Unifying the Imperfective and the Progressive: Partitions as Quantificational Domains

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Abstract: This paper offers a new unified theory about the meaning of the imperfective and progressive aspects that builds on earlier analyses in the literature that treat the imperfective as denoting a universal quantifier (e.g. Bonomi 1997, Cipria & Roberts 2000). It is shown that the problems associated with such an analysis can be overcome if the domain of the universal quantifier is taken to be a partition of a future extending interval into equimeasured cells. Treating the partition-measure (the length of each partition-cell) as a contextually dependent variable allows for a unified treatment of the habitual and event-in-progress readings of the imperfective. It is argued that the contrast between the imperfective and the progressive has to do with whether the quantifier domain is a regular partition of the reference interval or a superinterval of the reference interval.

1   Introduction

The aspectology literature agrees on the intuition that imperfective aspect marking allows reference to incomplete or ongoing situations. On the simplest description, this intuition can be stated as follows: the imperfective maps some situation to the set of times that are contained within it. So, a declarative sentence with imperfective marking such as (1) asserts that the contextually salient time (that contains the event of Mary's coming in) is itself contained within the time of an event of John's washing the dishes.

(1)   John **was** wash-**ing** the dishes when Mary came in.

Progressive/imperfective aspect marking realizes some part of this content, which may be expressed as in (2).[1] (2) says that the semantic value of a language-specific PROG-marking (e.g. the English Progressive) is a function that applies to a predicate ϕ over intervals (where the type of intervals is indicated by ι) and returns the set of non-final intervals ($\subset_{nf}$) of an interval at which ϕ holds.

(2) $[\![\text{IMPF}_{morph}]\!] = \lambda\phi_{\langle\iota,t\rangle}\lambda i.\exists i'[\phi(i') \wedge i \subset_{nf} i']$

Language-specific grammatical expressions such as tense/aspect/modality markers have been observed to exhibit strong cross-linguistic similarities with respect to the meanings they express. These similarities allow for the reasonable hypothesis that the meaning of such expressions is invariant (or at least restricted to a small set of well-defined options) across languages. On this view, (2) is a potential candidate for the common semantic core of IMPF meaning shared by IMPF-marking cross-linguistically. How semantically useful (2) is in that function, depends on how well it accounts for the readings associated with IMPF-marking. Cross-linguistically, marking that is labeled imperfective is associated with at least three distinct readings – (a) the progressive or *event-in-progress* reading; (b) the habitual or generic *characterizing* reading; and (c) the *continuous* reading with lexically stative predicates.[2] The three readings are illustrated in (3) with examples from Gujarati, an Indo-Aryan language with IMPF-marking.[3]

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[1]Throughout this paper, I will reserve the abbreviations IMPF and PROG to refer to the semantic categories of the imperfective and the progressive respectively, while the morphological marking that realizes these categories will be called IMPF-marking and PROG-marking respectively. Following Comrie (1976), language-specific aspectual markers will be written with capitalized initials (e.g. the English Progressive or the Gujarati Imperfective).

[2]Examples include French, Modern Greek, Russian, Bulgarian, Georgian (Comrie 1976), Arabic (Ryding 2005), and Bambara (Tröbs 2004). Yet another cross-linguistically robust pattern is the association of counterfactual meaning with IMPF-marking (e.g. Greek (Iatridou 2000), Italian (Ippolito 2004), Hindi (Bhatt 1997)). This reading, (typically) associated with *past* IMPF-marked forms, will not be discussed here.

[3]The glosses used in this paper are as follows: PRES = present; PST = past; IMPF = imperfective; PERF = perfective; PROG = progressive; CAUS = causative; 1 = First person; 2 = Second person; 3 = Third person; NOM = nominative; ACC = accusative; INS = instrumental; DAT = dative; GEN = genitive; LOC = locative; M = masculine; F = feminine; N = neuter; SG = singular PL = plural.

(3) a. niśā (atyāre) rasoḍā-mā roṭli **banāv-e**
N.NOM.SG now kitchen-LOC bread.NOM.SG make-IMPF.3.SG
ch-e
PRES-3.SG
Niśā *is making* bread in the kitchen (right now). *event-in-progress*

b. niśā (roj) roṭli **banāv-e** **ch-e**
N.NOM everyday bread.NOM make-IMPF.3.SG PRES-3.SG
Niśā *makes* bread (everyday). *characterizing*

c. niśā navsāri-mā **rah-e** **ch-e**
N.NOM.SG Navsari-LOC live-IMPF.3.SG PRES-3.SG
Niśā *lives* in Navsari. *continuous*

If (2) is taken to be the contribution of IMPF-marking, then two puzzles immediately arise in deriving the truth-conditions of the sentences in (3) from (2).

The first puzzle is the *generalization* puzzle: On the characterizing reading, a sentence containing an episodic predicate modified by IMPF describes a generalization over episodes. It is logical to expect there to be a connection between the characterizing reading and the presence of IMPF-marking, but it is not clear how a meaning of the imperfective such as the one in (2) can give rise to this reading.[4]

The second is the *intensionality* puzzle, which is better known in one of its sub-cases, the Imperfective Paradox (Dowty 1977, 1979). The paradox is that a PROG-marked sentence containing an accomplishment predicate may be true at an interval i with the event-in-progress reading even when there is no larger containing interval i' at which the unmodified accomplishment predicate is true. The intensionality puzzle also arises with some characterizing sentences with IMPF-marking, where the described generalizations may not ever have had actual instantiations. For example, a characterizing sentence like *Mary handles the mail from Antarctica*, must be expressed with IMPF-marking in a language like Gujarati and may be judged true despite the absence of actual episodes of mail arriving from Antarctica that is then handled by Mary.

Yet a third puzzle for (2) is that of *typological variation*. IMPF-marking in Gujarati or in Romance (the Italian Imperfetto or French Imparfait) differs in its

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[4]It is sometimes assumed that the generalization is effected by a covert operator such as HAB or GEN, to whose output the imperfective applies (e.g. Bohnemeyer 2002, Filip & Carlson 1997, Boneh & Doron 2009, and others).

distribution and interpretation from imperfective marking in English – the English Progressive. (2), by itself, does not give any indication that the imperfective aspect may have diverse cross-linguistic incarnations. It may be realized by the so-called progressive morphology, which is saliently associated with the event-in-progress reading in (3-a) or by the more general imperfective morphology, which is compatible with all three readings in (3). The *typological variation* puzzle has to do essentially with the problem of identifying the similarity and the difference between the more general IMPF-marking and the semantically narrower PROG-marking.[5]

Connected with the issue of typological variation is the fourth puzzle, which I will call the *temporal contingence* puzzle. In some languages (e.g. Hindi, English), PROG-marking, in addition to exhibiting the event-in-progress reading (4-a), is also compatible with characterizing (4-b) and continuous (4-c) readings.

(4) a. Mary *was biking* to work...when she got hit by a bus.   *Event-in-progress*
     b. Mary *was biking* to work...until she bought a car.   *Characterizing*
     c. I'm 8 weeks pregnant and right before I got pregnant I *was weighing* 187 (5'6), I went to the doctor at 6 weeks and *was weighing* 184...
         (Google example)   *Continuous*

(4-a) and (4-b) license a strong inference that the situation they describe is temporally contingent and subject to change, as has been observed by Comrie 1976, Dowty 1979, Goldsmith & Woisetschlager 1982 as well. IMPF-marking, on the other hand, licenses no such inference.

This availability of a characterizing but temporally contingent reading to PROG-marked sentences in some languages is central to determining the meaning of the progressive aspect and its relation to the broader imperfective aspect. An adequate account of the meanings of PROG and IMPF, then, must provide an explanation for the four puzzles that the account in (2) confronts.

(5) a. The *generalization* puzzle
     b. The *intensionality* puzzle
     c. The *typological* puzzle
     d. The *temporal contingence* puzzle

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[5]Ferreira 2005 is also concerned with the typological puzzle and proposes that the typological variation reflects variants of the imperfective operator that are (in)sensitive to the number properties of the VP. Discussing this proposal in detail would take us far afield from the goals of this paper.

This paper proposes a unified analysis of the meanings of IMPF and PROG that attempts to solve the puzzles in (5). The proposal is couched within a branching time framework (Thomason 1970, 1984), where the intensional component associated with IMPF and PROG involves alternative futures branching from a given reference time. To anticipate the coming analysis, the claim is that both IMPF and PROG contain a universal quantifier, whose domain is a *regular partition* (i.e. a set of collectively exhaustive, non-overlapping, equimeasured subsets) of some interval. The partition-measure (the length of each partition-cell) is a free variable with a contextually determined value. The contrast between IMPF and PROG has to do with whether the quantifier domain is a regular partition of the reference interval (in the case of PROG) or of a superinterval of the reference interval (in the case of IMPF). This contrast is the source of the temporal contingence implicature associated with PROG.

This explicit partition-based characterization of the quantifier restriction resolves several problems on the *generalization* front that accompany previous analyses associating IMPF with universal quantification (e.g. Bonomi 1997; Lenci & Bertinetto 2000; Cipria & Roberts 2000). The relativization of the restriction to a contextually determined partition over an interval facilitates a unified treatment of the event-in-progress vs. the characterizing readings on the one hand, while capturing the different flavors of genericity (habituals and dispositionals) on the other. The use of a branching time framework with alternative futures is central to addressing the *intensionality* puzzle, the *typological* puzzle, and the *temporal contingence* puzzle.

The plan of the paper is as follows. §2 lays out the intimate connection between imperfective morphology and characterizing readings and points out several problems that are faced by existing analyses which analyze IMPF as containing a universal quantifier. §3 presents the main analysis that preserves the association of universal force with IMPF, while specifying the nature of its restriction. The advantages of this proposal in dealing with well-known properties of characterizing sentences are discussed in the same section. In §4 I show how a simple assumption about the partition-measure can account for the event-in-progress reading of IMPF-marked sentences. A meaning of the English Progressive that can account for the *temporal contingence* problem (a distinct progressive operator) is provided in the same section. §5 argues that the proposed analysis for the two aspects and the locus of semantic difference between them has two attractive consequences from a typological perspective. First, it establishes a constrained system within which typological variation in imperfective and progressive marking may occur. Second, it allows us to motivate a typologically well-attested path of historical

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change in the meanings of progressive and imperfective markers. §6 concludes.

2 The generalization problem

The correlation of IMPF-marking on episodic predicates with a characterizing reading of the sentences in which they occur is a fairly robust cross-linguistic tendency (Comrie 1976, Bybee & Dahl 1989, Dahl 1985, 1995, Bybee et al. 1994, among others). Such sentences express a regularity, a non-accidental (but exception-tolerating) generalization over episodes of the type described by the basic episodic predicate. (6) contains characterizing sentences with IMPF-marking in Hindi, Russian, and Modern Standard Arabic.

(6) a. purāne jamāne-ke log   patthar-ke hathiyār
         ancient age-GEN   people.NOM.PL stone-GEN weapons
         banā-te   th-e
         make-IMPF.M.PL PST.M.PL
         People from the ancient ages made weapons out of stone.   **(Hindi)**

     b. Vanja   **pisa-l**   pis'ma   materi   po
         Vanja.NOM write-IMPF.PST.M letter.ACC.PL mother.DAT on
         voskresenjam
         Sunday.DAT.PL
         Vanya wrote a letter to his mother on Sundays.   **(Russian)**

     c. **ya-ᶜmalu**   fii l-ᶜidaarat-i
         work-IMPF.3.M.SG in the administration
         He works in the administration. (Ryding 2005:442)   **(Arabic)**

The generalization puzzle is basically this: What contribution, if any, does IMPF-marking make to the logical form of sentences with characterizing readings which emerge with such morphology? In languages like English, which lack IMPF-marking, sentences in the simple tenses may carry quantificational force akin to that contributed by overt adverbials like *generally* or *typically*. In the absence of an overt source for this quantificational force, a covert dyadic operator GEN, with the structure and type of quantificational adverbs (Q-adverbs), is posited in the logical form of characterizing sentences (Heim 1982; Farkas & Sugioka 1983; Carlson 1989; and the references in Krifka et al 1995). Making a further assumption that these operators are selective quantifiers over intervals, (7-a) can be given

the logical form in (7-b).

(7)　a.　John walks to school.
　　　b.　GEN $[\lambda i.$ John go to school $(i),$ $\lambda i'.$ John walk to school$(i')]$

(8-b) says that in general, an interval at which the predicate 'John goes to school' holds is also an interval in which the predicate 'John walks to school' holds. This is a simplified presentation of the treatment of Q-adverbs and GEN as involving selective quantification over events or situations (e.g. De Swart 1991, Heim 1990, Von Fintel 1994, Krifka et al 1995).

　　GEN, being default, is replaced by overt adverbs when they are present in the sentential structure. What happens in languages like those in (6) where overt aspectual marking (imperfective) correlates with a characterizing reading of sentences and persists in the presence of overt Q-adverbs? Two possibilities exist:

(8)　a.　The generalization is effected, as in English, by covert quantificational operators, such as GEN or HAB, which transform an episodic predicate into a characterizing predicate. IMPF (with a simple meaning of the sort in (2)) then applies to the result of the covert operation.
　　　b.　Some component of the meaning of IMPF effects this generalization.

The division of labor in (8-a) seems to be either explicitly or implicitly assumed in much of the literature that treats imperfectivity as contributing unboundedness or an internal viewpoint on the situation (Smith 1991; Klein 1994; Bohnemeyer 2002; Filip & Carlson 1997, Boneh & Doron 2009 among others). On this approach, the bulk of the semantic work of generalization is effected by some covert operation, with IMPF contributing an existential quantifier over intervals corresponding to the internal viewpoint (the Reichenbachian R $\subset$ E relation). The latter hypothesis (8-b) finds representation in work that treats the primary semantic function of IMPF as introducing a strong, quasi-universal quantifier over events/intervals or situations (Newton 1979; Bonomi 1997; Delfitto & Bertinetto 1995; Lenci & Bertinetto 2000; Cipria & Roberts 2000).

　　I will use the term IMPF-as-universal analysis to characterize the type of analysis contained in accounts where IMPF-marking is associated with a universal quantifier. The general property that unifies these accounts is that the characterizing reading of IMPF-marking is attributed to the quantificational force inherent to the imperfective aspect. What makes this an attractive solution is that the semantic contribution usually attributed to covert operators like GEN or HAB, is located in an overt piece of morphology. This is a desirable outcome in that it system-

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atizes the relation between linguistic form (IMPF-marking) and linguistic meaning (characterizing sense). Nonetheless, existing versions of the 'IMPF-as-universal' analysis face some problems, which are described in the next section.

2.1 IMPF **and universal quantification**

Bonomi (1995, 1997) is the first formal treatment of the imperfective aspect in terms of universal quantification over times (or eventualities). In his discussion on the interpretation of *when*-clauses in Italian, Bonomi proposes that the aspectual opposition between the perfective and the imperfective can be captured in terms of the difference in their quantificational force. Specifically, the imperfective triggers a universal quantifier over times or eventualities, while the perfective is associated with an existential quantifier.[6] Bonomi's approach to aspect-determined quantification can be illustrated with his treatment of bare habitual sentences. (9-a) is an example from Bonomi (1997), with its desired logical form (factoring out tense information) in (9-b), and the actual logical form of the sentence is in (9-c) (based on the representation on pp. 489).

