

Part I

Cross-Linguistic Studies of Quantification

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Strategies of Quantification in St’át’imcets and the Rest of the World

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1. Introduction

One of the well-known important contributions of Generalized Quantifier theory (Montague 1974; Barwise and Cooper 1981) is that it enables a compositional derivation of the meanings of quantified noun phrases. A semantic ‘determiner’ (instantiated in English, for example, by *every* or *most*) denotes a relation between sets (equivalently, a function of type $\langle\langle e,t\rangle,\langle e,t\rangle,t\rangle$). It combines with a common noun phrase to create a Generalized Quantifier (such as *most girls*), which denotes a set of sets (a function of type $\langle\langle e,t\rangle,t\rangle$). My goal in this chapter is to address a topic which Barwise and Cooper themselves did not discuss, namely the internal compositionality of the semantic determiner. As observed by Szabolcsi (2010: 61, 78–9), Barwise and Cooper define the ‘determiner’ subtractively: everything within the noun phrase, minus the noun. This entails that strings such as *more than half* or *at least three* are semantic determiners, even though they do not correspond to syntactic D heads, and even though there may be important compositionality issues within these semantic determiners (cf. Krifka 1999; Hackl 2000, 2009, among others).

In this chapter I will argue that even setting aside complex quantifications like *more than half*, the function of the semantic determiner, namely to create a GQ from

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a common noun, is not a unitary or primitive process. Rather, GQ-creation standardly involves at least two separate functions: quantification, and domain restriction (cf. von Stechow 1994, among many others). This leads to a cross-linguistic prediction, namely that we will find languages in which domain restriction is overtly expressed within the noun phrase via a separate lexical item (cf. Matthewson 2001; Giannakidou 2004; Etxeberria 2005). Furthermore, there are languages where the elements which effect domain restriction and quantification do not even form a syntactic constituent. Instead, domain restriction occurs first, producing an argumental but non-quantificational noun phrase; the quantifier then applies to a sister of type *e*, rather than of type $\langle e, t \rangle$ (Matthewson 2001). I will thus argue that the notion of the ‘semantic determiner’ in Barwise and Cooper’s sense may need to be retired, as it has outlived its cross-linguistic usefulness. I argue that we need to investigate the GQ-internal syntax–semantics mapping in a large number of different languages, in order to determine what the range of possibilities is in this domain and where the interesting generalizations lie.

The chapter is divided into two main parts. The first deals with St’át’imcets (Lillooet Salish), and the second presents a survey of data from a range of languages. The St’át’imcets section of the chapter compares the analysis argued for in Matthewson (2001) with the alternative analyses advanced by Giannakidou (2004), Etxeberria (2005, 2008, 2009), and Etxeberria and Giannakidou (2010). All the opposing analyses of St’át’imcets share important similarities, most notably the claim that St’át’imcets quantified phrases contain elements which overtly express domain restriction. The analyses differ, however, in whether they claim that St’át’imcets possesses lexical items which instantiate Barwise and Cooper’s semantic determiner. I argue that it does not.

In the second half of the chapter I take a step towards finding out what the options are in natural language more generally, in terms of the compositional creation of GQs. I present a small typological survey of a number of languages, as well as reporting on some recent theoretical work on quantifiers in non-Indo-European languages. I argue that there is evidence neither for the universal presence, nor for the universal absence, of the semantic determiner. Instead, quantifiers have a certain amount of freedom in terms of their semantic types, and the syntactic constructions they appear in. Lexical quantifiers also differ from each other in their combinatorial properties, even within a single language. This suggests that it would be misguided to maintain the idea that we will find a lexical item or constituent instantiating the semantic determiner in every language.

In the remainder of this introduction we take a very brief look at English, and then turn to St’át’imcets in section 2.

1.1. Semantic Determiners in English

English possesses several strong quantifiers which seem to straightforwardly instantiate Barwise and Cooper's semantic determiners. Lexical quantifiers such as *every*, *each*, *most*, or *both* combine with an NP predicate to create a GQ. A typical lexical entry conforming to this idea is given in (1).

$$(1) \llbracket \textit{every} \rrbracket = \lambda f \in D_{\langle e,t \rangle} \cdot \lambda g \in D_{\langle e,t \rangle} \cdot \forall x \in D_e [f(x) = 1 \rightarrow g(x) = 1]$$

In line with Barwise and Cooper's prediction for semantic determiners, elements like *every* simultaneously quantify and convert a predicative element into something of argumental (GQ) type. There is a tidy correspondence between the syntax and the semantics, since the second function of the semantic determiner, creation of an argumental type, is syntactically associated with the category D in English (Higginbotham 1985; Stowell 1989; Longobardi 1994, among others). In English, argument DPs are headed by an overt determiner or demonstrative (with the principled exceptions of bare plurals, mass nouns, and proper names), and quantifiers in non-partitive phrases usually replace the determiner or demonstrative.

Even within English, there are instances where the semantic determiner does not correspond to a single lexical item, and hence cannot be a syntactic D head. Examples of complex semantic determiners are given in (2), taken from Keenan and Stavi (1986: 254–5); see also Keenan and Moss (1985); van Benthem (1983); Rothstein (1988); Partee (1995); Keenan (1996), among others.

