 gong2daai6waa6 go3 wo3.
but he PRT PRT very like lie SFP SFP
‘But he likes to lie very much.’
 - c. I don’t know why so I want to ask for your advice how should I teach him?

Hara and McCready analyze the example by considering that since both parents are not liars, a reasonable (but defeasible) assumption is to assume that their child is not a liar either, which explains the use of *wo3* to mark that the information in the prejacent goes against what is normally expected. This analysis puts *wo3* in the “counterexpectation” flavor of mirativity recognized by Aikhenvald.

In contrast with the mirative aspect of *wo3*, *tim1* rather marks an aspect of surprise for the speaker and sudden discovery or sudden revelation or realization. This can be seen in the following minimal pair, adapted from (Matthews 1998).

- (36) a. Keoi5dei6 bun1 uk1 wo3.
they move house SFP
‘You know, they’re moving house.’ (believe it or not)

- b. Keoi5dei6 bun1 uk1 tim1.
 they move house SFP
 ‘They’re moving house!’ (speaker is surprised about learning/deducing the information from some input)

In (36-a) the information is not new to the speaker, but the speaker indicates that the reported fact is unexpected in the light of other information they know about. In (36-b), the speaker necessarily just found out about the information reported (whether directly or by some form of inference) and expresses their surprise about it. Unlike (36-a), (36-b) is not compatible with a context in which the speaker already knew about the contents of the utterance and wants to report its unlikely character as in (35-b).

Another possible value that the mirative *tim1* can convey is related to what Aikhenvald (2004; 2012) call *deferred realization* i.e. a situation “where-by the speaker gives a post-factum interpretation to what they may have observed in some way.” Aikhenvald mentions that this value is found in different languages (such as Quechua or Western Apache) and that “deferred realization is an integral part of mirative meanings in all systems where mirativity is associated with inference.” Deferred realization is what is at hand in (26). In that example, the speaker is of course aware of what they eat at night. The surprise element comes from the realization of the potential consequences of their eating habits, i.e. of the existence of an inferential link between eating at night and putting on weight.

Besides surprise, the mirative *tim1* is often accompanied by a negative overtone. For example, many speakers interpret (37) as marking that the wedding proposal is both an unexpected and rather unfortunate event, most likely because the speaker has no intention of getting married.

- (37) Ngo5 naam4pang4jau5 tung4 ngo5 kau4fan1 tim1.
 My boyfriend with me ask-marry SFP
 ‘My boyfriend actually asked me to marry him!’

However that negative overtone does not seem to be part of the core meaning of the mirative *tim1*. For example, a sentence like (37) can easily be continued with a statement of the speaker saying how happy she is without sounding contradictory. We will therefore not integrate this reading into our analysis and consider that the negative overtone is a conversational implicature derived from the mirative reading. One way to derive the implicature is to consider people might generally hold negative attitudes to events they are not prepared for, although this default preference is easily overridden.

Finally, it should be noted that mirative *tim1* is in complementary distribution with *wo3* which is expected since they denote complementary values of mirativity. The additive *tim1* is however compatible with *wo3* (cf. (25) above), further strengthening the claim that the two usages of *tim1* should be distinguished.

5 Formal analysis

Table 2 summarizes the differences between the two *tim1*.

In spite of their differences, the two particles still entertain some obvious relations. The most salient one is their segmental similarity. Besides it, there are ways to relate the scalar dimension of the additive with the mirative *tim1*. To do this, we will adopt an argumentative approach which we detail in this section and show how the mirative reading came as a pragmatization of the additive one.

Formally, we will adopt a probabilistic framework to model argumentation. We do this because it allows to keep much of the intuitive appeal of a notion like *unlikelihood* while giving it a more restricted sense. Essentially, the argumentative approach factors in the

Table 2: Additive vs. Mirative *tim1*.

	ADDITIVE <i>tim1</i>	MIRATIVE <i>tim1</i>
<i>Acoustic realization</i>	Long in sentence final position	Short in sentence final position
<i>Position in SFP clusters</i>	Cluster-initial or final	Cluster-final
<i>Anaphoric (presupposition is not accomodable)</i>	Yes	No
<i>Semantics</i>	Scalar additive Associate at least as high as antecedent	Mirative marker Marks the surprise of the speaker.

goal of the speaker in conversation, which we argue is the element that is missing when considering scales of unlikelihood.

We give a brief introduction to this model in Section 5.1. We then use this model to propose a formalization for the additive meaning (Section 5.2) and the mirative one (Section 5.3). The relationship between the two particles is dealt with in Section 6. There we argue that the mirative *tim1* is derived from the additive *tim1*.

5.1 Formal framework: Probabilistic semantics and argumentation

The probabilistic framework we use is based on standard intensional logic to which a probability measure P has been added. Thus, rather than dealing with binary truth-values, we are dealing with probabilities interpreted in a Bayesian way, that is as subjective *degrees of belief* (Jeffrey 2004). In that setting, *belief update* is modeled by conditioning: upon learning that a content φ is true, the probability measure P is replaced by a measure P' such that $\lambda x.P'(x) = \lambda x.P(x|\varphi)$, where $P(x|\varphi)$ is the conditional probability of x given φ .¹⁶ In other terms: prior beliefs are replaced with posterior beliefs which correspond to the prior beliefs conditionalized by grounding the information that φ is true.