(9)   a.   Leo giocava   a golf
                Leo play-IMPF golf.
                Leo used to play golf.   (Bonomi 1997: 485 (ex. 28a))
    b. $[\![\text{IMPF(Leo-play-golf)}]\!] = \lambda i. \forall i'[\subseteq (i', i) \wedge Cont(i') \rightarrow \exists e[\text{Leo-play-golf}(e) \wedge >< (i', e)]]$ (pp. 487)
    c. $\exists i[< (i, now) \wedge \forall i'[\subseteq (i', i) \wedge Cont(i') \rightarrow \exists e[\text{Leo-play-golf}(e) \wedge >< (i', e)]]]$

(9-c) (translating (9-a)), says that there exists an interval before now such that every *Cont*extually relevant interval within this interval coincides ($><$ to be understood in the sense of overlap) with an eventuality of John playing golf. The characterizing reading for (9-a) arises because of the universal quantifier ranging over the *Cont*extually relevant subintervals of the reference interval (in Reichen-

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[6]The main argument for Bonomi's analysis comes from the interpretation of *when*-clauses in Italian, which may serve as restrictors of the relevant quantifier signaled by aspectual marking on the *when*- and matrix clauses. In those cases, where the restrictor for the universal quantifier is introduced by frame adverbials or left implicit, as is often the case with bare characterizing sentences, Bonomi introduces a phonetically null **when**-operator that introduces the relation of inclusion or overlap between two sets of eventualities or intervals. The precise way in which Bonomi achieves a compositional analysis of imperfective sentences with and without *when*-clauses is technically complicated and not pertinent to the goals of this paper.

bachian terms).

Delfitto & Bertinetto (1995) and Lenci & Bertinetto (2000) rely on a similar notion of contextual relevance, where the domain of quantification for the universal quantifier is assumed to be derived from the context. Cipria & Roberts' (2000) account of the characterizing reading of the Spanish Imperfecto takes the universal quantifier to quantify over characteristic sub-situations of a larger situation, where 'characteristic' conveys the sense of 'normal' or 'usual', as determined by the meaning of the utterance and the context (pp. 324-325).

2.2 Problems for IMPF-as-universal analyses

Despite the attractiveness and simplicity of the IMPF-as-universal analysis, there are several shortcomings to the account sketched above, some of which have been already pointed out in the later literature. *First*, in most of these accounts, the restriction of the universal quantifier is taken to be contextually dependent without a clear explication of how the context determines the restriction set. Related to this is the *second* problem: IMPF-marked sentences which contain an explicit restrictor, nevertheless, tolerate exceptions. It is not clear how an IMPF-as-universal account that seeks to replace GEN can tackle the exception tolerating behavior of IMPF-marked characterizing sentences.[7] *Third*, as Lenci & Bertinetto (2000) argue, characterizing sentences are understood intensionally, as expressing non-accidental, temporally unrestricted generalizations (although their manifestation might be temporally restricted). The lack of any intensional component reflecting the temporal continuation of the characterizing situation makes an extensional IMPF-as-universal account such as Bonomi's inadequate for characterizing the contribution of the imperfective.[8] The *fourth* problem, as Bonomi himself admits, is that the IMPF-as-universal analysis breaks down in the presence of explicit Q-adverbs that do not have coinciding quantificational force (e.g. *seldom*, *often*) (see Lenci & Bertinetto 2000 and Menendez-Benito 2002). I now turn to these problems in §2.2.1, §2.2.2, §2.2.3, and §2.2.4 respectively.

The data used in this section comes from imperfective forms in two languages — the Italian Imperfetto (wherever the literature provides relevant examples) and

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[7]An obvious solution to this is to weaken universal quantification to generic quantification of the sort contributed by GEN (e.g. Lenci & Bertinetto 2000); however that considerably weakens the explanatory force of the IMPF-as-universal analysis.

[8]Lenci & Bertinetto (2000) present a modal intensional IMPF-as-universal account relying on a stereotypical ordering source. The analysis proposed in this paper expresses the intensional aspect of imperfectivity making use of the branching time framework.

the Hindi Imperfective (wherever Italian data is not available). Both languages are comparable with respect to the characterizing readings that these forms exhibit, sharing this property with several other languages. Since the discussion here has to do with the robust cross-linguistic generalizations about the readings available to IMPF-marking and the assumption is that such markers share a common core of meaning across languages, the alternation between the two languages should not be a hindrance to the exposition.

2.2.1 Non-explicit restriction

At its core, the IMPF-as-universal analysis is parallel to analyses of the generic operator which seek to reduce it to the universal quantifier relativized to the subset of relevant or typical/normal entities within a domain (e.g. Declerck 1991; Eckardt 2000; Heyer 1990). The move aims to "set aside contrary or exceptional instances so that once the domain of applicability is correctly defined, application will universally hold of the domain." (Carlson, 1999). The general problem faced by these types of approaches is one of developing a predictive theory of how to determine appropriate restrictions for the universal quantifier. While the latter analyses focus on kind-referring NPs and extracting the correct subset from such NP-denotations, IMPF-as-universal analyses must provide a mechanism for identifying the restriction set of contextually relevant or characteristic intervals/situations.

Bare habitual sentences without explicit domain restrictors best illustrate this problem. Consider (9), repeated in (10).

(10)   a.   Leo giocava   a golf
            Leo play-IMPF golf.
            Leo used to play golf.   (Bonomi 1997: 485 (ex. 28a))
       b. $[\![\text{IMPF}(\text{Leo-play-golf})]\!] = \lambda i. \forall i'[\subseteq (i', i) \wedge Cont(i') \rightarrow \exists e[\text{Leo-play-golf}(e) \wedge >< (i', e)]]$ (pp. 487)
       c. $\exists i[< (i, now) \wedge \forall i'[\subseteq (i', i) \wedge Cont(i') \rightarrow \exists e[\text{Leo-play-golf}(e) \wedge >< (i', e)]]]$

If (10-a) is uttered with neutral intonation, it is not clear what the *Cont*extually relevant set of intervals that is being quantified over by IMPF is. It could plausibly be the set of intervals in which Leo played some sport; the sentence can then be taken to convey the proposition that whenever Leo played something (within some past interval), he played Golf. However, the sentence can be uttered truthfully to describe an interval in which Leo regularly played Golf and Basketball and Hockey, making this universal quantification too strong. Neither does the

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sentence seem to express the proposition that whenever there was somebody who played golf, it was Leo. How exactly is the set of contextually relevant intervals to be determined in such a case? Assuming absolutely no contextual restriction clearly gives the wrong result. In these kind of cases, then, restricting the domain to relevant or characteristic intervals/situations amounts to treating contextual relevance as a predicate in its own right ($\lambda i\ Cont(i)$), rather than assuming a pragmatic mechanism for recovering the domain of quantification from the context. This greatly undermines the value of the IMPF-as-universal analysis and requires an ad hoc weakening of the universal quantifier to account for the weaker truth-conditions.

2.2.2 Exception tolerance

A further, more serious problem arises in dealing with the exception-tolerating behavior of characterizing sentences where the domain is explicitly restricted. Consider the Italian Imperfetto sentence in (11), which may be judged true even if there are a few cases within the salient past period where the janitor did not open the door despite seeing the speaker (the restriction condition).

(11)   Quando mi vedeva, il custode apriva   la porta.
        when   me see-IMPF the custodian open-IMPF the door.
        When(ever) the janitor saw me, he opened the door. (Bonomi 1997: 474 (ex.7))

If *when*-clauses are interpreted in the restriction of the universal quantifier, the truth-conditions come out as too strong for the IMPF-marked generic sentence. One of the motivations for positing a generic adverbial operator distinct from a universal adverb is that characterizing sentences (even with overt restrictors) allow for exceptions while a universal quantifier does not (Dahl, 1975; Carlson, 1982; Krifka et al., 1995, and others). A sentence like (12) is evaluated as false if there were some instances of the janitor seeing the speaker that were not accompanied by instances of the janitor opening the door within the relevant period.

(12)   *Sempre*, quando mi vedeva, il custode apriva   la porta.
        always   when   me see-IMPF the custodian open-IMPF the door.
        When(ever) the janitor saw me, he always opened the door.

Bonomi proposes to overcome the problem of exceptions by attributing it to further implicit domain restriction to relevant cases. In other words, (11) is true if

the "relevant" subset of the set of intervals in which the janitor saw the speaker is in the set of intervals which coincide with an event of the janitor opening the door for the speaker. So again, *Cont*ext gives the contextually relevant set of intervals which constitute the domain set rather than indicating a pragmatic mechanism for determining the domain set for the quantifier (e.g. von Fintel (1995)). Exceptions can always be argued away as being irrelevant to the evaluation, effectively weakening the strength of the universal quantifier.

2.2.3   The intensional component

IMPF-marked characterizing sentences describe generalizations that are expected to hold indefinitely across time, not merely accidental ones. For instance, it might be true that in 1998, every new-born in Yale-New Haven Hospital (YNH) happened to be a breech-baby, forcing the mother to undergo C-section surgery. The generalization that holds is that if a mother gave birth in YNH in 1998, then the mother underwent C-section.

An extensional IMPF-as-universal analysis predicts that an IMPF-marked sentence should form an acceptable description of this situation given the circumstances in 1998 in YNH. Every *Cont*extually relevant interval within 1998 (a birth in YNH) coincided with a birthing process involving C-section. It turns out, however, that the aspectual marking that is most appropriate to describe this situation is perfective and not imperfective. The examples in (13) are from Hindi. (13-a), with IMPF-marking is unacceptable as a description of the YNH situation in 1998 while (13-b) is a perfectly acceptable description.

(13)   a. ??1998-mẽ, YNH-mẽ dākhal aurat-ẽ   C-section-dvārā
           1998-LOC YNH-LOC admitted woman.NOM.PL C-section-FROM
           janam   de-ti   thi
           birth.NOM give-IMPF.F.PL PST.F.PL
           In 1998, women admitted to YNH gave birth (used to give birth) via C-section.
        b. 1998-mẽ, YNH-mẽ dākhal auratõ-ne   C-section-dvārā
           1998-LOC YNH-LOC admitted woman.ERG.PL C-section-FROM
           janam   diy-ā
           birth.NOM give-PERF.F.PL
           In 1998, women admitted to YNH gave birth via C-section. (happened to be the case).

(13-a) leads to an expectation that the situation continued beyond 1998 because of some systematic relation holding between the property of giving birth in YNH with the property of having to undergo C-section (e.g. a policy prohibiting natural birthing or a team of mal-practicing obstetricians). This systematic relation is expected to continue indefinitely unless conditions change (for instance, through a change in policy or through the replacement of its obstetric staff.) If the context includes such relevant information, (13-a) becomes immediately acceptable.

Lenci & Bertinetto (2000), in arguing for a modal analysis of the imperfective, demonstrate that in perfective sentences, frame adverbs such as *in 1998* restrict the domain of overt Q-adverbs to events within the time denoted by the frame adverb. There is no such restriction imposed on the adverb domain in IMPF-marked sentences.

(14) a. Nel 1998, Gianni é andato spesso al cinema con Maria
     in 1998 Gianni go-PST often to cinema with Maria
     In 1998, Gianni often went to the cinema with Maria. (L&B 1998,
     ex. 16(a), pp. 252)

    b. Nel 1998, Gianni and-ava spesso al cinema con Maria
     in 1998 Gianni go-IMPF.PST often to cinema with Maria
     In 1998, Gianni often went to the cinema with Maria. (L&B 2000,
     ex. 16(b), pp. 252)

(15-a), according to them, expresses the claim that most events of John going to the cinema in 1998, were events of going to the cinema with Mary. On the other hand, (15-b) expresses the claim that the generalization that most events of John going to the cinema were events of John going to the cinema with Mary, held in 1998. This generalization may have held before 1998 and since 1998 up until the time of utterance.

What these data show is that the acceptability of IMPF-marked sentences is not dependent on the existence of a temporary generalization, but requires principled generalizations that hold across points of evaluation. In modal approaches to the generic operator, these points of evaluation are accessible worlds. These analyses extend the modal semantics for conditionals to the interpretation of characterizing sentences. The idea is that characterizing sentences are interpreted as necessity statements restricted to the set of worlds within the modal base that are the most normal on some ordering source. (Heim 1982; Condoravdi 1994; Krifka et al

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1995; Lenci & Bertinetto 2000).

In contrast, Cohen (1999) argues that characterizing sentences exhibit intensionality with respect to the time index, rather than the world index. The truth conditions of characterizing sentences, according to him, do *not* depend on the extensions of properties that such sentences relate, across worlds (normal or otherwise); rather they depend only on the extensions of such properties in the actual world at different times. Cohen's probability-based account makes reference to alternative histories within a branching time framework, where the histories under consideration are restricted to those in which the relevant properties of the actual world are maintained across large stretches of time.

A substantive comparison between the intensionality implicated in a modal analysis and the temporal intensionality that Cohen refers to is beyond the scope of this paper. In so far as imperfectivity and aspectual marking is taken to make reference to temporal notions, the analysis proposed in this paper will be framed in terms of branching time rather than possible worlds or world-time pairs, but nothing crucial hinges on this choice, to the best of my understanding. The point of this section was only to show that an IMPF-as-universal analysis that treats the universal quantifier as ranging over an extensional domain fails to be adequate. Any viable analysis of IMPF must be equipped with an intensional component, whether it is one that involves temporal or modal intensionality.

2.2.4 Overt quantificational adverbs

On the standard account, the generic operator may be seen as a covert dyadic Q-adverb (a default quantifier) that relates one set of conditions to another. This operator takes sentential scope and is replaced by overt Q-adverbs like *always*, *often*, and *seldom*, when they occur in the sentence. The association of the universal quantifier with IMPF is a move that effectively replaces GEN with the universal. Crucially, on such an account, IMPF (associated with overt morphological marking) is taken to make the contribution normally associated with the covert GEN. But how does this square with the fact that explicit Q-adverbs are perfectly compatible with IMPF-marking? Bonomi acknowledges this as an open problem for his account, since there is no clear way to reconcile the conflicting quantificational forces of non-universal adverbs and the imperfective. Consider the perfectly grammatical Italian sentences in (15-a-b), in which imperfective marking cooccurs with the adverbs *a volte* 'sometimes' and *mai* 'never' respectively.

14

(15) a. *A volte*   quando mi ved-eva,   il custode apr-iva
          Sometimes, when   me see-IMPF.PST the janitor open-IMPF.PST
          la porta.
          the door.
          The janitor sometimes opened the door when he saw me. (Bonomi
          1997: 508 (ex. 68a))

      b. *Mai*   quando mi ved-eva,   il custode apr-iva   la
          Never, when   me see-IMPF.PST the janitor open-IMPF.PST the
          porta.
          door.
          The janitor never opened the door when he saw me.