- (2) *almost every, John's five, every... but John, a prime number of, all the, at most six, between six and ten, about a hundred, practically no, nearly twenty, not more than ten, more male than female, no... but John, all but six, some but not all, every third, no student's.*

As noted above, the Barwise and Cooper line would be that these complex semantic determiners take a predicate and produce a GQ. In practice, however, the notion of the semantic determiner has often been interpreted even more strictly, to require that the lexical quantifiers themselves (*most*, *many*, *every*) are always of type $\langle \langle e,t \rangle, \langle \langle e,t \rangle, t \rangle \rangle$. Take, for example, Ladusaw's (1982) analysis of partitive constructions (cf. also Hoeksema 1984; Barker 1998). Ladusaw's analysis is explicitly built on the assumption that the lexical quantifiers themselves always have the type of a semantic determiner, whether they attach to an NP or to an *of the*-phrase. Ladusaw achieves this by arguing that partitive *of* converts the group-level individual denoted by the DP into a set. Thus, in both non-partitive *most cakes* and partitive *most of the cakes*, *most* is a semantic determiner and converts a predicate into a GQ. In the former case, the lexical quantifier receives an NP denoting the set of all cakes; in the latter case, the sister to the lexical quantifier denotes the set of

all contextually relevant cakes. Ladusaw's analysis has many virtues; the question I address here is whether the assumption underlying it, namely that lexical quantificational lexical items will always instantiate a semantic determiner, is cross-linguistically justified.¹

There is another issue raised by the partitive construction, namely the status of domain restriction. It is by now widely accepted that a process of domain restriction takes place during GQ-creation, even in non-partitive GQs (von Stechow 1994, among others). A debated issue concerns *where* domain restriction takes place—does it operate at the NP level, or at the level of the lexical quantifier (cf. Martí 2002, 2009; Stanley and Szabó 2000; Etxeberria 2005; Etxeberria and Giannakidou 2010, among others). For current purposes the question posed by domain restriction is whether and how it meshes with the notion of the semantic determiner. I will argue that domain restriction is a separate process from quantification, to the extent that some languages lack any constituent which instantiates the semantic determiner and simultaneously creates a GQ from an NP predicate. The first piece of evidence for this claim comes from St'át'imcets, to which we now turn.

2. Semantic Determiners in St'át'imcets

St'át'imcets is a highly endangered Northern Interior Salish language spoken in the south-west interior of British Columbia, Canada. In this language, unlike in English, quantified phrases are never created by the addition of a single lexical item to a common noun phrase. The St'át'imcets-internal evidence suggests that there is no constituent which corresponds to a semantic determiner in Barwise and Cooper's sense. First, the functions of quantification and domain restriction are always performed by two distinct overt elements. Secondly, there is no evidence for any element or constituent which simultaneously quantifies and converts to an argumental type, or for any element or constituent which both quantifies and performs domain restriction.

2.1. *St'át'imcets Quantified Phrases: The Data*

As a first step towards proving the above claim, observe that determiners correlate absolutely with argumenthood in St'át'imcets, as shown in (3–5).² (3) shows that argumental noun phrases contain overt determiners, even when they correspond in

¹ Others have questioned the semantic determiner analysis even within English; see Krifka (1999), among others, and see relevant discussion in Szabolcsi (2010).

² St'át'imcets thus corresponds directly to the predictions of Higginbotham (1985), Stowell (1989), Longobardi (1994), among others, and is an NP-Pred language in Chierchia's (1998) typology. There is an interesting issue for future research with respect to a polarity determiner *ku*, which can appear in some predicative positions (although still not on a main predicate). See Matthewson (1998); Werle (2000) for discussion.

English to bare plurals or bare mass nouns. The relevant determiners are all composed of a pro-clitic portion which encodes deixis and number, and an enclitic portion (analysed by Matthewson 1998 as encoding 'assertion of existence') which encliticizes to the first word in the noun phrase.³

- (3) (a) q'wez-ílç [ti=smúlhats=a]
dance-INTR [DET=woman=EXIS]
'A woman danced.'
- (b) léxlex [i=smelhmúlhats=a]
intelligent [DET.PL=woman(PL)=EXIS]
'Women are intelligent.'
- (c) wa7 ts'aqw-an'-ítas [i=t'éc=a] [i=míxalh=a]
IMPF eat-TR-3PL.ERG [DET.PL=sweet=EXIS] [DET=bear=EXIS]
'Bears eat honey.'

(4–5) confirm the determiner/argument correlation by showing that bare nominal arguments are ungrammatical, and that determiners are ungrammatical on predicates.

- (4) (a) *q'wez-ílç [smúlhats]
dance-INTR [woman]
'A woman danced.'
- (b) *léxlex [smelhmúlhats]
intelligent [woman(PL)]
'Women are intelligent.'
- (c) *wa7 ts'aqw-an'-ítas [t'éc] [i=míxalh=a]
IMPF eat-TR-3PL.ERG [sweet] [DET.PL=bear=EXIS]
'Bears eat honey.'
- (5) (a) kúkwpí7 [kw=s=Rose]
chief [DET=NMZ=Rose]
'Rose is a chief.'
- (b) *[ti=kúkwpí7=a] [kw=s=Rose]
[DET=chief=EXIS] [DET=NMZ=Rose]
'Rose is a/the chief.'⁴

³ St'át'imcets data are presented in Jan van Eijk's practical orthography of the language (see van Eijk and Williams 1981). The 7 represents a glottal stop.

⁴ Equational constructions are rendered with a cleft-like construction, in which the nominal does not function as the main predicate.