In that probabilistic setting, it is possible to characterize a notion of *argumentation* which will prove useful for the description of the *tim1* particles. We will consider that an utterance of content p is an argument for a conclusion H iff $P(H|p) > P(H)$, i.e. iff learning that p is true increases the belief in the truth of H . This is a probabilistic interpretation of the linguistic notion of argumentation first postulated by Anscombe & Ducrot (1983) and which was notably developed by Merin (1999) to characterize different aspects of communication as well as the semantics of some discourse markers. One of the tenets of argumentation theory is that every utterance in a discourse is oriented towards an *argumentative goal*, i.e. that in all instances of communication it is assumed that speakers speak *to a point* (Merin 1999). Sometimes this goal is explicit or contextually obvious, sometimes not. In those latter cases the argumentative properties of the utterances in discourse constrain the possibilities to figure out that goal. In other words, the goal is not a purely contextual element, but one that is semantically constrained by the set of argumentative elements used in an utterance.

With that notion of argumentation it is possible to measure the strength of an argument. This can be done by a variety of means (Merin 1999; van Rooij 2004). A classical way to do it is to consider a *relevance function* (*rel*) which is such that p is an argument for H if $rel(p, H) > 0$. The higher $rel(p, H)$ is, the better the argument will be. If $rel(p, H)$ is negative, then p is a *counter-argument* for H . While there are many definitions of *rel* (e.g. Good's weight of evidence, cf. Good 1950), all can be mapped to the quantity $\frac{P(H|p)}{P(H)}$, called the *impact factor*, which measures the difference between the prior belief in H and

¹⁶ There are arguments against conditionalizing on the absolute truth of an asserted content (Jeffrey 2004), i.e. instead of setting the probability of newly acquired content at 1, it should be set at a lower value, representing a threshold of plausibility. We leave such details out in this work since they have no direct bearing on our claims.

the posterior belief in H , after learning that p is true. The impact factor can directly be rewritten as $\frac{P(p|H)}{P(p)}$ via Bayes' rule. In that quantity $P(p|H)$ is called the *likelihood*. This term is used here in a precise way, and is crucially a property depending on two elements: the content asserted by the speaker (p) and the goal H the speaker is aiming at (rather than the asserted content alone). Intuitively, the likelihood component corresponds to the probability of observing what the speaker asserts, if what they argue for is true. This can be illustrated in (38).

(38) He must be a priest: he's wearing a cassock.

In (38), the speaker is arguing that the referent of *he* is a priest ($=H$) and uses the fact that he is wearing a cassock ($=p$) as evidence. The argument is effective because it is very likely for a priest to wear a cassock, i.e. $P(p|H)$ is quite high, and it certainly is higher than the prior probability for an arbitrary person to wear a cassock ($P(p)$), meaning the argument has a high impact factor, or relevance. This is a property we will use in the following sections.

Linguistic argumentation theory claims that the semantics of some natural language items is intrinsically argumentative. For example, the connective *but* conveys argumentative opposition (Anscombe & Ducrot 1977; Winterstein 2012b), while operators like *only* reverse the argumentative orientation of their prejacent (Ducrot 1973; Winterstein 2012a). In line with these claims, we attribute an argumentative component to both versions of *tim1*.

The argumentative properties of a sentence are usually correlated with their degree properties if they express some, although this is not necessarily the case. For example the quantifiers *a few*, *some*, *most*, *all* form a quantitative scale (each expresses a quantity that is higher than the one below it) which is usually correlated with argumentative strength. Thus in (39), the higher the quantifier on that scale, the better the argument will be for the explicitly targeted conclusion John knows Deleuze quite well.

(39) John knows Deleuze quite well. He read {a few/some/most/all} of his books.

Beyond quantifiers, any expression which denotes a degree will usually map onto an argumentative scale (Fauconnier 1975; Ducrot 1980). Thus quantized NP form argumentative scales, as do gradable predicates modified by intensifiers. This all boils down to the fact that we can assume a unique scale for *tim1*, namely an argumentative scale which is relative to the speaker's goal. This scale is partly contextual, but is also constrained by linguistic expressions: the isomorphy of degree scales and argumentative scales is one example, but there are plenty other cases which form the core of the works in the framework of argumentation within language (see e.g. Anscombe & Ducrot 1983; Merin 1999 for a wealth of examples and applications).

Finally, from a compositional point of view, argumentative constraints can be likened to expressive meanings conveyed via conventional implicatures (CI), in the sense of Potts (2005) and McCready (2010). This distinguishes these meanings from presuppositions. CI contribute new meaning, but not in an at-issue way, which explains their scopelessness properties and the difficulty to deny them. Presuppositions also share these properties but unlike CI they do not convey new material and can rather be seen as conditions for a felicitous assertion (McCready 2010). In this paper, we will use the framework of the \mathcal{L}_{CI}^+ logic (Potts 2005; McCready 2010) to formalize the way the content of the *tim1* particles is introduced. This is done for reasons of convenience since that logic is commonly used in theoretical works describing elements that convey CI.

5.2 Additive *tim1*

The analysis we propose for the additive *tim1* borrows from the argumentative one proposed for French *même* ‘even’ by Anscombe & Ducrot (1983: 57–67) (A&D) to capture the scalar constraint, and the one for non-scalar additives proposed by Winterstein (2011) to deal with matters of anaphoricity and association. The argumentative description of scalar additive items treats them as imposing that both their prejacent p and antecedent q must be arguments for some conclusion and that their prejacent presents a stronger argument than their antecedent. Formally, we write it as: $\exists H : \text{rel}(p, H) > \text{rel}(q, H) > 0$.

For matters of anaphoricity, an additive like *too* can be described as encoding an existential presupposition along with an argumentative constraint which imposes the argumentative similarity of its prejacent and its antecedent (Winterstein 2011) (modulo some substitutions that we eschew here for clarity purposes).