One possibility is that aspectual marking is associated with a default universal
quantifier, which gets overridden by the quantificational force associated with an
overt Q-adverb. So the sentences in (15) are cases where the universal quantifier
is neutralized (reminiscent of GEN force being neutralized by overt Q-adverbs).
This hypothesis predicts, however, that perfective and imperfective sentences with
the same overt Q-adverb are semantically identical. That is, there is no *semantic
difference* between (16-a) and (16-b.), since the universal and the existential quan-
tifier have been respectively overridden.[9]

(16) a. *Sempre* quando mi ved-eva,   il custode apr-iva   la
          Always, when   me see-IMPF.PST the janitor open-IMPF.PST the
          porta.
          door.
          The janitor always opened the door when he saw me. (Bonomi 1997:
          508 (ex. 67a))

      b. *Sempre* quando mi vide,   il custode aprí   la porta.
          Always, when   me see-PST the janitor open-PST the door.
          The janitor always opened the door when he saw me. (Bonomi 1997:
          508 (ex. 67b))

Menendez-Benito (2002) (Spanish) and Lenci & Bertinetto (Italian) argue that in-
tuitions on this point are very clear and that the two cannot be taken to be seman-

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[9]The perfective member of the aspectual opposition is associated with the existential quantifier
on Bonomi's analysis.

tically identical. While both (16-a) and (16-b) are descriptions of generalizations over episodes, (16-a) is understood to describe a characterizing non-accidental generalization while (16-b) is understood to describe an accidental generalization (Menendez-Benito, 2002).

The intuitions are identical for Hindi (as well as other Indo-Aryan languages), where also Q-adverbs are perfectly acceptable in both imperfective and perfective marked sentences.

The neutralizing hypothesis for the imperfective quantifier does not work, and the difference between overtly quantified perfective and imperfective sentences suggests that at least some part of the aspectual meaning persists in the presence of Q-adverbs. If it does, and if this component has to do with universal quantification, the question is, what is the scopal relation between Q-adverbs and the universal quantification associated with the imperfective and how is conflicting force resolved? §3.3.6 will show that it is perfectly possible to maintain a non-default, non-neutralizing universal quantifier in the meaning of IMPF provided we posit the correct domain for such a quantifier.[10]

2.3   Summary

The IMPF-as-universal approach is confronted with the same set of problems that any universal analysis of generics is confronted with – the problems of determining restriction domains, accounting for exceptions, intensional behavior. Additionally, associating genericity with the morphologically overt IMPF-marking via a universal quantifier presents a problem for the interaction between equally overt adverbs and the imperfective. What is needed for a convincing IMPF-as-universal account is a clearer picture of the relevant domain of quantification for the quantifier as well as of the interaction between Q-adverbs and imperfective aspect.

3   The proposal

The IMPF-as-universal idea can only have real bite if we can come up with a predictive theory about the restrictor set for the quantifier that accounts for exception-tolerance and takes the intensional aspect of IMPF-marked sentences into consideration. What should such a theory look like? The intuition with characterizing

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[10]Lenci & Bertinetto (2000) offer an analysis of the interaction between aspect and Q-adverbs that turns out to be minimally different from the one offered here, but the two proposals differ with respect to other properties. See discussion in §3.4.1.

sentences is that they describe the *expected continuation* of a *regular distribution* of events across time. A framework that regards time as non-linear or branching (Thomason 1970, 1984) is a useful framework within which to characterize the *expected continuation* intuition.[11] In such a framework, for any given instant or interval, there are any number of possible linear futures continuing it. A maximal linear course of time, i.e. a totally ordered subset of the set of times, is called a *history*. I introduce the notion of a *regular partition* of a history to capture the intuition of the regular distribution of events in time. A regular partition is defined as a partition of a set into collectively exhaustive, non-overlapping, equimeasured subsets. Informally, the coming analysis proposes (17) as the correct characterization of the meaning of an IMPF-marked sentence:

(17) $[\![\text{IMPF}(P)(i)]\!] = 1$ iff every (suitably restricted) history h continuing i contains a j where $i \subset_{nf} j$ and **every** subinterval k of j that is also a cell of a contextually provided regular partition of j overlaps with a P interval.

The rest of this section spells out this semantics for IMPF and demonstrates how it gives us the correct set of explanations for the behavior and interpretation of characterizing IMPF-marked sentences — exception-tolerance and implicit domain restriction, expected indefinite continuation, and cooccurence with Q-adverbs.

3.1   The setup

The formal framework is based on the branching time semantics proposed in Thomason (1970, 1984). A treelike frame consists of a pair $<\mathcal{T}, \prec>$, where $\mathcal{T}$ is a nonempty set of times with dense ordering and $\prec$ is a transitive tree-like relation on $\mathcal{T}$ such that for all $t, u, v \in \mathcal{T}$ if $u \prec t$ and $v \prec t$, then either $u \prec v$ or $v \prec u$ if $u \neq v$. A *history* (or *maximal chain*) on $\mathcal{T}$ is a subset h of $\mathcal{T}$ such that (a) for all $t, u \in h$, if $t \neq u$, then $t \prec u$ or $u \prec t$, and (b) if g is any subset of $\mathcal{T}$ such that for all $t, u \in g$, if $t \neq u$, then $t \prec u$ or $u \prec t$, then $g = h$ if $h \subseteq g$. For any $t \in \mathcal{T}$, H_t is the set of histories containing t.

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[11]Although this particular analysis is implemented in a branching time framework, I believe that there is nothing essential about this choice. It should be fairly straightforward to translate the basic ideas of this proposal into an analysis using world-time pairs. Such a translation will probably be necessary in combining the ideas here with theories of modality to understand the modal properties of imperfective markers.
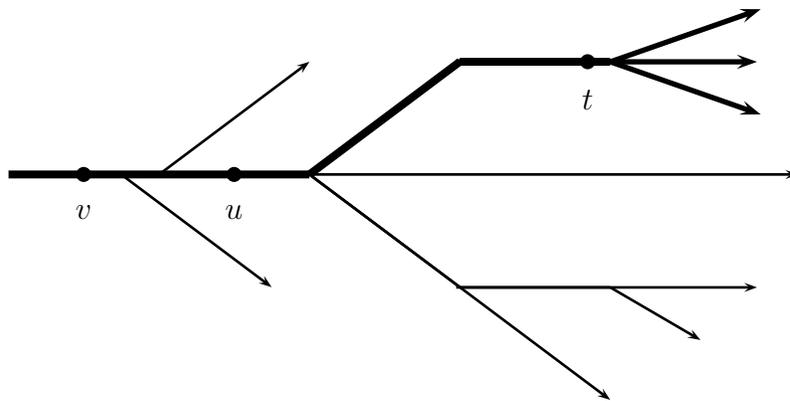
Figure 1: Non-linear time

In addition to the set of times $\mathcal{T}$, the ontology contains intervals and sorted eventualities. An interval i is a subset of $\mathcal{T}$ such that (1) i is a proper subset of some history $h \subseteq \mathcal{T}$, and (2) for all t_1, t_2, $t_3 \in h$, if t_1, $t_3 \in i$ and $t_1 \prec t_2 \prec t_3$ then $t_2 \in i$ (Dowty, 1977: 64). Let $\mathcal{I}$ be a domain of non-null intervals (with points as a special case), partially ordered by the relation of temporal precedence $\prec$ and by the subinterval relation $\subseteq$. $i, j, k...$ are variables over $\mathcal{I}$ and H_i is the set of histories containing i.

The function *Inr* assigns to each $i \in \mathcal{I}$ a proper subset of the histories containing $i - H_{i_{inr}}$, which are the inertia futures of i (Dowty, 1979: 152).[12]

(18) **Inertia futures**
$$Inr = f : I \to \wp(H)$$
$$i \mapsto H_{i_{inr}} \subset H_i$$

For any interval i a subset of $\mathcal{T}$, a partition of i is the set of the non-empty, mutually exclusive, and collectively exhaustive subsets of i. The notion of a *regular partition* of i is defined in (19).

(19) **Regular partition**

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[12]A note about the status of *Inr* is in order here. Dowty (1977, 1979) introduces the notions of inertia worlds and inertia futures as a means to access the set of worlds/histories that are indistinguishable from each other up until the reference interval and continue past this interval in ways that are compatible with and predictable from the normal course of events. Much literature on the Imperfective Paradox has focused on refining the nature of the modal component of the progressive, particularly relativizing it to the predicate and event under question (Landman 1992; Portner 1998). It is not within the scope of this paper to contribute to these refinements. Both the progressive and the characterizing uses of IMPF depend on the future behaving in ways predictable from the past and the present. Inr is only intended to be a **placeholder** function that allows us restrict our attention to histories that meet this predictability requirement. A complete modal-temporal analysis of imperfectivity will spell out with much more precision the modal semantics involved in imperfectivity and I leave this as an issue for further development.

$\mathcal{R}_i$ is a regular partition of i if $\mathcal{R}_i$ is a set of intervals $\{j, k...n\}$ such that

    a. $\bigcup\{j, k...n\} = i$

    b. $\forall j, k \in \mathcal{R}_i \rightarrow j \cap k = \emptyset$ if $j \neq k$

    c. $\forall j, k \in \mathcal{R}_i \rightarrow \mu(j) = \mu(k)$ (where $\mu(x)$ stands for the Lebesgue measure of x).[13]

For any $\mathcal{R}_i$, each of its subsets will have the same measure and this measure will be referred to by the term *partition-measure*. Intuitively, a regular partition of i is a set of non-overlapping chunks of time of equal length partitioning i, a set against which predicate-instantiation may be evaluated with respect to *regular distribution* in time.

$\mathcal{E}$ is a non-null domain of eventualities, sorted into a set of events $\mathcal{E}^E$ and a set of states $\mathcal{E}^S$. The temporal trace function τ from $\mathcal{E}$ to $\mathcal{I}$ gives the run time of an eventuality. The eventuality argument of basic eventive predicates is of the sort E while the eventuality argument of a basic stative predicate is of the sort S. *Sentence radicals* are predicates of eventualities (eventive or stative) built from such basic predicates with their individual (non-eventuality) arguments saturated (somewhat corresponding to the VP-level assuming VP-internal subjects). Aspectual modifiers such as negation, frequency and Q-adverbs, and quantified PPs apply to such predicates of eventualities to yield predicates of intervals. Aspectual operators like IMPF or PERF may either apply to predicates of eventualities denoted by sentence radicals or to the predicates of intervals returned by aspectual modifiers. They map properties of eventualities/intervals to sets of intervals relative to which these predicates are instantiated via existential quantification over the Davidsonian event variable. In a branching time ontology, instantiation is relative to a time and a history, The instantiation of properties at a time and a history is specified here in terms of the COINcidence relation defined as in (20). In words, P is in a coincidence relation with i and h if P is instantiated within i or at a superinterval of i and the time of instantiation is a subset of h.

$$(20) \quad \text{COIN}(P, i, h) = \begin{cases} \exists e\, [P(e) \wedge \tau(e) \circ i \wedge \tau(e) \subset h] & \text{if } P \subseteq \mathcal{E}^E \text{ or } P \subseteq \mathcal{E}^S \\ P(i) \wedge i \subset h & \text{if } P \subseteq \mathcal{I} \end{cases}$$

Tense operators are functions that map predicates of eventualities or intervals to propositions, instantiating these properties in time.

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[13]The Lebesgue measure is the standard way of assigning a length, area, or volume to subsets of Euclidean space. Intervals are a proper subset of the Lebesgue measurable subsets of the real number line.

3.2 The meaning of IMPF

The IMPF operator is defined in (21). According to (21), IMPF applies to a predicate (of eventualities or intervals) P to yield a predicate of intervals i such that (a) every inertia future of i contains an interval j (where i is a non-final subinterval of j) and (b) every cell k of a contextually determined regular partition of j, $\mathcal{R}_j^c$, COINcides with P. A contextually determined regular partition is a regular partition where the partition-measure is anaphoric on the context.

(21)   IMPF: $\lambda P \lambda i. \forall h[h \in H_{i_{inr}} \to \exists j[i \subset_{nf} j \subset h \wedge \forall k[k \in \mathcal{R}_j^c \to \text{COIN}(P, k, h)]]]$

The first task is to demonstrate how the proposed meaning combines with other semantic components in order to build up the meaning of IMPF-marked sentences. Let us assume that the Italian Imperfetto (besides past tense) realizes the meaning in (20). Then, a sentence like *Leo giocava a golf* (9a) is true of an interval i on the characterizing reading iff i is before *now* and every inertial future that continues i contains a superinterval j of i, and for every subinterval k of j that is in the contextually determined regular partition $\mathcal{R}^c$ of j, k overlaps with the run time of an event of Leo playing golf. The appropriate partition-measure here could be of the length of a week or a month or a year, depending on context. The logical form of the sentence, with the new meaning for the Imperfetto (as in (22)) is given in (23).

(22) $[\![\text{Imperfetto}]\!]$
       $= \lambda P. \exists i[i < \text{now} \wedge \forall h[h \in H_{i_{inr}} \to \exists j[i \subset_{nf} j \subset h \wedge \forall k[k \in \mathcal{R}_j^c \to \text{COIN}(P, k, h)]]]]$

(23) $[\![\text{Leo-play-Golf}]\!] = \lambda e. \text{Leo-play-golf}(e)$

(24) $[\![\text{Imperfetto(Leo-play-Golf)}]\!] = \exists i[i < \text{now} \wedge \forall h[h \in H_{i_{inr}} \to \exists j[i \subset_{nf} j \subset h \wedge \forall k[k \in \mathcal{R}_j^c \to \text{COIN}(\lambda e. \text{Leo-play-golf}(e), k, h)]]]]$
       $= \exists i[i < \text{now} \wedge \forall h[h \in H_{i_{inr}} \to \exists j[i \subset_{nf} j \subset h \wedge \forall k[k \in \mathcal{R}_j^c \to \exists e[\text{Leo-play-golf}(e) \wedge \tau(e) \circ k \wedge \tau(e) \subset h]]]]]$

Remember that the problem with an IMPF-as universal analysis that relies on an unexplicated reference to contextual relevance is that it is not always clear what the restriction for the universal quantifier is. For a sentence like *Leo giocava a golf*, one could possibly assume that the restriction is the set of relevant/appropriate intervals, or the set of intervals in which Leo played *something* or *someone* played golf, but neither of these sets is justified by the version of the

sentence with neutral intonation.[14] On the analysis proposed above, the sentence is true if there is an interval of Leo playing golf coinciding with every contextually given disjoint part of an interval extending to the future of the reference interval. The context determines the restriction in a principled way; it does not provide a predicate, nor does it rule out those members of a restriction set to which a generalization does not apply as being irrelevant to the quantification. It only provides the partition-measure, a measure of length which serves to draw a partition which constitutes the restriction set.

3.2.1 The partition-measure

Saying that the partition-measure is contextually determined or anaphoric on the context is not enough. That quantifier domains are context-dependent is a familiar fact from our understanding of nominal quantifier expressions, Q-adverbs, and modals. What is needed is a precise specification of how the discourse context supplies the partition-measure. In this paper, however, keeping the overarching goal in mind, I will limit myself to an illustration of how the partition-measure varies with variation in the discourse context and how this variation may affect the contextual felicity of IMPF-marked sentences.