Next observe that a lexical quantifier may not perform the function of creating an argument phrase; a quantifier *always* co-occurs with a determiner, as illustrated in (6) vs. (7).^{5,6}

- (6) (a) léxlex [tákem i=smelhmúlhats=a]
 intelligent [all DET.PL=WOMAN(PL)=EXIS]
 ‘All (of the) women are intelligent.’
 (b) úm’-en=lhkan [zǐ7zeg’ i=sk’wemk’úk’wm’it=a] [ku=kándi]
 give-DIR=1SG.SUBJ [each DET.PL=child(PL)=EXIS] [DET=candy]
 ‘I gave each of the children candy.’
- (7) (a) *léxlex [tákem smelhmúlhats]
 intelligent [all woman(PL)]
 ‘All women are intelligent.’
 (b) *úm’-en=lhkan [zǐ7zeg’ sk’úk’wm’it / sk’wemk’úk’wm’it] [ku=kándi]
 give-DIR=1SG.SUBJ [each child / child(PL)] [DET=candy]
 ‘I gave each child / each (of the) children candy.’

These data provide evidence that in St’át’imcets, there is never a single element which creates a generalized quantifier from a nominal predicate. The St’át’imcets evidence instead suggests that the sister to a quantifier word is an individual-denoting DP, of type *e* (see Matthewson 1998, 1999, 2001 for further argumentation).

⁵ There is, in addition to the construction exemplified in (6), another construction in which the quantifier appears inside the determiner, as in (i).

- (i) (a) i=tákem=a smelhmúlhats (b) i=zǐ7zeg’=a smelhmúlhats
 DET.PL=all=EXIS woman(PL) DET.PL=each=EXIS woman(PL)
 ‘all the women’ ‘each of the women’

Sentences containing the ordering in (i) are felt by speakers to have subtly different meanings from those in (6), but further research is required to determine the exact differences (see Matthewson 1998; Davis this volume for some discussion). Giannakidou’s (2004) proposal that the determiner composes with the quantifier in (i) is incorrect; see section 3.3 below for discussion.

⁶ Matthewson (1998) discusses one principled exception to the claim that lexical quantifiers never combine directly with nouns in St’át’imcets, namely temporal adverbials such as *tákem sq’it* ‘every day’. The example discovered by Szabolcsi (2010: 191) in Matthewson (1999: 103), given here as (i), would be a real counter-example to the generalization:

- (i) [zǐ7zeg’ smelhmúlhats] met’-en-ítas [ta=máw=a]
 [each woman(PL)] pet-DIR-3PL.ERG [DET=cat=EXIS]
 ‘Each woman petted a cat.’

Embarrassingly for Matthewson (1999), but fortunately for the generalization, (i) contains a typo. The example accepted by the speaker *did* contain a determiner, as in the correct version in (ii):

- (ii) [zǐ7zeg’ i=smelhmúlhats=a] met’-en-ítas [ta=máw=a]
 [each DET.PL=WOMAN(PL)=EXIS] pet-DIR-3PL.ERG [DET=cat=EXIS]
 ‘Each woman petted a cat.’ (data from Rose Whitley, 23 March 1998)

Thus, determiners and quantifiers perform two different functions, have different semantic types, and obligatorily co-occur whenever a quantifier is present. There is not even any constituent string which corresponds to Barwise and Cooper's semantic determiner.⁷

2.2. *An Analysis (Matthewson 1999, 2001)*

Matthewson (1999, 2001) argues for a choice function analysis of St'át'imcets determiners; these determiners attach to a predicate and return one of the (singular or plural) individuals which satisfy the predicate. As noted above, there are a number of choice function determiners in St'át'imcets, which encode number and proximity of the referent to the speaker. All the choice function determiners (which are all and only those which co-occur with quantifiers) end in the enclitic=*a*, hence the notation *X...a* in (8), taken from Matthewson (2001). The index on the determiner specifies which choice function will be used; *g* is an assignment function, from indices to choice functions. Thus, *g(k)* is a choice function of type $\langle\langle e, t \rangle, e \rangle$, and DPs are of type *e*, denoting either a singular or a plural individual.

$$(8) \llbracket X \dots a_k \rrbracket^g = \lambda f \in D_{\langle e, t \rangle} \cdot (g(k))(f)$$

Quantifiers take entities of type *e* as their first argument. This is illustrated with the quantifier *zíʔzegʔ* in (9–10).⁸

$$(9) \llbracket \text{zíʔzegʔ} \rrbracket = \lambda y \in D_e \cdot \lambda f \in D_{\langle e, t \rangle} \cdot \forall x \leq y [\text{atom}(x) \rightarrow f(x) = 1]$$

- (10) (a) [zíʔzegʔ i=smelhmúlhats=a] qwatsáts
 [all DET.PL=WOMAN(PL)=EXIS] leave
 'Each woman left.'

- (b) $\llbracket \text{zíʔzegʔ } i_k \text{ smelhmúlhatsa } qwatsáts \rrbracket^g = 1$ iff for all *x* which are atomic parts of the plural individual composed of women chosen by the choice function *g(k)*, *x* left.

⁷ In fact, recent research by Davis (2011, this volume) argues that St'át'imcets poses a challenge not just to the idea of a unitary semantic determiner, but to the universality of GQs themselves. Davis argues, contrary to Matthewson (1998, 1999, 2001) (but in line with claims made by Jelinek 1995 for a related Salish language), that St'át'imcets lacks GQs altogether. Davis's evidence is convincing; it relies in part on the absence of scopal interactions between quantified phrases. For current purposes I will set this aside, noting that Davis's findings only bolster the claim that languages do not all follow the standard GQ-creating mechanism. One could of course argue that *if* a language had real GQs, *then* there would necessarily be an element (or at least a constituent) which instantiated the semantic determiner. That would predict that there could be no language which created its quantified phrases in a manner parallel to St'át'imcets, but in which the quantified phrases allowed scopal interactions—an interesting prediction which has yet to be tested.