Taking these two approaches together, we formalize the core meaning of additive *tim1* as follows. In a nutshell, it indicates that its prejacent is at least as strong an argument as its antecedent for some conclusion. The antecedent is determined by considering the set of accessible alternatives to the associate. We assume the following notations:

- x : the associate of *tim1*
- Q : the *scope* of *tim1*, i.e. the abstraction such that $Q(x) = p$, where p is the propositional content of the host of *tim1*.
- $\mathfrak{A}(x)$: the set of accessible alternatives of x

We use the notation defined earlier, and analyze *tim1* as an element that conveys the truth of its prejacent and introduces an additive presupposition along with a conventional implicature stating that its prejacent is argumentatively stronger than its antecedent. This can be formalized by analyzing *tim1* as in (40). We use the \mathcal{L}_{ci}^+ framework of McCready (2010) to model these dimensions of meaning, using their \blacklozenge operator to conjoin at-issue and expressive meaning (i.e. we treat it as a mixed expressive).¹⁷

$$(40) \quad \llbracket \text{tim}_{\text{add}} \rrbracket = \lambda Q \lambda x. \{ \exists y \in \mathfrak{A}(x) : y \neq x, Q(y) \}. Q(x) \blacklozenge \lambda Q \lambda x. \text{alag}(Q(x), Q(y)) : \langle \sigma, \langle \tau, t \rangle \rangle^a \times \langle \sigma, \langle \tau, t \rangle \rangle^s$$

As such the representation does not make explicit the binding between the variable y existentially bound in the presupposition and the free variable y that appears in the CI content (so named to make it clear what it should be bound to). We take the latter to be akin to a pronoun which can be dynamically bound to the presuppositional variable (noting that such technical issues are not specific to the case of *tim1*).

Analyzed as in (40), *tim1* leaves the at-issue of its host unchanged, its main function being to introduce the presupposition and the CI.

The *alag* (p, p') relation is defined as: $\exists H : 0 < \text{rel}(p', H) \leq \text{rel}(p, H)$ i.e. p must be at least as good an argument as its antecedent p' for some H , corresponding to the argumentative goal targeted by the speaker. As argued above, this scalar relation can be based on the contextual argumentative properties of the elements in play, or based on their linguistic properties (e.g. in the case of quantized NP and gradable predicates).

One thing that stands out in (40) is the different nature of its contributions: a presupposition and a CI. The status of the former is rather straightforward and in line with much of the existing literature: it has the expected projection properties, and can be bound to a

¹⁷ τ and σ are variable in the typing of the expression: the semantic type of the associate of *tim1* is variable (minimally it can be an NP, a VP or a full sentence), so we use a variable to focus on the contribution of *tim1* (following Potts 2005 in his description of pure expressives).

previous statement (and sometimes needs to be, cf. our discussion in Section 2.2.1). The scalar component also projects in the way expected of conventional implicature, i.e. it is not altered by interrogation or an embedding under modals: for example (41-b) conveys that three beers for Bob is argumentatively stronger than the two beers John had (e.g. to argue that there was a lot of drinking going on that night).

- (41) a. John had two beers.
 b. Ho2nang4 Bob jam2zo2 saam1 bui1 be1zau2 tim1.
 Maybe Bob drink.PFV three CL beer SFP
 ‘Maybe Bob even had 3 beers.’

Among the differences between presupposition and conventional implicatures are: (i) the fact that CI cannot be bound in the manner of presuppositions, (ii) the usual ineffability of CI compared to presuppositions, (iii) the speaker-oriented nature of CI (Potts 2005; McCready 2010). All these apply to the scalar component of *tim1* (and scalar additives in general), and also apply to the component conveyed by mirative *tim1* described in the following sections. Example (42-b) shows both the difficulty in providing a proper paraphrase of the scalar component (in the antecedent of the conditional), and to bind the use of *tim1* to that expression.

- (42) John really likes China.
 a. He goes there on holiday every year.
 b. #Jyu4gwo2 ni1go3 hai6 hou2di1 ge3 zing3ming4, keoi5 hok6gan2
 if this COP better GEN proof he study.PROG
 zung1man2 tim1.
 Chinese SFP
 ‘If that’s better proof, he even learns Mandarin.’

The scalar component of *tim1* is also speaker-oriented in that the speaker does not present it as backgrounded and purportedly shared information (though it can be), but takes in charge the scalar relation between prejacent and antecedent. Thus in (43) the speaker conveys, in a non at-issue way, that they believe checking e-mails during class is at least as annoying (probably more) than coming late to class. The two conjuncts could be reversed with the opposite reading.

- (43) Aa3mei1 hai6 go3 hou2 maa4faan4 ge3 hok6saang1. Keoi5 sing4jat6 ci4dou3
 A-Mei COP CL very annoying GEN student she always late
 tung4maai4 keoi5 sing4jat6 waan2 din6waa2 tim1.
 and she always play phone SFP
 ‘A-Mei is really an annoying student. She is always late and
 even/also plays with her phone.’

The description in (40) covers all necessary aspects of the additive *tim1*: its need for an antecedent (via its presupposition) and its scalar component in the form of an argumentative superiority constraint conveyed as a CI. We illustrate this on two examples we introduced so far. First is (19) (adapted with a proper name).

- (19) Bob sik1 POU4MAN2 tim1.
 Bob know Portuguese SFP
 ‘Bob also/even knows Portuguese.’