(25)   a.   niśā   rasoī-mẽ   roṭi   **banā-tī**   hai
             N.NOM kitchen-LOC bread.NOM.SG make-IMPF.F.SG PRES.3.SG
             Niśā makes bread in the kitchen.

         b.   niśā   ãgan-mẽ   roṭi   **banā-tī**   hai
             N.NOM courtyard-LOC bread.NOM.SG make-IMPF.F.SG PRES.3.SG

             Niśā makes bread in the courtyard.

Consider the Hindi sentences in (25) with the background of the following facts: Niśā typically makes bread in the kitchen, except when the weather is really hot or on some special occasion, and then she lights up the clay oven (*tandoor*) outside in the courtyard and makes bread there. Thus, in some sense, (25-a) and (25-b) are both true.

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[14]And even when focus-marking does partition the sentence, the problem of exception-tolerance persists.

But in what sense are these both true? It is certainly not true that GEN events of Niśā making bread are also events of Niśā making bread in the kitchen *and* GEN events of Niśā making bread are also events of Niśā making bread in the courtyard. The conjunction of the two propositions leads to a contradiction. What allows the conjunction to be a non-contradiction is that baking-bread events take place in both the kitchen and the courtyard with some degree of regularity. The actual frequency of these events in these respective locations is variable and so is the granularity or size of the interval within which we find instances of these events. This can be distinguished by setting up an appropriate context in which one sentence is felicitous but not the other.

(26)   a.   **Context:** Ramā and Nādia are discussing where their friends typically make their bread.[15] Ramā says: Rajni makes bread in the courtyard, Parul makes it on her terrace...

           b.   #Niśā makes bread in the courtyard   (25-b)

           c.   Niśā makes bread in the kitchen   (25-a)

Given that the question under discussion (Roberts 1996) in the previous context is about where Niśā usually makes bread, and given that bread-making is an almost daily activity in Indian culture, the partition-measure provided by the context is of a small length (a few days at most), and while each partition-cell overlaps with an event of Niśā making bread in the kitchen, it does not always overlap with an event of Niśā making bread in the courtyard. Naturally, (26-c) is felt to be infelicitous in the discourse context. This contrasts with the context in (27), which makes (25-b) felicitous.

(27)   a.   **Context:** Ramā and Nādia are discussing Niśā's move to a new house, where there is no oven inside the house and only a communal Tandoor in a shared courtyard. Ramā wants to know if Niśā has any experience cooking outside. Nādia says:

           b.   Niśā makes bread in the courtyard   (25-b)

The context here is about the diversity of Niśā's cooking experience, which invokes a much larger partition-measure than the one justified by Niśā's usual cooking pattern. Despite the relatively lower frequency of bread-making events in the courtyard, the regular occurrence of such events and the assumed size of the partition-measure makes it possible that every partition-cell overlaps with a bread-

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[15]Making bread is often an open-air activity in North India and ovens may be located both inside and outside the house. The outside clay ovens are called Tandoors.

making event in the courtyard.

3.3 Advantages of the partition-based account

As stated earlier, the intuition with characterizing sentences is that they describe the expected continuation of a regular distribution of events across time. The introduction of inertia futures (histories) into the meaning of IMPF allows us to formalize the *expected continuation* intuition. The universal quantifier quantifies not over the subintervals of the reference interval, but over the subintervals of future-extending superintervals of the reference interval.

The intuition about *regular distribution* in time is expressed via the notion of a regular partition. The actual frequency of events that is necessary to evaluate a pattern of episodes as regular varies from context to context, and is best treated as a function of context. Treating the partition-measure, the object that generates the restriction set, as a free variable whose value is provided by context, captures this variability. The predicate in the scope of IMPF coincides with every cell of this context-determined partition.

3.3.1 Exception-tolerance

If the restriction for the universal quantifier associated with IMPF is a partition of a future-extending interval, then the tolerance of exceptions to the expressed generalization in face of both implicit and explicit restrictors is easily explained. Consider (11) as a bare characterizing sentence (ignoring the *when* clause for the moment) repeated in (28). As Bonomi concedes, an IMPF-marked sentence like *The janitor opened the door*, with an implicit restrictor set ($\lambda i.\exists e$ (the-janitor-see-me$(e) \land \tau(e) \subseteq i$)) allows for exceptions where some seeing events do not coincide with door-opening events. Further, even with the restricting *when*-clause expressed overtly, some such non-coincidences are easily overlooked in evaluating the generalization.

(28)   (Quando mi ved-eva)   il custode apr-iva   la porta.
        (When   me see-IMPF.PST) the custodian open-IMPF.PST the door.
        (When he saw me), the janitor opened the door.

But if the restriction is a context-determined partition rather than a set of appropriate or relevant or implicitly considered situations, the exceptions to a generalization may not matter truth-conditionally. The sentence does not make a claim about the inclusion relation between an implicit pragmatically derived predicate

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over events and the scope set, but rather about the inclusion relation that holds between a set of equi-measured intervals (whose measure is determined by context) and the scope set. It is perfectly fine if the janitor does not open the door at some of the times that he sees the speaker, *as long as* the relevant partition is such that there is a door-opening event coinciding with every cell of the partition.[16]

3.3.2 Non-accidental generalizations

(29) 1998-mẽ, YNH-mẽ dākhal aurat-ẽ   sirf C-section-dvārā
      1998-LOC YNH-LOC admitted woman.NOM.PL only C-section-FROM
      janam   de-ti   thi
      birth.NOM give-IMPF.F.PL PST.F.PL
      In 1998, women admitted to YNH only gave birth (used to give birth) via C-section.

The imaginary scenario from YNH hospital described earlier, with not a single natural natural birth in 1998, does not incline us to judge (29) as true. The reason is that the sentence compels us to imagine a further scenario where natural birthing, the normal state of affairs as far as birthing is concerned, is indefinitely prohibited – by policy or malpractice – a scenario highly improbable in any hospital worth its name. The facts in 1998 do not inspire the confidence that the nature of future births is also determined, i.e. that every inertia future of 1998 contains an interval in which C-section rules as the birthing norm. Consequently, the sentence is felt to be false, unless of course, there is a policy in place that allows the sentence to be judged as true.

The reason that IMPF-marked characterizing sentences do not express contingent accidental generalizations is because their truth depends on what is predicted to happen (at regular subintervals) in the unrealized futures of the reference interval, not only on what happens at regular subintervals of the reference interval (or sub-situations of the reference situation). The contrast between an extensional IMPF-as-universal analysis and the one proposed here is that in the former, the domain of the universal quantifier is taken to be the reference interval itself; (29) is expected to be judged true under such an account.

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[16]This proposal has nothing to say about generic sentences with kind-referring NPs, where the generalization applies to only some members of the kind; i.e. where exceptional individuals are tolerated (e.g. *Pheasants lay speckled eggs*, *Turtles live a long life.*) These sentences also carry IMPF-marking in most languages, which most likely reflects the atemporality of the relation that holds between the two conditions.

3.3.3 Unrealized instances

The truth of characterizing sentences does not always depend on the existence of actually realized events. A sentence like *Mary handled the mail from Antarctica until Larry took over from her* may be judged true or false, despite no actual mail from Antarctica, based on our knowledge of Mary's job description, or her fascination for all things Antarctican, or some other circumstances. The sentence is true if Mary is confidently predicted to handle such mail if and when it actually arrives. Such a characterizing sentence is realized with IMPF-marking in Italian or Hindi.

   On the current proposal, the sentence is true if the context provides a partition-measure for a partly unrealized interval such that every cell of the partition contains an event of Mary handling Antarctican mail. It is not necessary that the interval stretching from the left boundary of the reference time up until the time of utterance include even a single partition cell. If context and world knowledge tells us that mail from Antarctica is rare, even non-existent currently, then the partition-measure that the context provides is correspondingly large.[17]

3.3.4 The universal and existential characterizing readings

It has been pointed out that characterizing sentences are associated with at least two kinds of generic reading – one a universal habitual reading and the other a weaker existential dispositional one (Lawler 1973, Dahl 1975, Krifka et al 1995). For example, an IMPF-marked characterizing sentence like (30) can be read in two ways. On the habitual reading, it means that Rām eats meat with a high degree of frequency; in fact, most of times that he eats food, the food involves meat. On the dispositional reading, the sentence says that meat is not a kind of food that Rām does not eat.

(30)   rām   mãsāhārī   khānā   **khā-tā**   hai
       rām.NOM non-vegetarian food.NOM eat-IMPF.M.SG PRES.3.SG
       Rām eats meat (non-vegetarian food).   **(Hindi)**

In contrast to Lawler's proposal to account for the contrast by employing two hidden generic operators, Krifka et al retain a single universal meaning for the generic

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[17]I admit that relying on the length of the partition-measure is not an entirely satisfactory way of handling the problem of unrealized instances. It seems intuitively to me that what is required is access to the inertial histories continuing the initial bound of the reference interval i rather than i itself, but I must leave the task of formalizing this in detail for later work.

operator and account for the readings via different partitions of the semantic material. The partitioning for the two readings of (30) is given in (31).

(31) a. **GEN**[x,y,s;](x = **Rām** & x **eats** y **in** s; y **is meat**)
      b. **GEN**[x,y,s;](x = **Rām** & y **is meat** & x **in** s & y **in** s; x **eats** y **in** s)

Focus, expressed through accent placement (on the object, which corresponds to (31-a) or on the verb, which corresponds to (31-b)), justifies the distinct structures associated with the two readings. (31-b) says that if a situation contains Rām and meat, it is generally a situation in which Rām eats the meat. However, on the dispositional reading, (30) is likely to be judged true even if Rām normally does not eat meat when it is available (because he is partial to vegetarian food, which he habitually eats), as long as some of the times he does eat it.

A possible account for this contrast within the proposal made here can be sketched out in the following way. The habitual and the dispositional generic readings necessarily differ with respect to the absolute frequency of the events denoted by the sentence radical, within some larger interval. The habitual reading implies a high frequency instantiation of such events, while the dispositional reading implies a sparser frequency of such events. This difference can be naturally captured by the context-induced variability of the partition-measure. If the discourse context is concerned with whether Rām has the habit of eating meat, the context provides a partition of the appropriately short measure (e.g. a measure of the length of a couple of days) and every partition cell is expected to overlap with a meat-eating event. On the other hand, if the context is concerned with whether Rām objects to eating meat or not, we might consider a partition-measure of much larger length (e.g a measure of the length of a year, or even longer), and each cell in the partition is expected to overlap with a meat-eating event.

Notice that on the dispositional reading, there is no requirement that there be a meat-eating event by Rām within the actually realized part of the interval under consideration. The partition-measure may be much longer than the actual interval stretching from the left boundary of the reference time until utterance time. Imagine a scenario in which Rām, who has been a fanatic vegetarian all his life, gives up his resolve and has decided to not always reject meat when it is around him. This happened last week but he has not yet had the opportunity to implement his changed attitude. Nevertheless, (30) is true today since Rām's attitude supports the possibility of meat-eating events to occur with regularity (though perhaps with limited frequency) in the future.

3.3.5 Variability in frequency

Characterizing sentences exhibit variability in the frequency of episodes considered sufficient for determining their truth value. So far fewer instances of stealing cars are needed to attribute such a habit/disposition to an individual than instances of driving cars for making a judgement about the corresponding habit.

(32) a. Rām   gāḍiyā̃   **curā-tā**   thā
          rām.NOM car.NOM.PL steal-IMPF.M.SG PAST.3.SG
          Rām stole cars.
      b. Rām   gāḍiyā̃   **calā-tā**   thā
          rām.NOM car.NOM.PL drive-IMPF.M.SG PAST.3.SG
          Rām drove cars.

It is not obvious that there is a clear partition into a restriction and scope set of the sentential material in (32-a-b). The set of appropriate intervals/situations is not easily available for GEN to quantify over. A regular partition determined by a partition-measure introduced by the context can be the appropriate sort of set for the universal quantifier to quantify over in these cases. The variability in required and observed frequency is a function of the variable temporal length of the partition-measure.

3.3.6 Interaction with Q-adverbs

I pointed out in §2.2.4 that an IMPF-as-universal account where the quantifier domain is a set of relevant or appropriate intervals faces a problem in accounting for the cooccurence of IMPF-marking with overt Q-adverbs of differing quantificational force. The suggestion that the universal force of IMPF is neutralized in the presence of overt Q-adverbs considerably weakens the IMPF-as-universal analysis, since part of the appeal of that theory is that it attributes a semantic function to overt morphology.

On the current proposal, where IMPF quantifies over a context-determined partition over an interval, it is possible to maintain that both the aspectual and the adverbial operators contribute their meaning to an IMPF-marked sentence with overt Q-adverbs. Suppose that the meanings of adverbs like *always* or *sometimes* are something like those in (33-a-b). The restrictor of Q-adverbs might be implicit and is pragmatically recoverable from context, or from a focus-determined partition of the sentential material (Rooth 1985, 1992; Von Fintel 1995). I am assuming that adverbs quantify over sets of intervals and return sets of intervals within which the

quantificational relation (inclusion or intersection, as the case may be) holds.[18]

(33) a. ALWAYS $= \lambda P \lambda Q \lambda i.$ **every**$[\lambda i'. \text{AT}(P, i') \wedge i' \subseteq i, \lambda i''. \text{AT}(Q, i'')]$
b. SOMETIMES $= \lambda P \lambda Q \lambda i.$ **a**$[\lambda i'. \text{AT}(P, i') \wedge i' \subseteq i, \lambda i''. \text{AT}(Q, i'')]$

I propose that a sentence like (34-a) has the structure in (34-b), i.e. the output of the Q-adverbial operator is the argument to IMPF. The output of the adverbial operator is given in (34-c).

(34) a. Rām **kabhi-kabhi** gāḍiyã̃ **curā-tā** thā
rām.NOM sometimes car.NOM.PL steal-IMPF.M.SG PAST.3.SG
Rām sometimes stole cars (...but most often he stole bicycles).

b. [PAST [IMPF [SOMETIMES [Ram-steal-cars]]]]

c. $\lambda i.$ **a**$[\lambda i'. \text{AT}(C, i') \wedge i' \subseteq i, \lambda i''. \text{AT}(\text{John-steal-cars}, i'')]$

IMPF applies to the set returned by the adverbial operator and returns another predicate of intervals, viz. one which contains those intervals whose every inertial history contains a larger interval, and every cell of a partition on this larger interval coincides with an interval of the type in (34-c). The result of the function application is in (35). *tā*, as we have seen, realizes IMPF in Hindi.