⁸ The alternative structures where the quantifier attaches inside the determiner (as in n. 5) are argued by Matthewson (1998) to involve LF-movement of the quantifier to adjoin to DP.

We see that the function of the determiner is to narrow the denotation of the NP predicate, before the lexical quantifier applies. Matthewson therefore argues that the choice function determiners instantiate quantifier domain restriction in the sense of von Stechow (1994), Stanley and Szabó (2000), Martí (2002), among many others.⁹

Summarizing, we see that St'át'imcets lacks any single item, or even syntactic constituent, which converts a nominal predicate into a generalized quantifier. Domain restriction is marked overtly, and the domain restrictor forms a syntactic constituent with the NP, before the quantifier element applies. Furthermore, the lexical quantifier does not apply to an element of predicative type, but rather to an individual-denoting DP. St'át'imcets therefore lacks any analogue of Barwise and Cooper's semantic determiner.¹⁰

2.3. A Reanalysis (Giannakidou 2004; Etxeberria 2005)

Giannakidou (2004: 111) presents a reanalysis of the St'át'imcets data whose goal is to explain the St'át'imcets facts 'without giving up the idea that the domain of a Q-det is a predicate'. In other words, Giannakidou's intent is to maintain the universality of the semantic determiner as conceptualized by Barwise and Cooper (1981). Etxeberria (2005, 2008, 2009) and Etxeberria and Giannakidou (2010) argue for similar reanalyses of the St'át'imcets facts; see also Cheng (2009) and Martí (2009) for related discussion.

Giannakidou (2004) argues that the circumfixal articles in St'át'imcets (*ti...a*, *i...a* etc.) do not create DPs of type *e*, but rather of type $\langle\langle e, t \rangle, t \rangle$. She thus adopts a semantic determiner analysis for St'át'imcets articles. Her generalized lexical entry for the relevant determiners is given in (11). The variable *C* corresponds to the contextually salient set of individuals; this is the domain restriction.

$$(11) \llbracket X \dots a \rrbracket = \lambda C \lambda P \lambda Q \{x: C(x)=1 \ \& \ P(x)=1\} \subseteq \{x: Q(x)=1\}$$

(Giannakidou 2004: 119)

The denotation of the DP *ti smúlhatsa* 'the/a woman' is given in (12):

$$(12) \llbracket ti \ smúlhatsa \rrbracket = \lambda C \lambda Q \{x: C(x)=1 \ \& \ woman(x)=1\} \subseteq \{x: Q(x)=1\}^{11}$$

(Giannakidou 2004: 119)

As was outlined above, DPs of the sort in (12) combine in the syntax with quantifiers. Giannakidou therefore proposes that a DP which is sister to a quantifier

⁹ See also Gillon (2006) for the claim that in Skwxwú7mesh Salish and in fact universally, elements in the D head contribute domain restriction.

¹⁰ Davis (this volume) argues that St'át'imcets determiners do not create individual-denoting DPs. For the reasons outlined here, I am sceptical of (only) this aspect of his analysis. As noted in n. 7, Davis's analysis still entails that St'át'imcets lacks a semantic determiner.

¹¹ I have changed the variables for consistency with (11).

undergoes type-shifting to a predicate type. That is, it undergoes Partee's (1987) BE operation, given in (13).

$$(13) \text{ BE: } \text{GQ} \langle \text{et}, \text{t} \rangle \rightarrow \langle \text{et} \rangle: \lambda P_{\langle \text{et}, \text{t} \rangle} \lambda x [\{x\} \in P]$$

Giannakidou assumes that the type-shifter in St'át'imcets is syntactically present, as a covert element (a covert version of English *of*). The structure of a St'át'imcets quantified phrase is therefore as in (14), where there are actually *two* semantic determiners: D and Q-DET.

$$(14) \text{ } [_{QP} \text{ Q-DET } [_{PP} \emptyset \text{ } [_{DP} \text{ D } [_{NP} \text{ N}]]]] \quad (\text{Giannakidou 2004: 120})$$

In order to explain why English DPs cannot type-shift in a similar manner when quantifiers are added (that is, why we do not say **every the women*), Giannakidou invokes a blocking explanation. The presence of overt *of* in English blocks a covert type-shifter with the same semantics (Giannakidou 2004: 120). The St'át'imcets/English difference is thus reduced to whether the languages use an implicit or an explicit domain restrictor. St'át'imcets uses explicit domain restrictors and a covert type-shifter; English uses covert domain restrictors and an overt type-shifter.

There are various versions of this reanalysis of St'át'imcets, which differ in whether the articles are claimed to (a) create GQs, which are then converted back to predicates via a BE-type shift (Giannakidou 2004; Etxeberria 2005); (b) create individual-denoting DPs, which are converted to predicates via Partee's Id type-shift (Etxeberria 2005); or (c) leave the type of the NP unchanged, requiring no subsequent type-shift (Etxeberria and Giannakidou 2010). This last, type-preserving version of the St'át'imcets articles is given in (15).

$$(15) \llbracket i \dots a \rrbracket = \lambda P_{\langle \text{et} \rangle} \lambda x P(x) \cap C(x) \quad (\text{Etxeberria and Giannakidou 2010: 18})$$

The type-e analysis of St'át'imcets DPs suggested by Etxeberria (2005) presumably looks very similar to Matthewson's original analysis; the only difference would be that rather than assuming that the lexical quantifier applies directly to the type-e DP, a type-shift is proposed (Id), whose sole motivation is to enable us to analyse St'át'imcets as possessing lexical items which instantiate Barwise and Cooper's semantic determiner.