According to the description of *tim1* in (40), *tim1* requires two arguments, which are: its associate *x* (*Portuguese*), and its scope *Q* (*Bob knows*). It then conveys three components. First, it conveys an at-issue meaning corresponding to $Q(x)$ (= *Bob speaks Portuguese*). Second, it triggers a presupposition according to which Bob knows another language, different from Portuguese. To satisfy this presupposition, the language in question must be salient/identified in the context, i.e. it cannot be accommodated *ex nihilo*, which entails that by itself (19) cannot be used discourse initially. Third, it conveys a conventional implicature according to which Bob knowing Portuguese is an argument which is at least as strong as its antecedent for the goal the speaker is arguing for.

The question of whether one argument is stronger than another is partly a contextual one. In the case of (19), we can consider at least two different contexts. In the first one, the speaker is trying to convince the addressee that Bob knows a lot of different languages. In that context, all languages have similar argumentative power: asserting that Bob speaks either of them will have the same (positive) relevance to the argumentative goal *Bob speaks many languages*. However, if speaking Portuguese has some high contextual relevance (e.g. if the goal is *Bob will easily settle in Brazil*) then that will remain compatible with the semantics in (40).

Beyond such contextual properties, argumentative relations are also partially defined lexically, typically in the case of expressions denoting quantities or degrees which map onto argumentative scales, as shown in Section 5.1 above.

To illustrate, we repeat example (13) and indicate the associate *x* and scope *Q* of *tim1*.

- (13) John hou2 lek1. BOB lek1 gwo3 keoi5 tim1.
 John very smart Bob smart COMP him SFP
 ‘John is smart. Bob is even smarter.’
 a. $x = \text{Bob}$
 b. $Q = \text{is smart to a degree}^{18}$

With those elements, *tim1* conveys an at-issue meaning according to which Bob is smart to a certain degree (higher than John). In addition, it presupposes that somebody else is smart to a certain degree (present in the context) and conveys a conventional implicature according to which the smartness of Bob is argumentatively at least as strong than John’s. This is immediately verified given that argumentative scales map onto degree scales, i.e. since Bob’s degree of smartness is above John’s, then whatever goal is supported by smartness will be affected more by Bob’s degree than John’s (e.g. their suitability for a task).

We can show that the scalar constraint of *tim1* is indeed argumentative by seeing the behavior of *tim1* in cases that involve discourse segments which stand in systematic argumentative opposition. A first example of that sort involves the Cantonese adverbs *zaang1di1* ‘almost’ and *gan2gan2* ‘barely’. For the purpose of the paper we will assume that these adverbs function like their English equivalents. From the argumentative point of view these elements are interesting because even though an expression of the form *barely X* entails that *X* is the case, *barely* will act as an argumentative reversal operator, i.e. the whole expression will argue against whatever *X* might argue for (Anscombe & Ducrot 1983). Thus, example (44-b) is degraded, even though the speaker conveys that John was on time. This is due to the reversal effect of *barely*.

¹⁸ Here we eschew issues related to how the scope is determined. We take it that it’s the predicate itself (*is smart*) which enters the composition and allows to find the matching presupposition. This can be done for example by assuming a high-order unification framework to find the maximally similar portion of the antecedent, cf. Pulman (1997), and Winterstein (2011) for an application to the case of *too*.

- (44) a. John is reliable. He was on time.
b. #John is reliable. He was barely on time.

Almost is the dual of *barely*: while it negates its prejacent, it retains its argumentative properties (Anscombe & Ducrot 1983; Jayez & Tovena 2008). Let's now examine the case of (45).

- (45) #Aa3mei1 zaang1di1 zou6-jyun4 fan6 zung1man4 gyun2. Keoi5 gan2gan2
A-Mei almost do-finish CL Chinese paper she barely
zou6-jyun4 fan6 jing1man4 gyun2 tim1.
do-finish CL English paper SFP
(int.) 'A-Mei *almost* finished her Chinese paper. She even *barely* finished her English paper.'

The example is degraded, but it should be observed that in it, the English paper is already finished, unlike the Chinese paper. Therefore, on the scale of advancement/completion, the host of *tim1* offers a property that is higher on some scale than its antecedent. But *tim1* does not seem to be able to access that scale and is not felicitous in that example. This is easily explained if we assume that *tim1* relies on an argumentative scale and is thus sensitive to the fact that expressions like *almost finished* and *barely finished* are in systematic argumentative opposition.

Another example that supports the hypothesis that *tim1* relies on an argumentative scale involves the adversative connective *daan6hai6* 'but' which imposes that its two conjuncts stand in argumentative opposition (Anscombe & Ducrot 1977; Winterstein 2012b). It is easy to check that the use of the additive *tim1* is not compatible with the use of an adversative connective (46).

- (46) #Aa3wai5 hou2 gou1, hou2 leng3zai2, daan6hai6 hou2 ceon5 tim1.
A-Wai very tall very good-looking but very stupid SFP
(int.) 'A-Wai is very tall and good looking, but also very stupid.'

The same constraint explains why (15) is not felicitous.

- (15) #Aa3mei1 hai2 hoeng1gong2 ceot1sai3 ge3. Keoi5 hai2 aa3gan1ting4
A-Mei in Hong-Kong born SFP she in Argentina
duk6gwo3syu1 tim1.
study.EXP SFP
(int.) 'A-Mei was born in HK. She studied in Argentina!'

The reason is that it is difficult to abduce a goal for which both the fact that A-Mei was born in HK and the fact that she studied in Argentina are co-oriented (meaning they mostly argue in favor of opposite sets of conclusion). However, if one gives an explicit goal such as *A-Mei has seen a lot of different places in her life*, then the acceptability of the example readily improves.