(35) $[\![\text{-tā (kabhi-kabhi (john-steal-cars))}]\!] = \lambda P \lambda i. \forall h [h \in H_{i_{inr}} \rightarrow \exists j [i \subset_{nf} j \subset h \wedge \forall k [k \in \mathcal{R}^c_j \rightarrow \text{COIN}(P, k, h)]]](\lambda i.$ **a**$[\lambda i'. \text{AT}(C, i') \wedge i' \subseteq i, \lambda i''. \text{AT}(\text{John-steal-cars}, i'')])$

$= \lambda i. \forall h [h \in H_{i_{inr}} \rightarrow \exists j [i \subset_{nf} j \subset h \wedge \forall k [k \in \mathcal{R}^c_j \rightarrow \text{COIN}(\lambda i.$ **a**$[\lambda i'. \text{AT}(C, i') \wedge i' \subseteq i, \lambda i''. \text{AT}(\text{John-steal-cars}, i'')], k, h)]]]$

$= \lambda i. \forall h [h \in H_{i_{inr}} \rightarrow \exists j [i \subset_{nf} j \subset h \wedge \forall k [k \in \mathcal{R}^c_j \rightarrow$ **a**$[\lambda i'. \text{AT}(C, i') \wedge i' \subseteq k, \lambda i''. \text{AT}(\text{John-steal-cars}, i'')] \wedge k \subset h]]]$

What (35) says is that the IMPF-marked sentence in (34-a) with the adverb *kabhi-*

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[18]Eventive, stative, and temporal predicates differ with respect to how they are instantiated in time and this can be specified in terms of the AT relation between a predicate and an interval (adapted from Condoravdi 2002; Abusch 1998).

$$\text{AT}(P, i) = \begin{cases} \exists e \, [P(e) \wedge \tau(e) \subseteq i] & \text{if } P \subseteq \mathcal{E}^E \\ \exists e \, [P(e) \wedge \tau(e) \circ i] & \text{if } P \subseteq \mathcal{E}^S \\ P(i) & \text{if } P \subseteq \mathcal{I} \end{cases}$$

kabhi 'sometimes' is true of an interval i if i is contained in a larger inertial segment j, such that in every interval k in a contextually determined partition of j, *some* of the set of contextually relevant intervals (e.g. those in which John steals something) are also intervals of which the property 'John steals cars' holds. In other words, every partition cell is such that some stealing event with John as agent occurring in it is a car-stealing event. IMPF thus imposes a further regularity on the quantificational relation expressed by the adverb. It is not enough for the relation to hold at a given time; if the sentence is IMPF-marked, such a relation must hold in every disjoint part of the interval under consideration. Q-adverbs, unlike what Bonomi hypothesizes, do not neutralize the effect of IMPF. On the other hand, they return an interval exhibiting a quantificational relation that is in turn asserted to have regular distribution by the application of the IMPF operator.

The contrast between the interpretation of Q-adverbs in the scope of IMPF and PERF is accounted for once we have teased apart the semantic contribution of the adverb from that of IMPF. Consider the sentences in (36-a-b), repeated from (16), which are clearly semantically different, as argued by Menendez-Benito (2002) and Lenci & Bertinetto (2000).

(36) a. *Sempre* quando mi ved-eva,   il custode apr-iva   la
          Always, when   me see-IMPF.PST the janitor open-IMPF.PST the
          porta.
          door.
          The janitor always opened the door when he saw me.

      b. *Sempre* quando mi vide,   il custode aprí   la porta.
          Always, when   me see-PST the janitor open-PST the door.
          The janitor always opened the door when he saw me.

The intuition for Romance languages (and Hindi) is that (36-a) expresses a real generalization, while (36-b) expresses an accidental statement of a correlation between two events. Suppose that the perfective aspect denotes an extensional existential quantifier over times, as is standardly assumed.

(37)   PERF: $\lambda P \lambda j. \exists k[k \subseteq j \wedge \text{AT}(P, k)]$

Then the contrast between an IMPF-marked sentence with an overt Q-adverb and a PERF-marked sentence with an overt Q-adverb falls out straightforwardly. Assume that, just like with IMPF, the input to PERF is a predicate of intervals that is the output of applying an adverb meaning to the meaning of a (pair of) sen-

tence radicals. So the argument to PERF or IMPF is the *always*-abstract in (38-a), corresponding to the sentences in (36).

(38) a. $\lambda i.\, \mathbf{every}[\lambda i'.\ \text{AT}(\text{the-janitor-see-me}, i') \wedge i' \subseteq i,\ \lambda i''.\ \text{AT}(\text{the-janitor-open-the-door}, i'')]$

b. $[\![\text{PERF(38-a)}]\!] = \lambda P \lambda j.\, \exists k[k \subseteq j \wedge \text{AT}(P, k)](\lambda i.\, \mathbf{every}[\lambda i'.\ \text{AT}(\text{the-janitor-see-me}, i') \wedge i' \subseteq i,\ \lambda i''.\ \text{AT}(\text{the-janitor-open-the-door}, i'')])$

$= \lambda j.\, \exists k[k \subseteq j \wedge \text{AT}(\lambda i.\, \mathbf{every}[\lambda i'.\ \text{AT}(\text{the-janitor-see-me}, i') \wedge i' \subseteq i,\ \lambda i''.\ \text{AT}(\text{the-janitor-open-the-door}, i'')], k)]$

$= \lambda j.\, \exists k[k \subseteq j \wedge \text{AT}(\mathbf{every}[\lambda i'.\ \text{AT}(\text{the-janitor-see-me}, i') \wedge i' \subseteq k,\ \lambda i''.\ \text{AT}(\text{the-janitor-open-the-door}, i'')]]$

(38-b) says that a PERF-marked *always*-abstract is true of an interval j if j contains an interval k such that every interval in k at which 'the janitor see me' is true is also an interval at which 'the janitor open the door' is true.[19] The universal quantifier denoted by *sempre* 'always' is in the scope of the existential quantifier denoted by PERF and no claim is made about possible continuation of the correlation between the two events in time. In contrast, an IMPF-marked sentence containing an *always*-abstract involves universal quantification over and above that introduced by the adverb.

This difference in the logical form of IMPF-marked and PERF-marked sentences containing adverbs is the reason behind the intuition that the IMPF-marked sentence describe a 'real' generalization, one predicted to persist in time, and one which involves the regular instantiation of a quantificational relation across disjoint temporal indices. In languages marking an (im)perfectivity contrast like Italian or Hindi, the use of PERF-marking with Q-adverbs can only express an accidental relation holding between sets of events; characterizing sentences must carry IMPF-marking. What this section shows is that Q-adverbs themselves are purely quantificational and do not contribute to the characterizing nature of IMPF-marked sentences. Even in a language like English, which does not have IMPF-marking

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[19]This is clearly an over-simplification that leads to wrong results if taken strictly, since it is well-known that the events related by *when*-clauses are only loosely cotemporal. What really needs to be said is that an interval of the type described in the restriction is extendable into a larger containing interval in which the scope property holds. But in the interest of not complicating the representation further, I have not expressed this in the representation.

(ignoring the Progressive for present purposes), simple past tense sentences with overt Q-adverbs exhibit two distinct readings, which can be made salient by the choice of an appropriate modifier – a quantified temporal PP in (39-a) and a frame-adverbial denoting a short duration in (39-b).

(39)   a.   John always/often came back late from work on Thursdays.   *characterizing*

       b.   John always/often came back late from work last month.   *episodic*

3.3.7   Interaction with iterative adverbs

Iterative adverbs like *twice*, *several times* are, contra much literature, compatible with the imperfective (Lenci & Bertinetto 2000). Consider the Italian example in (40-a) and the Hindi example in (40-b). (40-a) implies that there were several movies that were watched twice within a given interval. (40-b) implies that within some interval, there were several periods such that Mary visited Bombay thrice in each of those periods.

(40)   a.   Un film   interressante, Gianni lo vedeva   **due volte**
           An interesting film,   Gianni it watch-IMPF two times
           An interesting film, Gianni watched it twice. (L&B 2000: ex.5b)

       b.   Meri   **tin bār** bambai jātī   thī
           mary.NOM three times Bombay go-IMPF.F.SG PST.F.SG
           Mary went to Bombay three times.

I will assume that iterative adverbs are eventuality modifiers, which apply to eventive predicates and return predicates over intervals within which the predicate is instantiated a specified number of times. I adopt from Condoravdi & Deo (2008), the notion of the temporal correlate $P[i]$ of a predicate of events P, defined in (41).

(41)   For any $P \subseteq \mathcal{E}$, $P[i] = \lambda i. \exists e[P(e) \wedge i = \tau(e)]$

The meaning that I assume for an iterative adverb like *tin bār* 'three times' is given in (42). (42-b) gives the result of applying the iterative adverb *tin bār* 'three times' to the predicate denoted by the sentence radical in the composition for (40-b).

31

(42)   a. $[\![\text{three times}]\!] = \lambda P \lambda j.\ |\wp(j) \cap P[i]| = 3$

      b. $[\![\text{three times(Mary-go-to-Bombay)}]\!] = \lambda P \lambda j\ [|\wp(j) \cap P[i]| = 3]$
$(\lambda e.\ \text{Mary-go-to-Bombay}(e))$

        $= \lambda j.\ |\wp(j) \cap \lambda i.\ \exists e[\text{Mary-go-to-Bombay}(e) \wedge \tau(e) = i]| = 3$

IMPF straightforwardly applies to (42-b) with the result that the iteration is understood to be regularly distributed across a larger interval.

(43) $[\![\ \text{-tā (tin bār (Mary-go-to-Bombay))}]\!]$
$= \lambda P \lambda i.\ \forall h[h \in H_{i_{inr}} \rightarrow \exists j[i \subset_{nf} j \subset h \wedge \forall k[k \in \mathcal{R}_j^c \rightarrow \text{COIN}(P, k, h)]]]$
$(\lambda j.\ |\wp(j) \cap \lambda i'.\ \exists e[\text{Mary-go-to-Bombay}(e) \wedge \tau(e) = i']| = 3)$

        $= \lambda i.\ \forall h[\in H_{i_{inr}} \rightarrow \exists j[i \subset_{nf} j \subset h \wedge \forall k[k \in \mathcal{R}_j^c \rightarrow |\wp(k) \cap$
$\lambda i'.\ \exists e[\text{Mary-go-to-Bombay}(e) \wedge \tau(e) = i']| = 3 \wedge k \subset h]]]$

(43) says that (40-b) is true of an interval i if i is contained in a larger inertia interval j, such that every partition cell k of j contains three (intervals that are the runtimes of) events of Mary going to Bombay. That matches the intuition about the meaning of IMPF-marked sentences with iterative adverbs. To make this reading clearer, consider (40-b) with a frame adverbial like *last year* in (44-a). The only reading available for (44-a) is one in which the period introduced by the frame adverb is divided into some intervals of a salient length (weeks, months, trimesters...) such that the visits to Bombay were instantiated thrice within each of those intervals, and such regular visits were expected to continue beyond last year. The contrast is with the PERF-marked sentence in (44-b) which induces no such salient division and where the salient reading involves three visits to Bombay within the year.

(44)   a.   **pichle sāl**, Meri   **tin bār** bambai jātī
           last   year, mary.NOM three times Bombay go-IMPF.F.SG
           thī
           PST.F.SG
           Last year, Mary went to Bombay three times (a week, a month...)

      b.   **pichle sāl**, Meri   **tin bār** bambai ga-ī
           last   year, mary.NOM three times Bombay go-PERF.F.SG

Last year, Mary went to Bombay three times

3.4 Summary and comparison

The goal of this section was to present a proposal to address the generalization problem, which is essentially a problem of relating morphological form systematically to meaning. What is the contribution of IMPF-marking in deriving the characterizing reading of IMPF-marked sentences? I showed that at least some versions of the IMPF-as-universal hypothesis fall short of delivering in three respects — a vague characterization of the restriction to the universal quantifier, in particular, reliance on an imprecise notion of contextual relevance; lack of an intensional element to capture the expected continuation of a generalization; and an unclear picture of the interaction with Q-adverbs.

In the proposal presented here, I argue that it is possible to preserve the association of universal force with IMPF, provided we develop an appropriate notion of its quantificational domain and characterize more precisely the contribution of context to restricting the domain. The central idea is that the universal quantifier quantifies over non-overlapping, equimeasured subsets of a superinterval of the reference interval – a *regular partition*. The context provides the measure for such a partition. This characterization of its quantificational domain allows us to maintain a universal character for IMPF, while accounting for many of the properties of IMPF-marked characterizing sentences – that they tolerate exceptions, that they are compatible with unrealized instances, that they express non-accidental generalizations, that they may have both habitual and dispositional readings, that IMPF marking may cooccur with Q-adverbs and iterative adverbs.

If this solution is on the right track, then at least some properties attributed to the peculiar character of GEN, may be accounted for *without invoking* GEN, specifically in cases where overt IMPF-marking is obligatorily present in characterizing sentences and where the generalizations expressed are generalizations over temporal indices.

In §4, I show how this proposal for the meaning of IMPF can also yield the event-in-progress reading if we make one small assumption about the nature of the contextually provided partition. However, before moving further, I discuss the proposal of Lenci & Bertinetto (2000), which shares some properties with the current proposal, but makes some different predictions.

3.4.1 Lenci & Bertinetto 2000

Lenci & Bertinetto (2000) (L&B) is an analysis of the interaction of aspectual operators with quantificational and iterative adverbs. They adopt Bonomi's (1995, 1997) idea that IMPF introduces a quasi-universal quantifier (*Gn*) and seek to demonstrate how the contribution of aspect and adverbs may be reconciled. In this respect, L&B's goals and approach overlap with those of this paper.

In L&B's analysis, *Gn*, introduced by the Imperfetto, is an unselective quantifier which binds every free variable in its restrictor and always binds an interval variable whose size is contextually restricted. The logical form of (45-a), given in (45-b) illustrates what L&B take to be the role of context. One has to assume that the *top*ic marked part of sentence is to be accommodated into the restrictor of *Gn*.

(45) a. [Gianni and-ava   al mare]^{top} con Maria
         Gianni go-IMPF.PST to the beach with Maria
         Gianni went to the beach with Maria. (L&B 2000, ex. 36, pp. 263)

     b. $Gn_{i,e}$ $[C(i) \wedge$ go$(e) \wedge$ theme(John, e) $\wedge$ to(beach, e) $\wedge$ $e \subseteq i]$
         $[C(i) \wedge$ go$(e) \wedge$ theme
         (John, $e) \wedge$ to(beach, e) $\wedge$ $e \subseteq i \wedge$ with(Mary, e)

(45-b) says that (45-a) is true iff every interval of a certain contextually fixed size and every event of John's going to the beach occurring in this interval are such that these events happened in the company of Mary.[20]

The parallel between L&B's account and the one proposed here is that the context does not directly provide a set of relevant events or intervals, but rather places a condition on the length of the intervals quantified over by the universal or *Gn*. It is not clear what purpose the contextual fixing of the size of the interval in the domain of *Gn* serves in determining the truth-conditions of IMPF-marked sentences without overt Q-adverbs. If every event of John going to the beach is an event of John going to the beach with Mary, then it follows that in every interval of a contextually fixed size, every event of John going to the beach in that interval is an event of John going to the beach with Mary. The restriction to intervals of a contextually specified size is superfluous in cases like (45-a) and does not really contribute to a truth-conditional claim involving the contextually determined size of the interval.[21]

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[20]There is a modal component to the truth-conditions involving quantification over normal worlds but I am factoring this out since what is of relevance here is the temporal aspect.

[21]L&B's analysis treats IMPF as *Gn* rather than the stronger universal, and exceptions are tol-

In contrast, with the regular-partition analysis, which also relies on a contextually determined interval-size, there is a clear truth-conditional difference between universal quantification over cells of a regular partition and over the events occurring within such intervals.