In the next section I present empirical and conceptual arguments against the efforts to find a semantic determiner in St'át'imcets.

3. St'át'imcets Lacks a Semantic Determiner

3.1. *Language-Internal Evidence against Type-Shifting*

Giannakidou (2004) proposes that Partee's BE applies to St'át'imcets DPs when they appear as sisters to a quantifier. This enables an analysis of the quantifiers as being of

semantic determiner type, but does so at the expense of allowing type-shifting. Giannakidou herself does not view the allowing of the BE type-shift as an expense; on the contrary, she views it as an advantage (2004: 113):

a related question at this fundamental level is why the Salish DP has the distinctive property of always being interpreted in type *e*. This is a property very much unlike DP elements in languages like English, where definites and indefinites freely type-shift to quantificational (*et,t*) or predicative types (*et*), shifts that have been well-described and understood since Partee's (1987) important work. The [St'át'imcets] DP appears to defy the basic characteristics of the class it is supposed to belong to.

However, there is no language-internal evidence that St'át'imcets DPs undergo BE. Recall from section 2 that St'át'imcets DPs may not function as predicates; there is a strict correlation between the presence of a determiner and argumenthood. Thus, the language-internal evidence suggests that St'át'imcets DPs *do* differ in their properties from those of English.¹² It is also important to note that the assumption that Partee's type-shifts are universal—an assumption which Partee herself did not make—would not account for the St'át'imcets facts without extra stipulations. Stipulations will be necessary to prevent BE from applying to allow DPs in predicate position. It would be a weakening of the theory to allow a type-shifter which appears in only one place in the language—when next to a quantifier—but which is not generally available. The other versions of the reanalysis, where the St'át'imcets articles either create type-*e* DPs which are subject to Id, or are type-preserving, run into the same empirical problem, namely that they all incorrectly predict that full DPs can appear in predicate position.

It is also worth remembering that type-shifting in general is itself a weakening of a close correspondence between syntactic and semantic types. Viewed from this perspective, it is English nominals with their array of type-shifting possibilities which are conceptually less appealing. In general, we do not have a satisfactory set of restrictions on type-shifting, or a satisfactory set of predictions about what can type-shift when. Consider that within a generalized quantifier, there are several elements which are potential candidates for type-shifting. Giannakidou assumes that DPs can type-shift, but quantifiers should not. English may fit this analysis, but is this necessarily a language universal? Why not the reverse? Can languages choose which elements can type-shift? Do some languages dislike type-shifting in general? What types of empirical evidence can be brought to bear? These are important but still unsolved questions.

¹² Etxeberria (2005: 28) accuses Matthewson (2001) of 'assum[ing] that there is no variation in the semantics of natural languages'. This is a misunderstanding of my proposal that one adopt a null hypothesis of universality. A null hypothesis is falsifiable and therefore allows one to admit that there is variation when language-internal facts require it. See Matthewson (2001: 155–7) and von Stechow and Matthewson (2008) for discussion, and see Matthewson (1998, 2008a) for proposed semantic parameters.

3.2. *The Failure of the Blocking Account, and the Problem of of*

Recall that under Giannakidou's account, the grammaticality difference between English **each the women* and its St'át'imcets counterpart *zi7zeg' i smelhmúlhatsa* derives from the existence in English of overt *of*. *Of* is analysed as an overt type-shifter (following Ladusaw 1982), and as such, it blocks a covert type-shifter with the same semantics. In St'át'imcets, the lack of an overt counterpart of *of* allows covert type-shifting of the DP.

There are two problems with this idea. The first is that St'át'imcets *does* possess overt partitives of the English type, as shown in (15).

- (15) *zi7zeg' lhél=ki=smúlhats=a it'-em*
 each *from=DET.PL=woman=EXIS* sing-MID
 'Each of the women sang.'

The structure of (15) exactly parallels that of English explicit partitives, and, as such, should make covert type-shifting of St'át'imcets DPs in the much more pervasive preposition-less structures impossible.

The second problem arises already within English, namely that *of* is optional in many cases. Giannakidou advances the optionality of *of* in *all/both/half (of) the boys* as an argument against treating *of* as a semantically vacuous case-assigner (Giannakidou 2004: 114); see also Etxeberria (2005: 35), who writes that '*of* seems to be optional in some constructions, and this should not be so if the partitive preposition *of* is only there for case reasons'. However, the optionality of *of* is equally (or perhaps even more) puzzling if it is required semantically, to convert a definite DP into a predicate ready for serving as the first argument of a quantifier. The optionality of *of* is also a problem for the blocking story: if overt *of* blocks the corresponding covert type-shift (Giannakidou 2004: 120), then phrases like *both the boys* are problematic. A type-shift is supposedly required to provide the right type of argument for *both*, yet a null type-shift should be blocked.