Finally, the argumentative view also help make sense of the counter-examples of Greenberg (2016) discussed in Section 2.2.2:

- (17) #John jam2zo2 caa4 waak6ze2 gaa3fe1. Bill jam2zo2 caa4 tim1.
John drink.PFV tea or coffee Bill drink.PFV tea SFP
(int.) 'John had tea or coffee. Bill even had tea.'

The explanation of (17) is that a disjunction of the form *A or B* is not argumentatively co-oriented with either *A* or *B*. To see it, one can use the probabilistic interpretation of

argumentation and check that generally $P(H|A \vee B) > P(H)$ does not entail nor is entailed by $P(H|A) > P(H)$, meaning that the expressions are not co-oriented.

L&P strongly argue for a differentiation between *even* and *tim1*. We on the other hand gave *tim1* a core semantics that is very close to that of *even*: both have at their core a constraint of argumentative superiority (strict or not), and both rely on one unique scale. It is thus fair to review the arguments of L&P against a conflation of the two elements.

One of their arguments has to deal with the polarity sensitivity of *even*, and we will not challenge it. It is clear that *tim1* is not sensitive to polarity the way *even* is, and nothing in the semantics we gave to *tim1* predicts it should be. A second argument they give is that *tim1* can associate with different scales whereas *even* is restricted to the scale of unlikelihood. We discussed and challenged that assumption. We argue instead that the scalar part of *tim1* uniquely relies on an argumentative scale, like *even*. Unlike *even*, the scalar constraint is not a strict superiority one. Lastly, L&P argue that, unlike *even*, *tim1* does not mark its associate as the extremum of a scale. They illustrate this property of *tim1* by giving example (47) (their (27), including the choice of translation).

- (47) Keoi5 sik1 POU4MAN2 tim1, bat1gwo3 deoi3 keoi5 lei4 gong2 dou1 m4
 he know Portuguese SFP but to him come say still NEG
 hai6 zeoi3 ceot1kei4 ze1.
 COP most odd SFP
 ‘What he knows is Portuguese, but to him this is not the oddest thing.’

Example (47) is indeed acceptable, and can be interpreted as showing that knowing Portuguese is not the maximally unexpected property that can be predicated of the referent. However, if we take this sentence to be a test for the extremum quality of the associate, then *even* also passes this test, cf. the acceptable (48).

- (48) Hans even knows Portuguese, but that’s not the oddest thing about him.

L&P seem to consider that (48) should be out, but all native speakers we consulted confirmed that this is an acceptable discourse. In any case and whatever the actual status of *even* in (48), the analysis we propose does not mark the associate of *tim1* as the extreme point of a scale, so we predict the possibility of a sentence like (47).

5.3 Mirative *tim1*

For the description of the mirative *tim1*, we will also use the argumentative framework. In a way its description is less complex than its additive counterpart since it does not involve an associate nor a presupposition.

In a nutshell we propose that mirative *tim1* encodes a constraint of high relevance towards the speaker’s goal. We will show how such a constraint accounts for both the surprise and deferred realizations readings of mirative *tim1* discussed in Section 4.2. Formally, the proposed content for mirative *tim1* is given in (49) (where the typing follows Potts 2005 and McCready 2010).

- (49) $\llbracket \text{tim}_{\text{mir}} \rrbracket = \lambda p. \text{highrel}(p) : \langle t^a, t^c \rangle$

Where p is the at-issue content of the host of *tim1* and $\text{highrel}(p) =_{\text{def}} \text{ImF}(p, H) \gg 1$, where H is the argumentative goal targeted by the speaker. ImF is the impact factor discussed in Section 5.1 (of which relevance is a monotonous increasing function Merin 1999) which is such that: $\text{ImF}(p, H) = \frac{P(H|p)}{P(H)} = \frac{P(p|H)}{P(p)}$ (via Bayes’ rule). In other words, the constraint states that the prejacent of the mirative *tim1* must be especially relevant to the speaker’s goal.

How does a piece of evidence yield a high impact factor then? Basically, we can look at the meaning of a high impact factor in any of the two following ways (remembering that we are dealing with probabilities, i.e. quantities in the $[0, 1]$ interval):

- i. $P(H|p) \gg P(H)$
- ii. $P(p|H) \gg P(p)$

What the impact factor tells us is that the effect of p on H is conditioned by both the prior beliefs in p and H and the likelihood component $P(p|H)$. This means that asserting a content p by itself will not guarantee a high impact factor: that component also needs to be a good diagnostic for H . Thus if the belief in p is very low, then the impact factor will be high as long as there is a causal link that relates p and H . This is one area where the argumentative approach differs from most approaches to the scale encoded by scalar additives: the scale is not related solely to a property of the prejacent, but also involves a contextual element: the speaker’s goal (which is otherwise partly constrained by the linguistic structure of the utterance, cf. earlier sections).

What sort of causal link are we talking about here? The simplest way to think about it is along the lines developed by Pearl (2009) about causal Bayesian networks (CBN). A CBN is a directed acyclic graph in which the nodes represent random variables and the links represent the causal dependencies between variables. Links are oriented, and this orientation represents the hypothesis that the root of the link causes a change on the variable at the other end. The strength of the causal links is measured by conditional probabilities. When observing (changing) the value of a variable, the values of the other nodes are modified by updating the joint probability distribution represented by the whole CBN. CBN offer a flexible and compact way to represent probabilistic knowledge bases. They also offer a simple way to illustrate how the use of *tim1* can convey its high relevance. Our cases are rather simple in that they involve only two nodes: the goal targeted by the speaker H and the proposition p asserted by the speaker. Here we assume that the causal direction is such that p has an effect of H . This is represented on Figure 2.