L&B's real reason for introducing the contextual size condition is to provide an appropriate restrictor for *Gn* in the presence of Q-adverbs and iterative adverbs. (46-a), for instance, has the logical form in (46-b), which says that the sentence is true iff every interval of a contextually fixed size is such that most events of John reading in it were events in which John read spy stories.

(46)   a.   Gianni leggeva   spesso romanzi di spionaggio
            John   read-IMPF.PST often   spy stories
            John often read spy stories.
       b.   *Gn* $[C(i)]$ [Most $[\lambda e \text{ read}(e) \wedge \text{agent(John, } e) \ \wedge \ e \subseteq i]$ $[\lambda e \ \exists x (\text{spy-stories}(x) \wedge \text{theme}(x, e)]]$

Assuming that the intervals quantified over by *Gn* are located within some larger interval (within which the reference interval lies), the regular-partition analysis and L&B's analysis make similar claims about the truth-conditions of IMPF-marked sentences with Q-adverbs. As discussed in §3.3.6, such sentences are true on the regular partition analysis iff the Q relation between sets of events holds at every partition cell.[22]

L&B's analysis of the interaction of imperfective aspect with iterative adverbs involves treating them as VP-level operators giving rise to plural events. They argue that IMPF-marked sentences with iterative adverbs are most acceptable on a repetitive event reading typically with semelfactives (47-a). The repeated event reading (in (47-b)) is unavailable in IMPF-marked sentences.

(47)   a.   Il mio postino suona   due   volte
            My postman   ring-PRES twice.
            My postman rings twice.

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erated on this account because of the peculiar character of this quantifier. On a stronger IMPF-as-universal analysis exemplified by Bonomi (1997), Cipria &Roberts (2000), or this paper, the truth conditions given by L&B's analysis for (45-a) would end up being much too strong, excluding models in which John goes to the beach alone or with other people.

[22]The two accounts still do differ in this respect, but in the absence of a clearer statement in L&B's analysis of what they mean by a contextually fixed size for an interval, it is difficult to compare the truth-conditional differences. Such an enterprise would also take us too far from the main purpose of the paper.

b. *Gianni and-ava   al mare   con Maria due   volte
     Gianni go-IMPF.PST to the beach with Maria twice
     Gianni used to go to the beach with Maria twice. (L&B 2000, ex. 2,
     pp. 276)

The analysis I proposed in §3.3.7 treats iterative adverbs as functions returning sets
of intervals rather than plural events and there is no expectation that (47-b) is un-
acceptable provided an appropriate partition-measure (twice in a week, a month,
a year) can be accommodated. The Hindi facts certainly support this expectation
and so do the Italian facts in other cases, e.g. (48).

(48)   Un film interressante, Gianni lo vedeva **due volte**
          An interesting film, Gianni it watch-IMPF two times
          An interesting film, Gianni watched it twice. (L&B 2000: ex.5b)

If the anomaly of (47-b) is due to the absence of an appropriate context when ut-
tered out of the blue, and there is no reason to assume that (47-b) is unacceptable
in all contexts, then we can compare the claims of the two analyses informally.
On L&B's analysis, (47-b) is true iff every interval of a contextually fixed size
contains two events of John going to the beach with Maria. The regular parti-
tion analysis disregards overlapping intervals and considers only disjoint intervals,
those that are cells of a regular partition. On this analysis, (47-b) is true iff every
partition cell contains two events of John going to the beach with Maria.

Suppose the facts are that John used to regularly go to the beach with Maria on
two Saturdays every month while Peter did the same on two other Saturdays. The
precise Saturdays were not fixed. In this situation, (47-b) will be judged true on
a partition-measure of approximately a month's length. L&B's truth-conditions,
however, would require that every month-long interval (not every disjoint month-
long interval) contain two such events, which would demand a clock-work ar-
rangement between John, Peter, and Maria. This is surely too strong.

The two approaches can also be distinguished based on how cardinal NPs
are interpreted in IMPF-marked sentences. Suppose that every gardener working
in a public garden has to set him/herself a weekly goal of the number of new
plants they plant. Rām had decided to plant four new plants every week and had
religiously been doing so for several years. It is possible to describe this pattern
with the Hindi IMPF-marked sentence in (49).

(49)   Rām   bagīche-mẽ cār paudh-e   **lagā-tā**   thā
        Rām.NOM garden-LOC four plant-NOM.PL plant-IMPF.M.SG PST.M.SG
        Rām planted four plants in the garden.

(49) is true iff there were four plantings by Rām in every interval in the regular partition, where the partition-measure is set to a week's length. It does not matter when in the week the plantings occur as long as they overlap with every such interval. L&B's truth-conditions for the imperfective would come out too strong in this case as well, since their account would require every week-long interval (overlapping and non-overlapping) to contain four plantings.

To conclude, L&B's introduction of a contextually determined condition on the size of the intervals quantified over by *Gn* appears to be similar to the regular partition analysis, but there is a clear difference in the effects that the two have on the truth-conditions of IMPF-marked sentences. Further, it is not clear what role this condition has to play in IMPF-marked sentences without overt Q-adverbs or iterative adverbs, or for that matter in PERF-marked sentences (see the analysis of these in L&B 2000). A thorough comparison of the two approaches would require both a clearer statement of the motivation of the condition on contextual size that L&B propose and an explication of how the size of the interval is contextually determined.

4   The event-in-progress reading and progressive marking

The broader goal of this paper is that of providing a feasible meaning for the imperfective aspect that can also account for its event-in-progress or progressive reading. The intuition for the event-in-progress reading is that the reference interval itself is understood as being a subinterval of a larger interval within which the predicate in the scope of the imperfective operator holds (hence the familiar Reichenbachian R ⊂ E value for the imperfective). This intuition can be expressed with the current meaning of IMPF. IMPF-marked sentences exhibit the event-in-progress reading when the partition-measure is chosen from the set of infinitesimals; i.e when the measure is set to an *infinitesimally small* length. $\mathcal{R}_i^{inf}$ (I will call this an *I-partition*) is the set of mutually exclusive and collectively exhaustive subsets of an interval i of infinitesimally small measure. If every such subset of i COINcides with a predicate P that IMPF applies to, then i itself coincides with P. Specifically, for a predicate of eventualities P, i is guaranteed to be a subinterval

of the time of an event e instantiating P. This idea of expressing the subinterval relation between the reference interval and a single event interval by allowing the partition-measure to be set at infinitesimal length is fully credited to Mokshay Madiman. The main attractive consequence of this move is that it allows us to uniformly retain partitions as the restriction set for the universal quantifier associated with IMPF.[23]

(50) il   custode apr-iva   la porta.
      the janitor open-IMPF.PST the door.
      The janitor was opening the door.

If it is assumed that the relevant measure for the partition over which IMPF universal quantification is of infinitesimal length, then (51) is the meaning of IMPF (minus tense) applied to the meaning of the sentence radical.

(51) ⟦Imperfetto (the-janitor-open-the-door)⟧
      $= \lambda P \lambda i. \forall h[h \in H_{i_{inr}} \to \exists j[i \subset_{nf} j \subset h \wedge \forall k[k \in \mathcal{R}_j^{inf} \to \text{COIN}(P, k, h)]]](\lambda e.$ the-janitor-open-the-door$(e))$

      $= \lambda i. \forall h[h \in H_{i_{inr}} \to \exists j[i \subset_{nf} j \subset h \wedge \forall k[k \in \mathcal{R}_j^{inf} \to \exists e[\text{the-janitor-}$ open-the-door$(e) \wedge \tau(e) \circ k \wedge \tau(e) \subset h]]]]$

According to (51), (50) is true at a (past) interval i iff i is a non-final subinterval of a larger interval j (in every inertial history), such that every subinterval that is in an I-partition of j overlaps with an event e of the janitor opening the door. That is, if the relation $i \subset_{nf} j \subseteq \tau(e)$ holds. For an accomplishment predicate of eventualities P_{acc}, assuming an I-partition, IMPF(P_{acc}) will yield the set of non-final subintervals of any interval that is in the temporal correlate of P_{acc} (where temporal correlate is defined in (41)). Crucially, for any i in IMPF(P_{acc}), it is not guaranteed to be in $P[i]$. For an activity predicate P_{act} (e.g. *walk*, *run*) or a semelfactive predicate P_{sem} (e.g. *knock*, *tap*), IMPF(P_{act}) or IMPF(P_{sem}) will correspond to the set of non-final intervals of any interval such that each of its subintervals (above a certain granularity) is in the temporal correlate. This generates the on-going process reading for activity predicates and the iterative reading for semelfactives.

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[23]I am grateful to Mokshay Madiman from the Yale Statistics Department for patiently discussing the problems associated with the imperfective with me and proposing that a partition-measure of infinitesimal length could generate the event-in-progress reading for the imperfective.

4.1 The typological variation problem

So far, I have shown that it is possible to assume a single meaning for IMPF and account for both its characterizing and event-in-progress readings by assuming varying measures for a context-determined regular partition. The flavors within each of these readings – habitual vs. dispositional for the characterizing reading, and non-culminated event vs. ongoing process vs. iterative emerge as natural consequences of further differences in the partition-measure or the lexical properties of the predicate in the scope of IMPF.

At the outset, I stated that one of the problems in determining the meaning of IMPF was to identify the systematic difference between a broader category that encompasses the event-in-progress and the characterizing readings (realized, for instance, by the Italian Imperfetto), and a narrower category (realized by the English progressive morphology) that saliently exhibits the event-in-progress reading. There is one obvious way in which the current analysis can naturally make sense of this typological variation. We could say that progressive marking realizes PROG, which is a specific version of IMPF, namely, an operator where the partition-measure is obligatorily chosen from a set of infinitesimal values. Anticipating the need for some modifications, I will call this operator PROG_1. Let us posit that PROG_1 differs from IMPF only in that the partition-measure for IMPF varies by context, while that for PROG_1 is obligatorily fixed to infinitesimal length. In other words, with PROG, the restriction of the universal quantifier is constrained to be an I-partition, guaranteeing only the event-in-progress reading for a sentence containing PROG_1 in its logical form. The two can be compared in (52).

(52) a. PROG_1: $\lambda P \lambda i. \forall h[h \in H_{i_{inr}} \to \exists j[i \subset_{nf} j \subset h \land \forall k[k \in \mathcal{R}_j^{inf} \to \text{COIN}(P, k, h)]]]$

   b. IMPF: $\lambda P \lambda i. \forall h[h \in H_{i_{inr}} \to \exists j[i \subset_{nf} j \subset h \land \forall k[k \in \mathcal{R}_j^c \to \text{COIN}(P, k, h)]]]$

If this is indeed an accurate characterization of the difference between the meanings of IMPF-marking and PROG-marking, then languages can vary within a four-way typology – whether they morphologically realize IMPF or PROG_1 or neither or both. The following table gives examples of languages which fall in each of these slots.

(53)

OPERATOR		
IMPF	PROG$_1$	Languages
$\emptyset$	$\emptyset$	German[24]
$\emptyset$	$\checkmark$	English
$\checkmark$	$\emptyset$	Russian, Arabic
$\checkmark$	$\checkmark$	Hindi, Italian

Within this typology, a language like English realizes PROG$_1$ and therefore the English Progressive is incompatible with characterizing readings. A language like Italian realizes IMPF, which subsumes the meaning of PROG$_1$, and therefore the Italian Imperfetto exhibits both characterizing and event-in-progress readings. We say that IMPF subsumes PROG$_1$ because one of the values that the contextual free variable for the partition-measure can receive is an infinitesimal one. Italian (as well as Hindi) contrast with a language like Arabic in that in these languages, PROG$_1$ is also realized morphologically via periphrastic devices. While this cross-linguistic picture of the relation between imperfective marking(s) and imperfective meaning(s) is initially appealing, there remain two outstanding problems for the proposed meaning of PROG$_1$ in a language like English. I turn to these in the next section. These problems point the way to a subtler understanding of the cross-linguistic manifestations of imperfectivity.

4.2 Problems for PROG$_1$

Suppose the English Progressive realizes the operator PROG$_1$, which has the meaning in (52-a). Then we are confronted with two problems regarding the uses of the English Progressive. *First*, how do we account for the deteriorated acceptability (in most contexts) of individual-level statives (e.g. *know*, *own*, *love*) with progressive marking as in (54)? *Second*, how do we account for the perfect acceptability of habitual readings for episodic predicates in the scope of the Progressive, as in (55)?

(54) a. ?John *is owning* three houses.
       b. ?Mary *was knowing* the answer.

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[24]It was noted by a reviewer that certain dialects of German, e.g. Rhenish, do realize the progressive morphologically. *Ich bin einen Aufsatz am lesen* (lit. I am a paper at-read). The claim about the absence of imperfective marking, should be therefore limited to the standard dialect or Hochdeutsch.

(55)   a.   John *is baking* baguettes (these days).

        b.   Mary *was jogging* five miles (last year).

Individual-level stative predicates have the subinterval property; i.e. they hold at every subinterval of any interval they hold at. Consequently, if a predicate like *Mary-know-the-answer* holds at an interval i and is expected to hold at a superinterval j of i, then it will automatically hold in every $k \in \mathcal{R}_j^{inf}$. If PROG$_1$ is the meaning of the English Progressive, there is no explanation for this incompatibility.

With the habitual reading, the problem is slightly different. A sentence like (55-a) crucially does not assert of an interval i (more specifically of a future-extending superinterval j of i) that every $k \in \mathcal{R}_j^{inf}$ COINcides with an event of John baking baguettes. That would require John to be at the oven or the kitchen counter twenty-four hours a day throughout the interval that *these days* introduces. That is certainly not the condition for the truth of (55-a). What we want is to be able to access partition-measures that are larger than infinitesimal length.

Both these problems are connected to one of the puzzles that I stated at the beginning – the *temporal contingence* problem. A solution to the *temporal contingence* puzzle, I will show, offers a simultaneous solution for the two problems delineated above. But for that, we need to make the move of altering one part of the meaning that we have assumed so far for IMPF and PROG$_1$.

4.2.1   A modification

For any predicate P, IMPF(P) denotes the set of non-final intervals of some containing interval j (for each inertial history h), such that P COINcides with every subinterval k in $\mathcal{R}_j^c$. An alternative formulation of IMPF is given in (56).

(56)   IMPF: $\lambda P \lambda i. \forall h[h \in H_{i_{inr}} \rightarrow \exists j[i \subseteq_{ini} j \wedge \forall k[k \in \mathcal{R}_j^c \rightarrow \text{COIN}(P, k, h)]]]$

In words, IMPF(P) denotes the set of *initial* subintervals of an interval j such that every cell of $\mathcal{R}_j^c$ COINcides with P. For any $i \in$ IMPF(P), it is either in the set (57-a) or (57-b.)