Admittedly, the case proposal advanced by Matthewson (2001) does not really seem to work either. The facts suggest that lexical quantifiers can actually freely apply to sisters of various types. This weakens the universal version of Matthewson's (2001) analysis (as I will argue below that we need to do), but also casts doubt on the postulation of null type-shifters for which there is no motivation other than the desire to make lexical quantifiers uniformly of type $\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle\rangle$ (cf. Etxeberria 2005, as discussed above).

3.3. *D does not Form a Constituent with Q in St'át'imcets*

It is often claimed in the literature that St'át'imcets articles may form a constituent with a lexical quantifier (Cheng 2009: 66; Etxeberria 2009: 81; Martí 2009: 126;

Ettxberria and Giannakidou 2010: 8). This proposal is usually made in the context of arguing that domain restrictors may appear attached to Q, rather than to NP, something which is probably correct for many languages, but which is not correct for St’át’imcets. The issue is relevant to our current concerns because if it were true that the articles combined with lexical quantifiers in St’át’imcets, we would have evidence for a syntactic constituent which together performed the function of Barwise and Cooper’s semantic determiner. Let us therefore see why the proposal is inconsistent with the facts.

The claim that Q can combine with D in the syntax in St’át’imcets is based on the existence of structures as in (16), where the determiner appears to ‘envelop’ the quantifier (cf. Ettxberria and Giannakidou 2010: 8); see n. 5 above.

- (16) (a) *i=tákem=a* smelhmúlhats
 DET.PL=all=EXIS woman(PL)
 ‘all the women’
- (b) *i=zí7zeg’=a* smelhmúlhats
 DET.PL=each=EXIS woman(PL)
 ‘each of the women’
- (c) *i=cw7ít=a* smelhmúlhats
 DET.PL=each=EXIS woman(PL)
 ‘many (of the) women’

However, as pointed out in Matthewson (1998, 2001, 2009), the determiner does *not* syntactically envelop the quantifier in structures such as (16), nor does it form a constituent with it. The position of the enclitic portion of the relevant determiners is phonologically determined: it encliticizes to whatever is the first lexical item in the noun phrase. We see this in (17).

- (17) (a) *i=smelhmúlhats=a*
 DET.PL=woman(PL)=EXIS
 ‘some/the women’
- (b) *i=emhálqwem’=a* smelhmúlhats
 DET.PL=beautiful=EXIS woman(PL)
 ‘some/the beautiful women’
- (c) *i=lélex=a* emhálqwem’ smelhmúlhats
 DET.PL=intelligent=EXIS beautiful woman(PL)
 ‘some/the intelligent beautiful women’
- (d) *i=cw7ít=a* emhálqwem’ smelhmúlhats
 DET.PL=many=EXIS beautiful woman(PL)
 ‘many (of the) intelligent beautiful women’

It would be odd to postulate that the determiner formed a syntactic constituent with *emháłqweŋ* 'beautiful' in (17b), with *lélex* 'intelligent' in (17c), and with *cw7it* 'many' in (17d). It is much more plausible to assume that the determiner is the head of the phrase in each case, and that, just as in English, the adjectives form a constituent with the noun. We see from this that the surface position of the determiner offers no evidence that Q forms a constituent with D in St'át'imcets.

There is also cross-linguistic semantic motivation for rejecting the 'Q combines with D' approach for St'át'imcets. If structures like (16c) or (17d) really involved the domain-restricting determiner composing directly with the lexical quantifier, they would constitute counter-examples to Etxeberria and Giannakidou's (2010) claim that domain restrictors never combine with weak quantifiers. Etxeberria and Giannakidou argue that weak quantifiers in Greek and Basque do not co-occur with the determiners which perform domain restriction in the same way that strong quantifiers do. For a proportional reading of a weak quantifier in Greek or Basque, a partitive structure is required, in which the NP is first domain-restricted by the determiner, and then the lexical quantifier appears outside. Now, Matthewson (1998) has shown that weak quantifiers within DP in St'át'imcets (whether preceding or following the determiner) have only proportional readings, never cardinal. Etxeberria and Giannakidou's own analysis would predict that the domain restrictor does not combine with the quantifier in these cases, but rather that a partitive structure should be the only option. This is inconsistent with the 'Q combines with D' approach to St'át'imcets, but consistent with Matthewson's (1998) claim that the structures in (16c) and (17d) involve LF-movement to create a partitive structure.

We have seen that there is no evidence that the domain-restricting determiners combine with lexical quantifiers in St'át'imcets; this rules out the possibility of a Q-D constituent which performs the function of a semantic determiner. Instead, in St'át'imcets the domain-restricting determiners always combine first with the NP, creating an individual-denoting DP to which the lexical quantifier then applies.

3.4. *St'át'imcets Ds are not Definite*

My main goal so far has been to convince the reader that there is no evidence for the semantic determiner in St'át'imcets. In section 4 below, I will suggest that the evidence across languages favours neither the universal presence of a semantic determiner, nor the universal absence of one. Before that, however, I want to conclude this section by addressing one additional feature of the various reanalyses of St'át'imcets, to do with definiteness.

A common feature of these reanalyses is the claim that St'át'imcets DPs are definite descriptions.¹³ For example, Giannakidou (2004) writes that 'The choice function analysis is equivalent to the more familiar one of the definite article using uniqueness and maximality', and Ettxeberria and Giannakidou (2010: 20) propose that 'the Salish DP is like a demonstrative—a subspecies of definite'. I will briefly outline here why a definite analysis of the St'át'imcets DPs is inadequate.