We can use Figure 2 to discuss two of the mirative examples we discussed so far. First, we mentioned that (12) conveys a strong surprise of the speaker regarding rain.

- (12) Lok6jyu5 tim1.
 Rain SFP
 ‘It’s raining!’

We will assume that the goal targeted by the speaker of (12) is something akin to $H_{\text{bad}} = \textit{Things are bad}$. The way to understand the effect of this assertion is that the speaker indicates that the value of $P(p)$ is high (near certainty), thus modifying the value of the corresponding node in the CBN. This will then affect the probability of H accordingly. If $P(p)$ was already high, then the revised probability of H will not be altered much, meaning p will have had no impact. This is what explains the reading of unexpectedness of p in (12).

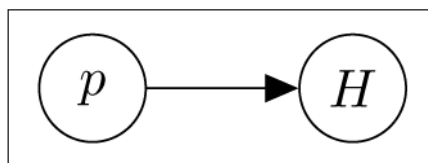


Figure 2: A simple CBN for a speaker asserting p in favor of goal H .

Second, we described (26) as conveying a deferred realization of the speaker, i.e. the realization that (s)he will probably get fat if (s)he keeps on eating night snacks.

- (26) Haa2, ngo5 sing4jat6 hou2je6 sik6 siu1je2 ge3 tim1.
 EXCL I all the time very-late eat night-snacks SFP SFP
 ‘I eat a lot of night snacks (and I realize it might have bad consequences).’

Regarding the speaker’s goal, one might argue that (s)he is either targeting something like H_{bad} above, or the closely related $H_{\text{fat}} = I \text{ will get fat}$. We will adopt the latter here, remembering that for many people H_{fat} entails H_{bad} .

Here, it is not credible to assume that the speaker had a low prior belief in the content of the assertion since one is supposed to be aware of one’s eating habits. Instead, we argue that what the speaker targets in the CBN is the strength of the link between p and H , i.e. their beliefs about the causal link between the two. An extreme case could be to go from a CBN in which no link exists between the nodes (which amounts to an assumption of causal independence) to one in which such a link exists. Therefore the modification of the CBN in this case is not about the value of the nodes but about the links between nodes, i.e. about causality. In the case of (26) this revision comes as the result of the assertion of the other speaker.

In both cases we analyzed the argumentative component as a conventional implicature, i.e. as new content conveyed by the speaker in a non at-issue way. This means that the speaker uses the particle to indicate the high relevance of its context. Depending on which belief state we can attribute to the speaker, his indication of high relevance might be interpreted as either a signal of his low prior belief, or his signaling that he adjusted his beliefs regarding the causal link at hand.

The constraint of high relevance also highlights a difference between *wo3* and *tim1*. The mirative *tim1* can be used with a preajcent whose probability is high (as in (26)) unlike *wo3*, which requires a low prior of its host (or of the speech act conveyed by the preajcent, see Hara & McCready 2017). Essentially *wo3* is not argumentative, even though it is probabilistic in a way. Its semantics are not directly related to the speaker’s goal, unlike that of *tim1*.

On a final note about the mirative *tim1*, and as yet another piece of evidence to distinguish it from its additive sibling, we can observe that nothing in the description we have given prevents mirative *tim1* from being involved in an adversative construction, unlike the additive *tim1*. This prediction is borne out, as in (50-b) which shows that a *tim1* segment can be introduced with the adversative *daan6hai6*:

- (50) a. Shall we go to the canteen together?
 b. Hou2 aa3, daan6hai6 ngo5 daai3zo2 faan6 tim1.
 Good SFP but I bring.PFV food SFP
 ‘Good idea, but I brought food.’

6 A diachronic analysis for additives

In this section we argue that the additive and mirative meaning of *tim1* are diachronically related, the latter one coming as an evolution of the former. This is discussed in Section 6.1. Beyond the case of *tim1* this pattern of evolution is cross-linguistically attested for other elements. In Section 6.2 we present a path for change that goes from non-scalar elements to mirative ones, with evidence taken from our Cantonese data and French, English, Japanese, and Basque.

6.1 From additive *tim1* to mirative *tim1*

Now that we have given a formal description of the contents of both the additive and the mirative *tim1*, we can turn to the question of their relationship. As can be seen from (40) and (49), both descriptions have in common that they express that the relevance of the host of *tim1* is higher than something: higher than that of *tim1*'s antecedent for the additive *tim1*, higher than some threshold in the case of the mirative *tim1*. The major difference between them is the fact that the mirative *tim1* stands alone, and seemingly lost its anaphoric character.

We argue that there has been a semantic change of the additive meaning towards the mirative one. The core semantics of the element has not changed, but it underwent a pragmatization of its meaning (Mosegaard-Hansen 2008). Traugott & Dasher (2002) give several criteria that characterize such a change in meaning. The relevant ones for *tim1* are the following:

- i. meanings tend to become *increasingly subjective*, i.e. grounded in the speaker subjectivity.
- ii. meanings tend to become *increasingly procedural*, i.e. indicate constraints on the interpretation of the utterance rather than its actual content.
- iii. the *scope* of items tend to enlarge, up to the *discourse level*.
- iv. meanings bearing on the event described tend to *refer to the speech act itself* (à la Sweetser 1990).