(57)   a. $\{i \mid \forall h[h \in H_{i_{inr}} \exists j[i \subset_{ini} j \wedge \forall k[k \in \mathcal{R}_j^c \rightarrow \text{COIN}(P, k, h)]]]\}$

        b. $\{i \mid \forall h[h \in H_{i_{inr}} \exists j[i = j \wedge \forall k[k \in \mathcal{R}_j^c \rightarrow \text{COIN}(P, k, h)]]]\}$

When i is assumed to be in the set corresponding to (57-b), the universal quantification is restricted to (partition-determined) subintervals of i, i.e. the reference interval. In such a case, IMPF$(P)(i)$ can express only a regularity that holds at i, not a regularity that is predicted to extend into the future. I propose that the difference between the Italian Imperfetto and the English Progressive is precisely characterizable by the sets distinguished in (57). More precisely, the Italian Imperfetto (factoring out tense for clearer comparison) returns the set that is the union of the sets specified in (57-a) and (57-b).

(58)   a. $⟦\text{Imperfetto}⟧ = \lambda P \lambda i.\, \forall h[h \in H_{i_{inr}} \to \exists j[i \subseteq_{ini} j \wedge \forall k[k \in \mathcal{R}_j^c \to$
$\text{COIN}(P, k, h)]]]$ (same as (58-a))

        b. $⟦\text{English Progressive}⟧ = \lambda P \lambda i.\, \forall h[h \in H_{i_{inr}} \to \forall k[k \in \mathcal{R}_i^c \to$
$\text{COIN}(P, k, h)]]$

The Italian Imperfetto realizes the semantically general IMPF, while the English progressive is a semantically narrower operator. The modified meaning for PROG, realized by the English Progressive is given in (59).

(59)   PROG: $\lambda P \lambda i.\, \forall h[h \in H_{i_{inr}} \to \forall k[k \in \mathcal{R}_i^c \to \text{COIN}(P, k, h)]]$

The next section provides arguments for why (59) should be taken to be the meaning for the English Progressive with respect to accounting for its incompatibility with individual-level stative predicates (as in (54)) and its exhibiting habitual readings (as in (55)).

4.3   Temporal contingence and PROG

Applied to a predicate P, PROG(P) denotes a set of intervals whose every partition cell i coincides with P. PROG contrasts with IMPF only in one respect: it does not introduce a superinterval over which a regularity holds. It requires the regularity to only hold at the reference interval. There is a distinction between a regularity (a universal quantificational relation) that holds at an interval and one that is expected to continue beyond such an interval. The former is what we call a temporally contingent regularity and the latter is a "real", non-accidental generalization. The English Progressive realizes PROG and the set of readings available to it reflect this meaning.

4.3.1 The event-in-progress reading

This is straightforwardly derivable by setting the partition-measure to be of infinitesimal length. If $\mathcal{R}_i^c$ is taken to be an I-partition, then every $i \in \mathrm{PROG}(P)$ COINcides with P, which requires it to be a subinterval of the runtime of a P event.[25] Consider the classic sentence in (60-a) and its logical form in (60-b).[26]

(60) a. John was drawing a circle.
      b. ⟦ -ed (be -ing (John-draw-a-circle))⟧
          = ⟦ -ed ⟧$(\lambda P \lambda i. \forall h[h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^c \rightarrow \mathrm{COIN}(P, k, h)]]$
          $(\lambda e. \text{John-draw-a-circle}(e)))$
          = ⟦ -ed ⟧ $\lambda i. [\forall h[h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^{inf} \rightarrow \exists e[\text{John-draw-a-}$
          $\text{circle}(e) \wedge \tau(e) \circ k \wedge \tau(e) \subset h]]]]$
          = $\exists i[i < now \wedge \forall h[h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^{inf} \rightarrow \exists e[\text{John-draw-a-}$
          $\text{circle}(e) \wedge \tau(e) \circ k \wedge \tau(e) \subset h]]]]$

4.3.2 The habitual reading

(55) is repeated in (61) for convenience.

(61) a. John *is baking* baguettes (these days).
      b. Mary *was jogging* five miles (last year).

The habitual reading obtains when the context provides a partition-measure of a higher magnitude, one significantly larger than the normal interval for an event of the type denoted by the predicate. (61-a) is true if there are regular baguette baking events distributed within whatever interval it is that is conveyed by *these days*. Perhaps John is a baker who has recently added baguettes to his repertoire and makes them every day; perhaps he is a reluctant cook who didn't use to bake at all and has only recently taken classes in French baking, the possibilities are

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[25]One of the consequences of this analysis is that, unlike standard analyses, it is not guaranteed that for an accomplishment predicate P, $\{i|\exists e[P(e) \wedge \tau(e) = i\} \cap \mathrm{IMPF}(P) = \emptyset$, when the restriction set is an I-partition. The temporal correlate of P is always going to be a subset of $\mathrm{PROG}(P)$, and, for that matter, $\mathrm{IMPF}(P)$. It is an open question whether such an outcome intrinsically undesirable or whether it reflects an organization of morphological categories where overlapping domains are adjudicated by the general-specific relation (blocking). The facts that make this a welcome consequence include the availability of the neutral reading for Russian and Italian IMPF-marked verbs, where IMPF-marking may be used to describe completed events.

[26]The affix *-ed* realizes PAST and the *be -ing* periphrasis realizes PROG. In (62), *-s* stands as the overt realization of PRESENT.

several. As long as every cell of a regular partition of the interval denoted by *these days* contains events of John baking baguettes, (61-a) is true.

(62) a. $[\![$ -s (be -ing (John-bake-baguettes))$]\!]$
$= [\![$ -s $]\!](\lambda P \lambda i.\ \forall h[h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^c \rightarrow \text{COIN}(P, k, h)]]$
$(\lambda e.\ \text{John-bake-baguettes}(e)))$

$= [\![$ -s $]\!](\lambda i.\ \forall h[h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^c \rightarrow \exists e[\text{John-bake-baguettes}(e) \wedge \tau(e) \circ k \wedge \tau(e) \subset h]]])$

$= \exists i[i \subseteq now \wedge \forall h[h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^c \rightarrow \exists e[\text{John-bake-baguettes}(e) \wedge \tau(e) \circ k \wedge \tau(e) \subset h]]]]$

Contrast (62-a-b) with their simple tense counterparts with the characterizing reading.

(63) a. John *bakes* baguettes (these days).
      b. Mary *jogged* five miles (last year).

Let us hypothesize that the logical form of the sentences in (63) contains the IMPF operator intervening between the sentence radical meaning and tense. The difference between (62) and (63) is that the regularities described in (62) are understood to be contingent and not continue indefinitely into the future while the sentences in (63) remain neutral about such continuation. If the English Progressive is taken to realize PROG we have a natural account of this distinction. The inference of temporal contingence licensed by a PROG-marked sentence on the habitual reading is more of an implicature than an entailment, since asserting that a regularity holds at a certain interval does not preclude it from holding at superintervals of such an interval. The choice of the Progressive in contrast with the more neutral simple tenses, however, indicates that the speaker is not in a position to extend his/her claims to superintervals extending to the future.

4.3.3 Infelicity with individual-level statives

The compatibility of stative verbs with English Progressive marking has been the subject of much discussion in the literature on the progressive (Taylor, 1977; Vlach, 1981; Dowty, 1979; Bach, 1981; De Swart, 1998). While stage-level statives (e.g. *lie*, *rest*) are often compatible with progressive marking (64-a-b), individual-level stative predicates are infelicitous (64-c-d).

(64)   a.   The socks *are lying* under the bed.
       b.   One corner of the piano *is resting* on the bottom step.
       c.   ?John *is owning* three houses.
       d.   ?Mary *was knowing* the answer.

Further, stage-level predicates are subject to a semantic restriction and in some contexts may not combine with the Progressive.

(65)   a.   ?New Orleans *is lying* at the mouth of the Mississippi River. (Dowty 1979: 174)
       b.   ?That argument *is resting* on an invalid assumption. (Dowty 1979: 174)

Dowty's characterization of the semantic restriction is as follows:

> Consideration of many such examples leads to the conclusion that the progressive is acceptable with these [stative] verbs just to the degree that the subject denotes a moveable object, or to be more exact, an object that has recently moved, might be expected to move in the near future, or might possibly have moved in a slightly different situation. (Dowty 1979: 175)

In other words, the Progressive is acceptable with a stative predicate only when the situation denoted by the predicate is a contingent one, subject to change. More or less permanent situations, expressed by individual-level statives or by stage-level statives with immoveable subjects (like (65)) cannot be appropriately described using the Progressive. Dowty invokes Carlson's operator G (GEN) and proposes that sentences like *New Orleans lies at the mouth of the Mississippi River* involve the generic operator applied to a stage-level predicate. The simple present sentence, which contains GEN, is the appropriate means to express the permanent nature of the fact, while the sentence in the Progressive (65-a) is understood to express a weaker, temporally restricted claim.

If PROG is the correct meaning for the English Progressive, then the pattern of (in)compatibility with stative predicates falls out naturally. A PROG-marked sentence may express a generalization or a regularity (as it does on the habitual reading as well), but the regularity is asserted to obtain at the reference interval (and therefore by implicature, not beyond this interval).

(66) $[\![$ -s (be -ing (NO-lie-at-the-mouth-of-MR))$]\!]$
       $= [\![$ -s$]\!](\lambda P \lambda i \, \forall h[h \in H_{i_{inr}} \to \forall k[k \in \mathcal{R}_i^{inf} \to \text{COIN}(P, k, h)]](\lambda e. \text{ NO-}$

lie-on-the-bank-of-MR$(e)))$
$= \exists i[i \subseteq now \ \wedge \forall h[h \in H_{i_{inr}} \to \forall k[k \in \mathcal{R}_i^{inf} \to \exists e[\text{NO-lie-at-the-mouth-of-MR}(e) \wedge \tau(e) \circ k \wedge \tau(e) \subset h]]]]$

If we set the partition-measure to be of infinitesimal length, then (65-a) is true if every interval in $\mathcal{R}_i^{inf}$ COINcides with a state of New Orleans lying at the mouth of the Mississippi. Suppose that the Present Tense counterpart of this sentence contains IMPF in its logical form (67-b).

(67)   a.   New Orleans lies at the mouth of the Mississippi River.

         b. $\exists i[i \subseteq now \ \wedge \forall h[h \in H_{i_{inr}} \to \exists j[i \subseteq_{ini} j \subset h \wedge \forall k[k \in \mathcal{R}_j^{inf} \to \exists e[\text{NO-lie-at-the-mouth-of-MR}(e) \wedge \tau(e) \circ k \wedge \tau(e) \subset h]]]]]$

The Present Tense sentence is neutral with respect to whether the situation it describes is asserted to hold at i or a superinterval of i. The PROG-marked sentence asserts the situation to hold at i, and offers a more specific view on the temporal duration of the situation. Further, it conversationally implicates that the situation does not hold at a superinterval of i, by the maxim of Quantity. Unfortunately, this interpretation doesn't cohere with our world knowledge about the location of cities with respect to natural landmarks. We expect such relations to be more permanent, and continue indefinitely into the future.

If PROG is taken to be the meaning of the English Progressive, then, with some additional pragmatic assumptions, we have an account for why the Progressive licenses the implicature of temporal contingence for the stative predicates in its scope.

Here is how the argument works. The Progressive, with universal quantification restricted to a partition of the reference interval, contrasts with the simple tenses, which are neutral with respect to the interval over which the regularity is asserted to hold. Every stative situation which can be described using the Progressive can also be described using the simple tenses, giving us two expressive devices in the language. Dowty (1980) posits a Gricean Blocking principle that can determine the distribution of two expressive devices with overlapping contexts of possible use.[27]

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[27]Cipria & Roberts 2000 propose a simliar blocking relation between the Spanish Pretérito and Imperfecto, where certain readings are pragmatically blocked for the more general Pretérito.

(68)   A neo-Gricean conversational principle: If a language has two (equally simple) types of syntactic structures A and B, such that A is ambiguous between meanings X and Y while B has only meaning X, speakers of the language should reserve structure A for communicating meaning Y (since B would have been available for communicating X unambiguously and would have been chosen if X is what was intended (Dowty 1980: pp 32).[28]

This pragmatic principle has a well-known counterpart in morphophonological analysis – the Blocking Principle. The key idea (originally due to the Sanskrit grammarian Pāṇini) is that given a context to which two rules may apply, the rule with a narrower domain of application takes precedence over the rule with a broader domain of application. (68) expresses a pragmatic blocking principle. Applied to the case of the Progressive and the simple tenses, this principle predicts that the simple tenses (structure A) be used in precisely those contexts in which the Progressive (structure B) is unavailable.

The Present Tense sentence *New Orleans lies at the mouth of the Mississippi river* is neutral with respect to whether the situation it describes holds at the reference time or at some larger superinterval of the reference time. The Progressive sentence *New Orleans is lying at the mouth of the Mississippi river* asserts that the situation holds at reference time. One effect of (68) is that the use of the Present Tense sentence gives rise to the quantity implicature that the situation holds at a larger superinterval of the reference time (the situation may persist indefinitely in time). Another effect of (68) is that the use of the Progressive (the narrower meaning) to describe situations known through world-knowledge to be relatively permanent pragmatically indicates that the situation will not persist at a superinterval of the reference time. In other words, the situation is temporally contingent and subject to change.

4.3.4   The futurate reading of the English Progressive

(69)   a.   Mary is driving to New York tomorrow.
        b.   John is attending a concert next week.

It is not transparent how assuming that the English Progressive realizes PROG accounts for the futurate reading illustrated in (69) because the truth of these sentences does not require *any* subinterval of the reference interval to overlap with an

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[28]This reference is due to discussion with Larry Horn (p.c.).

event of the type denoted by the sentence radical.

I follow Abusch (1998) and Condoravdi (2002) in assuming an intersective semantics for frame adverbials. Frame adverbials map properties of eventualities or times to properties of times, and may combine with sentence radicals before any other aspectual operator. The meaning of a frame adverbial like *tomorrow* is given in (70).

(70)   TOM: $\lambda P \lambda i. \, [\text{AT}(P, i \cap tomorrow)]$

Notice that the predicate returned by the application of the frame adverbial is not divisive i.e. it does not have the subinterval property. Feeding it directly as argument to PROG gives us a completely wrong result as is illustrated in (71), which corresponds to (69-a). According to (71-c), *Mary is driving to New York tomorrow* (factoring out tense) is true of an interval i iff every inertial history through i is such that every $k \in \mathcal{R}_i^c$ is such that it's intersection with *tomorrow* contains an event of Mary driving to New York. This is not the intended meaning.

(71)   a. $[\![\text{Mary-drive-to-NY}]\!] = \lambda e \, \text{Mary-drive-to-NY}(e)$

        b. $[\![\text{TOM (Mary-drive-to-NY)}]\!] = \lambda i \, \exists e[\text{Mary-drive-to-NY}(e) \wedge \tau(e) \subseteq i \cap tomorrow]$

        c. $[\![\text{PROG (TOM (Mary-drive-to-NY))}]\!] = \lambda i \, [\forall h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^c \rightarrow \text{COIN} \, (\lambda j \, \exists e[\text{Mary-drive-to-NY}(e) \wedge \tau(e) \subseteq j \cap tomorrow], k, h)]]$

              $= \lambda i \, \forall h[h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^{inf} \rightarrow \exists e[\text{Mary-drive-to-NY}(e) \wedge \tau(e) \subseteq k \cap tomorrow \wedge \tau(e) \subset h]]]$

What (69-a) actually conveys is that every cell of a partition on the reference interval overlaps with some interval whose intersection with tomorrow contains an event of Mary driving to New York, i.e. (72).