As argued in Matthewson (1999, 2008a), St'át'imcets full DPs and third-person pronouns display every property commonly assumed in the literature to correlate with indefiniteness: they are freely used in novel discourse contexts where the hearer has no prior knowledge of the referent, they are good in sluicing-like constructions, they appear in existential sentences, and they do not require uniqueness or maximality. In spite of this, Ettxeberria and Giannakidou (2010) argue that the St'át'imcets DPs are definite (see also Giannakidou 2004). The way they achieve this is by weakening the definition of definiteness to the extent that it forces neither familiarity nor uniqueness, and definites are predicted to be fully felicitous in existential sentences. Once this is done, however, it becomes impossible to derive the real empirical differences between English and St'át'imcets with respect to the felicity judgements for DPs (supported with a range of data in Matthewson 1999, 2008a; see also Davis 2006).

The reasoning behind Ettxeberria and Giannakidou's claim that St'át'imcets DPs are definite seems to be twofold. First, domain restriction by definition is taken to entail definiteness. However, as observed by Szabolcsi (2010: 197), '[d]efiniteness (maximalization) and context-dependency (domain-restriction) are not logically inseparable and thus need not be ensured by the same operator'. Secondly, the St'át'imcets determiners encode deictic features. Ettxeberria and Giannakidou argue on this basis that the St'át'imcets determiners are actually demonstratives, and therefore must be definite, since in more familiar languages, demonstratives are definite. However, St'át'imcets actually provides strong evidence that elements which encode deictic features can be *indefinite*. In Matthewson (2008a) I argue that St'át'imcets DPs and third-person pronouns are crucially non-presuppositional in that they never require any prior knowledge on the part of the hearer. This is consistent with them possessing deictic features, but not consistent with them being called 'definites', under any normal interpretation of the term.¹⁴

¹³ An exception is Cheng (2009: 66), who follows Matthewson (1998, 1999) in analysing the St'át'imcets determiners as indefinite.

¹⁴ A third motivation for analysing St'át'imcets DPs as definite is discomfort with their widest scope properties. For example, Giannakidou (2004: 112) writes that the property of taking widest scope, 'which sets [St'át'imcets] DPs apart from "regular" indefinites, unfortunately is merely stipulated in Matthewson 1999; why [St'át'imcets] DPs, unlike "regular" indefinites, exhibit this exclusive preference remains unexplained'. However, Matthewson's (1999, 2001) analysis of St'át'imcets DPs actually places them fully in line with analyses of English by Fodor and Sag (1982) and Kratzer (1998), for whom indefinites are ambiguous between specific and non-specific interpretations. St'át'imcets provides cross-linguistic support for Fodor

In this section we have taken a fairly detailed look at one language, and have found that it lacks Barwise and Cooper's semantic determiner. In the second half of the chapter I turn to a broader range of languages.

4. A Look at the Rest of the World

Recall our main question: is the notion of 'semantic determiner' cross-linguistically useful? So far I have argued that one language, St'át'imcets, lacks such a constituent. For the rest of the world, there is a paucity of relevant data; cross-linguistic evidence about the formation of generalized quantifiers is still sparse. We need to look at a far wider range of languages than have so far been considered, before we can ascertain whether there are uniform quantifier denotations in human language, or even general patterns. In the remainder of this chapter, I report on a preliminary typological study of quantifiers and determiners. I will be looking at 37 languages from 25 different families.

A few words about the scope of the study. First, I will by necessity be concentrating mostly on what we can infer from syntactic evidence. This means, for example, that I will not be able to address the very interesting question of whether the languages looked at even have elements with the semantics of a GQ. Determining whether this is the case requires detailed semantic fieldwork; the relevant information is almost never found in a descriptive grammar. For proposals that certain languages lack GQs altogether, see for example Baker (1995) on Mohawk, Vieira (1995) on Asurini de Trocará, Jelinek (1995) on Straits Salish, and Davis (2011, this volume) on St'át'imcets. There are also languages which primarily or exclusively use some other method of quantification than combining a quantifier with a nominal, such as Nuuchahnulth (Wakashan; Waldie 2007), Japanese, Mayali (Gunwinjguan; Evans 1995), and Blackfoot (Algonquian; Glougie 2002); see also Bittner and Trondhjem (2008) for very relevant discussion on Kalaallisut (Eskimo-Aleut) and other languages. It seems likely that the semantic determiner would run into problems in languages such as these; for the most part, I will set them aside here, as I am interested in how noun-phrase internal quantification proceeds.¹⁵

In terms of the phenomena to be investigated, I will be looking only at strong quantifiers, as weak quantifiers are usually taken to be analysable as predicative.

and Sag's and Kratzer's analyses of English, by overtly distinguishing the two interpretations argued for by these authors.

¹⁵ Note in this respect a claim by Beavers (2003: 52). Beavers observes that not all languages encode 'D-semantics' (i.e. definiteness, quantification, genericity, etc.) via determiners; some languages use verbal affixes, for example. However, he makes the strong and interesting claim that when languages do have determiners, they always encode D-semantics. One interpretation of this hypothesis could be taken to imply that syntactic determiners are always semantic determiners, something which obviously I would argue against.

Of course, when classifying quantifiers as weak or strong, I had to go by how they were translated into English. No grammars provided any semantic information about potentially ambiguous quantifiers such as ‘many’. More generally, *all* results are tentative because information in the grammars was often sketchy, and may have been misunderstood due to lack of knowledge of the languages. Generally, there was necessarily an enforced reliance on translations into English for clues about meaning.