All of these criteria apply to describe a move from the additive to the mirative *tim1*. First, the mirative *tim1* refers only to the speaker's own (subjective) surprise. The existential presupposition of the additive involves more objective considerations about the presence of an antecedent etc. Second, the additive *tim1* refers to the internal structure of its host and is directly linked to its truth-conditional interpretation, again via its existential presupposition. None of this is relevant in the interpretation of the mirative *tim1* which merely adds an expressive content indicating aspects to related to the processing of its host (which can be modeled as detailed in the previous section). Finally, unlike the additive, the mirative *tim1* scopes over the whole utterance, as indicated by its syntactic position (in line with the hypothesis of Law 2002 about the scope of SFPs in Cantonese). More specifically, the mirative *tim1* is only felicitous with assertions, whereas the additive one is for example possible in questions. This can be taken as evidence that the additive *tim1* operates below the level of speech acts, unlike the mirative one.

We will therefore hypothesize that the mirative *tim1* is a latter innovation based on the additive *tim1*, which itself was derived from the verb *tim1* meaning 'to add'. The evolution path for the morpheme is given in (51).

- (51) *tim1* 'add' > *tim1* 'too, even' > *tim1* 'even', *surprise*
 (verb) (additive particle) (mirative particle)

Having described the evolution path, we now turn to the mechanism behind the change. We argue that the semantic shift involved is based on metonymy. This is because one typical characteristic of metonymic change is that it presents a continuum between meanings, usually allowing for cases that allow both interpretations simultaneously (Mosegaard-Hansen 2008). The case of *tim1* fits that picture quite well: in many instances *tim1* occupies a sentence final position and is potentially interpretable as both an additive

and mirative element as in (52). Furthermore, its tendency to be phonologically reduced patterns well with other cases of grammaticalization.¹⁹

- (52) Aa3mei1 sik6zo2 wun2 faan6 tim1.
 A-Mei eat.PFV bowl rice SFP
 ‘A-Mei also/even had a bowl of rice.’ or ‘She ate a bowl of rice!’

The speaker of (52) can be taken as merely using *tim1* as an indication that A-Mei had a bowl of rice in addition to something else. But the utterance can at the same time also be taken to indicate the surprise of the speaker at this fact, and the relevance of it.

Ideally, these claims should be completed with diachronic corpus data showing the evolution of the marker. This is made difficult by the fact that, even though Cantonese has some written tradition (Snow 2004), finding reliable and authentic diachronic data is rather challenging (but see Leung 2006 about the evolution of *wo5* and related particles). The most readily available data for contemporary Hong Kong Cantonese is found in two corpora: the Hong Kong Cantonese Corpus (HKCanCorp, Luke & Wong 2015), which contains both casual conversations and radio show transcripts, and the Hong Kong Cantonese Adult Corpus (HKCAC Leung & Law 2001), which contains transcripts of radio shows. For diachronic data, the Corpus of Mid-20th Century Hong Kong Cantonese (Chin 2015) offers transcripts from movies ranging from 1943 to 1970. While these corpora might not be as far away in time as we could wish, we can still observe differences in the distribution of the additive and mirative readings of *tim1*. We extracted all occurrences of the particle in these corpora and classified their use as either additive or mirative. The classification was done manually by taking into account the context of use of each utterance, using clues such as the presence of an antecedent, and native speaker’s intuitions to determine the most probable reading of the particle. The results are summarized in Table 3.

The data suggest that the additive meaning is significantly more frequent than the mirative one in the Mid-20th century corpus compared to contemporary corpora (Fisher exact test: $p = 0.03$), in line with our hypothesis that this meaning diachronically came first. This could also be due to a difference in genre: movie scripts are more planned than radio shows or conversations, but even then this would be consistent with the idea that the additive meaning is more deeply entrenched than the mirative one. In addition, the Mid-20th century data also involves 4 instances of *tim1* as a verb, against none in the later corpora, which is also consistent with the idea that the verbal usage predates the others.

6.2 Cross-linguistic paths of change

Having laid out a path for the semantic shift of the particle *tim1*, we will now look at whether similar changes occurred in other languages.

Table 3: Distribution of uses in Cantonese corpora.

	Additive	Mirative	Ambiguous
HKCanCorp/HKCAC	60	30	4
Mid-20th Century Cantonese Corpus	148	42	4

¹⁹ For example, see how the common English noun *will* was grammaticalized to the future marker *will* and eventually reduced to the contracted form *'ll*, or *want to* and *be going to* are reduced to *wanna* and *gonna* respectively. For Cantonese data Ansaldo & Lim (2004) mention the case of the verb *gwo3* ‘to pass’ which has been grammaticalized to a comparative marker, and the lexical verb *dou3* ‘to arrive’ grammaticalized to a resultative verb, e.g. as in *geng1-dou3 sei2* ‘scared to death’. Both grammaticalized versions are shorter in syllable duration compared to their lexical counterparts.

There is evidence in many languages of a relationship between non-scalar and scalar additives, with the scalar uses coming after the non-scalar ones. English *even* and French *même* are two cases in point. Both have at their origin an expression that indicates the equality or the identical character of its host and its antecedent, rather than an indication of superiority of some sort (cf. Old English *efen* > *even*, Ancien Français *meime* > *même*). In French, that use is still accessible in some contexts via the expression *de même* which is synonymous to the non-scalar additive *aussi* ‘too’, cf. (53).

- (53) *French*
 Jean est parti, et Pierre de même.
 Jean is gone and Pierre DE MÊME
 ‘Jean left, and Pierre left too.’

The scalar use of non-scalar items is also discussed for Basque *ere* by Etxeberria & Irurtzun (2015). These authors argue that in a context like (54) the particle *ere* can receive a scalar interpretation, but that this is not part of the semantics of the particle. Rather this comes as an effect of the focalization of some constituents in the sentence, in a way that appears similar to the example (7-b) we discussed above.

- (54) *Basque* (Etxeberria & Irurtzun 2015)
 Jon ere etorri da.
 Jon ERE come AUX
 ‘Even John came./John came too.’