(72) $\exists i[i \circ now \wedge \forall h[h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^{inf} \rightarrow \exists j \exists e[\text{Mary-drive-to-NY}(e) \wedge \tau(e) \subseteq j \cap tomorrow \wedge k \circ j \wedge j \subset h]]]]$

So the only way to get the futurate reading on this analysis is by treating temporal predicates resulting from the application of a frame adverbial meaning to an eventuality predicate, exactly like eventuality predicates. In these cases, the straightforward definition of COIN does not work. Rather, COIN must be analyzed as introducing an interval at which the temporal predicate holds, and assert an

overlap between the time argument and the predicate instantiation interval. Unfortunately, as also noted by a reviewer, there does not seem to be a clear compositional way of obtaining the futurate reading from the syntax given the way COIN is defined currently.

4.3.5 Summary

The most salient reading for PROG-marked sentences in a language like English is the event-in-progress reading, which is a subset of the readings available to IMPF-marking in languages like Italian and Hindi. Accounting just for this sole reading requires us to make only minor changes to the meaning of IMPF, viz. to constrain the partition to sets of infinitesimal dimension. However, taking this to be the meaning of the English Progressive turns out to be problematic because in addition to the event-in-progress reading, the Progressive is also compatible with a habitual reading. Further, the Progressive often shows deteriorated acceptability with individual-level statives. The modified meaning for the English Progressive in 4.2.1 involves a restriction of the quantification to a partition on the reference interval, rather than a superinterval thereof. This changed meaning allows us to account for the event-in-progress and the habitual readings of the Progressive with episodic predicates, as well as the frequent (in)compatibility of the Progressive with stative predicates, and the inference of temporal contingence that it licenses. Further, it may also accommodate the futurate reading of the English Progressive, if temporal predicates returned by frame adverbial operators are treated as identical to eventuality predicates with respect to the COINcidence relation.

5 The typological problem revisited

Imperfectivity comes in two different, but closely related, manifestations. Language specific markers of imperfectivity (and here I include both imperfective and progressive forms) share a semantic core which accounts for the shared set of readings that they exhibit. The difference between these forms is constrained and has to do with the properties of the operator that they realize – whether it is IMPF or PROG. One crucial aspect of the analysis proposed thus far is that IMPF and PROG are minimally different from each other, and IMPF is transparently a semantically broader operator than PROG.

(73)   PROG: $\lambda P \lambda i. \forall h[h \in H_{i_{inr}} \rightarrow \forall k[k \in \mathcal{R}_i^c \rightarrow \text{COIN}(P, k, h)]]$ English Progressive

(74) IMPF: $\lambda P \lambda i. \forall h[h \in H_{i_{inr}} \to \exists j[i \subseteq_{ini} j \wedge \forall k[k \in \mathcal{R}_j^c \to \text{COIN}(P, k, h)]]]$
Imperfetto

Given an argument P, a contextually determined measure c, and any i in PROG(P), it holds that there is an interval j, a superinterval of i, such that every $k \in \mathcal{R}_j^c$ COINcides with P. That is, (75) holds.

(75) $\lambda i. \forall h[h \in H_{i_{inr}} \to \forall k[k \in \mathcal{R}_i^c \to \text{COIN}(P, k, h)]] \subseteq \lambda i. \forall h[h \in H_{i_{inr}} \to \exists j[i \subseteq_{ini} j \wedge \forall k[k \in \mathcal{R}_j^c \to \text{COIN}(P, k, h)]]]$

The relative semantic breadth of IMPF and PROG (or the markers that realize such operators) is transparently characterizable here in terms of the subset relation that holds between the sets of intervals returned by the two.

(76)
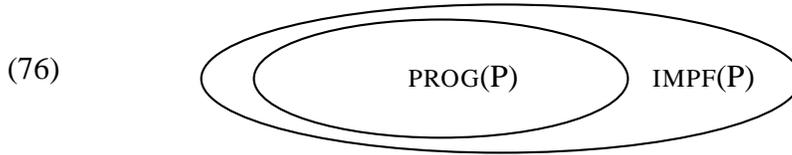
Independently, each operator is motivated by the distribution and interpretation of its morphological exponent in a language like Italian or English. But the typological advantages of this way of organizing the semantic domain of imperfectivity extend beyond the identification of the particular operator that may be realized by a language-specific form. The first has to do with the distribution of forms realizing IMPF and PROG in languages which realize more than one of them. The second has to do with cross-linguistically robust unidirectional diachronic shifts in which these categories participate.

It is beyond the scope of this paper to address these typological and descriptive facts in the depth that they deserve. But I refer the interested reader to the excellent typological database-based grammaticalization research by Bybee et al (1994) and Dahl (1985) that articulates the key typological and diachronic generalizations about markers of imperfectivity (Also see Deo (2006) for a brief overview). Here I limit myself to briefly sketching out how the analysis proposed above can shed light on these facts.

5.1 Imperfective markers and (non)-blocking

Consider a language which realizes both IMPF and PROG. Examples of such a language are Italian, Hindi, Marathi, or Turkish.[29]

From the intuitive picture in (79), one can hypothesize that the presence of a narrower operator such as PROG blocks the use of the semantically broader IMPF in the narrower contexts, resulting in a tendency for IMPF to be associated with contexts in which the narrower operator cannot occur. Such a blocking relation does hold between the progressive and imperfective forms in, for instance, Hindi.[30] In Hindi, the form realizing IMPF (Verb-*tā*) is incompatible with the event-in-progress reading. Hindi also realizes PROG (Verb + *rah*), which is asso-

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[29]It is not clear that the periphrastic progressive forms of Romance express the same meaning as the English (or Hindi/Marathi) Progressive. There seem to be at least two distinctions between the two in terms of available readings. The Romance Progressive forms are not as easily acceptable with stage-level stative predicates, neither do they allow for a habitual reading. (77-a-d) illustrates these distinctions with the Italian Periphrastic Progressive (data from p.c with A.M. Jaker, D. Bentley, and A. Bonomi).

(77) a.   The socks *were lying* on the floor.
      b.   ?I calzini si *stavano trovando* per terra.
      c.   John *was driving* to the university for several months until he rented an apartment closer.
      d.   ?John *stava guidando* all' universitá per diversi mesi finché trovó un appartamento píú vicino.

Intuitively, what characterizes the Italian Progressive is that it must make reference to a process ongoing at reference time. If this is correct, then we must distinguish yet another kind of imperfective, whose argument is constrained to be an eventive predicate, with an associated process. Let us call such a hypothetical function PROG_{proc}. PROG_{proc} applies to a predicate of eventualities (denoted by sentence radicals) and returns the set of intervals at which the process associated with the eventuality is instantiated (78). Process instantiation (PROC-INST) is defined in (79).

(78) $\text{PROG}_{proc} = \lambda P \lambda i. \forall h[h \in H_{i_{inr}} \rightarrow \text{PROC-INST}(P, i, h)]$ defined only if $P \subset \mathcal{E}^E$

(79) $\text{PROC-INST}(P, i, h) = \exists e \exists e'[P(e) \wedge process(e, e') \wedge i \subseteq \tau(e') \wedge \tau(e) \subset h]$

If the Romance Periphrastic Progressive forms realize PROG_{proc}, which is defined only for non-stative subsets of $\mathcal{E}^E$, the restriction to eventive predicates and ongoing processes follows. Sentences with morphological marking associated with PROG_{proc} will not be expected to exhibit habitual progressive and contingent state readings; further they are not expected to have the futurate progressive reading either. Native speaker intuitions (Andrea Bonomi and Fabio Del Prete (p.c)) suggest that in fact the periphrastic forms are only marginally acceptable in these contexts. I leave this possibility of a distinction within the progressive as an open research question.

[30]Marathi and Bengali are other Indo-Aryan languages that exhibit this pattern.

ciated with the event-in-progress reading as well as the contingent characterizing reading available to the English Progressive. Let us call this pattern the **blocking** pattern. On the other hand, in Italian (also French), the Imperfetto and the Imparfait exhibit the event-in-progress reading despite the presence of the periphrastic progressive forms. This pattern is one of **free alternation** where the more general imperfective form freely alternates with the narrower progressive form in describing events in progress.[31]

Whether the use of a general form in specific contexts is blocked by the presence of a specific form then appears to be a language-specific matter. Koontz-Garboden (2004; Spanish) and Kiparsky (2005; Vedic Sanskrit) examine the free alternation of semantically broader tense-aspect forms with semantically narrower forms in the expression of narrower meanings, in terms of an optimizing competition between two opposing constraints corresponding to semantic expressiveness and structural economy.[32] Cross-linguistically, progressive forms tend to be periphrastic (Bybee et al. 1994; Dahl 1985) and are therefore structurally more complex than imperfective forms, which are more likely to be synthetic. In a language where the IMPF–PROG contrast correlates with the synthetic–periphrastic morphological contrast, the distribution of the two forms is likely to be determined by the interaction of structural economy with semantic expressiveness. If the constraint favoring semantic specificity (EXPRESSIVENESS) is ranked above the constraint penalizing extra structure (ECONOMY), as in (80-a), the result is a strict blocking relation between the forms realizing IMPF and PROG that characterizes a language like Hindi or Marathi. In these languages, the forms realizing IMPF are not com-

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[31] Marchese (1979: 108) reports a similar pattern of free variation for Godié, a language of the Kru family.

[32] Koontz-Garboden observes that bilingual Spanish speakers who are influenced by their contact with English, tend to use the Spanish Progressive (a periphrastic construction) more frequently than monolingual speakers in the expression of the event-in-progress meaning. The other competing form for the same meaning is the Spanish Present, a synthetic form. Koontz-Garboden proposes two opposing constraints to account for this variation in the expression of progressive meaning. The first is a faithfulness constraint (MAX-λ) which favors the use of the form that is semantically more specified with respect to the input specification. The second is a markedness constraint (labeled *X^0) that penalizes overt syntactic structure. The faithfulness constraint prefers candidates that are maximally expressive with respect to the input (EXPRESSIVENESS). The markedness constraint prefers syntactically and morphologically less complex forms (ECONOMY). The Spanish Progressive is a more expressive but less economical form. The Spanish Present is a less expressive but more economical form. Koontz-Garboden argues that the monolingual/bilingual variation arises as a result of variation in the probabilistic distribution of these two constraints and predicts that such variation can only arise in languages with both a synthetic and analytic means for expressing the progressive aspect.

patible with an event-in-progress reading. On the other hand, in a language like Italian, it can be said that EXPRESSIVENESS and ECONOMY are freely ranked with respect to each other, which generates the pattern of free alternation between IMPF and PROG in the expression of the event-in-progress meaning.

(80)   a.   EXPRESSIVENESS $\gg$ ECONOMY   (Hindi)
         b.   EXPRESSIVENESS, ECONOMY   (Italian, Spanish)

The factorial typology in this domain is complete with the ranking of ECONOMY above EXPRESSIVENESS. Such a language is one in which a structurally complex form that expresses the specific event-in-progress meaning is not expected to surface. An example of such a language is Russian or Arabic, where a single form realizing IMPF exhibits the range of imperfective readings.

    To summarize, the nested relation of overlap between IMPF and PROG depicted in (76) allows for a transparent account of the variation in the distribution of the forms realizing these operators in languages where more than one operator finds morphological expression.

5.2   Aspect shift from progressive to imperfective

Large-scale grammaticalization and typological studies have produced a number of robust generalizations about unidirectional shifts in the meaning of tense-aspect markers. One well-known trajectory involves the progressive and imperfective aspects.

(81)   PROGRESSIVE $\gg$ IMPERFECTIVE

Marking associated with the progressive aspect tends to cross-linguistically generalize across time to exhibit the characterizing readings associated with the broader imperfective aspect. This diachronic generalization has been attested for progressive markers in several languages such as Turkish, Scots Gaelic, Tigre, Yoruba (Comrie 1976; Bybee et al 1994; Dahl 1985) and Maa (Heine 1990 (cited in Bybee et al)). A detailed discussion of the diachronic facts is beyond the scope of this paper; all that needs to be pointed out here is that (76) and the underlying set-theoretic relation of inclusion between the sets returned by IMPF, and PROG that it represents, facilitates a straightforward account of the diachronic shift in terms of entailment relations. As stated earlier, PROG$(P)(i)$ entails IMPF$(P)(i)$. A diachronic change which involves the generalization of the progressive to the imperfective, can be understood as involving the conventionalization of entailments

(semantic broadening) across time. (76) can then be taken to represent a semantic map that describes the organization of the imperfective domain, constituted by two gradient but discrete categories in a subsumptive relation. Synchronically, a language may realize one or the other, or more than one. Diachronically, a particular form may undergo semantic generalization, shifting from the narrower category to the more general one. Condoravdi & Deo (2008) offer a detailed semantic formalization of the diachronic perfect-to-perfective shift (also well attested cross-linguistically) in terms of the conventionalization of entailments. Such an account can very likely be extended to the progressive-to-imperfective shift. By precisely characterizing the minimal difference distinguishing IMPF and PROG, the analysis proposed in this paper sets the foundation for such an entailment-based account of the diachronic shift.

6   Conclusion

At the outset of this paper, I described four puzzles that must be resolved by an adequate theory of the progressive and the imperfective aspects.

(82)   a.   The *generalization* puzzle
       b.   The *intensionality* puzzle
       c.   The *typological* puzzle
       d.   The *temporal contingence* puzzle

The goal of this paper has been to provide a unified theory of the meaning of the imperfective and the progressive keeping in mind each of these four puzzles. I demonstrated that it is possible to maintain universal force for IMPF, as long as we provide a explicit proposal for the restriction of the universal quantifier. This restriction should be taken to be a regular partition over a superinterval of the reference interval. The partition-measure is taken to be a free variable determined by the context. Variability in the partition-measure accounts for the range of readings available to imperfective forms – in particular, the event-in-progress reading and the the habitual and dispositional characterizing readings.

On the generalization front, allowing a context-determined partition to constitute the restriction set for the universal quantifier makes significant headway into the problem of of why IMPF-marked characterizing sentences without overt Q-adverbs are tolerant of exceptions and why they may be judged true despite unrealized instances. This approach also provides a natural account of the interaction of IMPF-marking with Q-adverbs and frequency adverbs.

The key difference between IMPF and PROG is argued to lie in the interval that supplies the set for the context-determined partition. With PROG, the partition is over the reference interval itself; with IMPF, it is over a superinterval of the reference interval. This slight distinction accounts for the range of readings exhibited by the English Progressive and its infelicity with individual-level stative predicates.

Finally, §5 discusses how this nested organization of IMPF and PROG not only provides adequate accounts of the readings available to some language-specific forms, but also allows for a typology within which the distribution of such forms can vary. A language may realize one or both of IMPF and PROG, and the relation between the realized forms may be one of blocking or free alternation. Further, this particular organization shows a natural way in which we can make sense of diachronic aspect shifts in which forms that realize PROG diachronically generalize to become exponents of IMPF. The subset relation that characterizes predicates returned by PROG and those returned by IMPF allows for this change to be captured in terms of generalization of an entailment.

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