Japanese *mo* ‘too/even’ is another case of an element that can be seen as either non-scalar or scalar, cf. (55) for which a translation of *mo* by *even* appears best suited, but not necessary: a non-scalar additive would also be appropriate.

- (55) *Japanese*
 Saru mo ki kara ochiru.
 monkey MO tree from fall.PRS
 ‘Even monkeys fall from trees.’

There thus seems to be a tendency for non-scalar items to develop a scalar reading. This is probably also what happened to *tim1*, based on its original verbal meaning. The way we formalized the various meanings of *tim1* helps to represent how its meaning evolved. It first acquired its existential presupposition, to which the scalar meaning was later added, along the lines of the mechanisms proposed by Etxeberria & Irurtzun (2015), which entrenched the scalar component in the meaning of *tim1* (though note that *tim1* still has a non-scalar flavor in some of its uses, which we captured in our formalization by making it encode non-strict superiority). The mirative use of *tim1* represents another stage of the evolution in which the presupposition has disappeared and only the conventional implicature remains (i.e. the most subjective of the components).

The question is thus whether that last move is observed in other languages. For English, there already have been analyses that treat *even* as a mirative element (e.g. Zeevat 2009). More in line with our proposal, Kim & Jahnke (2011) consider a relatively understudied usage of *even* in utterance final position, which they claim also bears a mirative value. Example (56-a) is a case in point which marks the (pleasant) surprise of the speaker, and contrasts with (56-b) which does not convey that overtone.

- (56) a. Acrobat is easy to use, fun even!
 b. Acrobat is easy to use, even fun!

Aside from these, there are many cases for which the use of *even* does not have the anaphoric requirement of its non-scalar counterpart *too*, cf. (57).

(57) The party was fun. John even fixed cocktails for everyone.

In (57), no explicit alternative for John's cocktails is mentioned, though the first discourse segment provides the grounds for satisfying the presupposition (a similar example would work in Cantonese with *tim1*). Example (57) is still additive in the sense that the interpretation of the particle *even* (or *tim1*) requires an alternative. However, these examples offer the starting point from which such particles eventually will lose their presuppositional requirement by loosening the condition that the antecedent has to be clearly identified: an example like (57) ensures the existence of an antecedent, without being specific about its nature.

As a last note, the case of Japanese *mo* offers an interesting challenge. In some of its literary uses, *mo* appears to have a non-additive reading that is usually described as a "softener", e.g. as in (58) where the use of *mo* downplays the importance of its prejacent.²⁰

(58) *Japanese*
 Yoru mo fuketa.
 night MO develop.PAST
 'Night developed.'

It is not clear whether and how this meaning can be derived by using the set of hypotheses we have laid out so far, since it seems the reading of *mo* is more or less opposite to a mirative one. Future work might hopefully shed light on the matter.

7 Conclusion

This paper has focused on the Cantonese sentence final particle *tim1*. We have shown that this SFP has two distinct usages in modern Hong Kong Cantonese. Those usages are distinguished on different linguistic levels: acoustic, syntactic and semantic. To characterize the meaning of each particle we used a probabilistic argumentative framework. This helped underline what the two particles have in common and explain their relationship in diachronic terms.

Beyond discussing the particular case of *tim1*, we also addressed more general linguistic questions.

First, we proposed an analysis of *tim1* that rests on the use of an argumentative scale. This, we argued, is not specific to *tim1*, but is also a valid hypothesis for other scalar additives such as *even*. Adopting such a scale solves a number of problems that previous accounts of these items have been facing. For Cantonese, we specifically challenged previous claims by L&P about the fact that there is only a single *tim1* that can associate with a variety of scales. Notably we showed that one of the scales described by these authors (corresponding to their "+-operation") was formally unsound and empirically unfounded, and that their description of *tim1* left many issues about its distribution unsolved.

Second, the diachronic account we presented is relevant to the wider question of the evolution of additive particles. We argued that some scalar additives evolved from non-scalar ones by keeping their presupposition and adding a scalar component, which can be followed by a further evolution discarding the presupposition and only keeping the expressive scalar component.

²⁰ We thank a reviewer for that example.

Finally, when discussing the mirative use of *tim1*, we also proposed an analysis of the notion of mirativity, which in descriptive studies is usually taken as a primitive semantic value that does not get further analyzed. Here we argued that the mirativity encoded by *tim1* corresponds to the marking of high relevance, unlike the mirativity encoded by the particle *wo3* which has to do with expectations. Since mirativity is intuitively linked to notions of likelihood and expectations, the probabilistic framework we used naturally lent itself to the characterization of this meaning. Future work might attempt to capture all flavors of mirativity identified by Aikhenvald (2012) in probabilistic terms and establish the links between those values in more precise terms.

As mentioned at the start of the paper, *tim1* is an interesting element because unlike many of its counterparts its distribution is rather simple, especially because it is not sensitive to polarity, and because, in modern Cantonese, different stages of its evolution co-exist. This makes the study of the scale it associates with easier, and by extension allowed a wider discussion of the nature of scalar additives in a cross-linguistic and historical perspective.

Abbreviations

AUX = auxiliary, CL = classifier, COMP = comparative, CONT = continuous, COP = copula, EXCL = exclamation, EXP = experiential, NEG = negation, PFV = perfective, PROG = progressive, PRS = present, PRT = particle, SFP = sentence final particle

Ethics and Consent

The protocol of the reported experiment was approved by the Human Research Ethics Committee of the Hong Kong Institute of Education (Ref. no. 2014-2015-0269).

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Competing Interests

The authors have no competing interests to declare.

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