What kind of data are we looking for? In English, the following generalizations (which are more or less simplifications) are what led to the standard view whereby lexical quantifiers instantiate semantic determiners: argument DPs are headed by an overt determiner or demonstrative, with the principled exceptions of bare plurals, mass nouns, and proper names. There are two options for quantifiers: either they replace the determiner or demonstrative, or else *of* is required. Prima facie counter-evidence to the semantic determiner analysis would therefore be quantifiers taking sisters which contain determiners or otherwise look as if they are already of argumental type. (English already contains some such exceptions: *all the N*, *half the N*, etc.)

The languages investigated are listed in (18), grouped by geographical area. References are listed here for each language; they will usually not be repeated again in the discussion below.

(18) **Pacific:**

Ambae (Oceanic)	Hyslop (2001)
Erromangan (Oceanic)	Crowley (1998)
Hoava (Northwest Solomonian, Austronesian)	Davis (2003)
Kwaio (Austronesian)	Keesing (1985)
Malagasy (Austronesian) ¹⁶	Keenan (2008), Paul (2009)
Maori (Polynesian)	Bauer (1993), Chung (2008)
Manam (Oceanic)	Lichtenberk (1981)
Muna (Malay-Polynesian)	van den Berg (1989)
Siroi (Non-Austronesian PNG)	Wells (1979)
Taba (Austronesian)	Bowden (2001)
Tuvaluan (Polynesian)	Besnier (2000)

Eurasia:

Basque (isolate)	King (1994), Etxeberria (2005)
Evenki (Tungusic)	Nedjalkov (1997)
Finnish (Finno-Ugric)	Sulkala and Karjalainen (1992)
Kham (Tibeto-Burman)	Watters (2002)

¹⁶ Obviously, Malagasy is not spoken in the Pacific, but this seems the best place to group it for current purposes.

Maltese (Semitic)	Borg and Azzopardi-Alexander (1997), Putzu and Ramat (2001), Vanhove (2009)
Modern Hebrew (Semitic)	Glinert (1989)
Turkmen (Turkic)	Clark (1998)
Thai (Tai)	Smyth (2002)
Americas:	
Chalcatongo Mixtec (Otomanguean)	Macauley (1996)
Comanche (Numic, Uto-Aztecan)	Charney (1991), Robinson and Armagost (1990)
Cuzco Quechua (Quechua)	Faller and Hastings (2008)
Itzaj Maya (Yukatekan Mayan)	Hofling (2000)
Kawaiisu (Numic, Uto-Aztecan)	Zigmond et al. (1991)
Kiowa (Kiowa-Tanoan)	Watkins (1984)
Passamaquoddy (Algonquian)	Bruening (2008)
San Lucas Quiaviní Zapotec (Otomanguean)	Lee (2008)
Shoshone (Numic, Uto-Aztecan)	Dayley (1989)
Slave (Athapaskan)	Rice (1989)
Sochiapan Chinantec (Chinantec)	Foris (2000)
Tohono O'odham (Uto-Aztecan)	Zepeda (1983)
Tzutujil (Mayan)	Dayley (1985)
West Greenlandic (Inuit)	Fortescue (1984)
Africa:	
Igbo (Kwa)	Emenanjo (1987)
Koromfe (Gur/Voltaic)	Rennison (1997)
Xhosa (Bantu)	Du Plessis and Visser (1992)
Creole:	
Fongbe (Haitian)	Lefebvre and Brousseau (2002)

4.1. *The results*

The first issue investigated was whether languages require determiners to create argumental phrases. Perhaps surprisingly, the first generalization is as given in (19):

(19) Gen1: Determiners are rare.

Only a small minority of languages in the study show a robust correlation between argumenthood and determiners, and many languages lack determiners altogether.

- (20) *Languages with no determiners*: Chalcatongo Mixtec, Chinantec, Comanche, Cuzco Quechua, Evenki, Igbo, Kawaiisu, Kham, Kiowa, Manam, Passamaquoddy, Shoshone, Siroi, Slave, Sochiapan, Taba, Thai, West Greenlandic, Xhosa.
- (21) *Languages in which some arguments have determiners (i.e. determiners are optional, or e.g. there is a definite but not an indefinite article)*: Ambae, Erromangan, Fongbe, Hebrew, Itzaj Maya, Kwaio, Malagasy, Maltese.
- (22) *Languages which have a systematic correlation between arguments and determiners*: Tuvaluan, Maori, Hoava, Basque, O’odham, Tzutujil, Koromfe.

In the absence of a consensus in the literature about the status of bare arguments (i.e. whether these contain null determiners), it will be difficult to assess the implications of Q-NP structures in bare argument-languages. Do these Q-NP structures contain a classic semantic determiner (as in English *every cake*)? Perhaps these are instead cases of a lexical quantifier attaching to an argumental DP, given that NPs in bare-argument languages can function as arguments, either by being intrinsically of argumental type (Chierchia 1998 for Chinese), or by means of a null determiner (Wharram 2003 for Inuktitut). The analytical decisions here cannot be made on the basis of descriptive literature, but instead require subtle semantic and syntactic testing; see Gillon (2010) on Innu-Aiumun and Bošković (2008), Bošković and Gajewski (to appear) for relevant discussion.

Turning to demonstratives, recall that these are in complementary distribution with determiners in English, allowing for an analysis whereby demonstratives and determiners both function as semantic determiners. Consider now generalization 2:

- (23) Gen2: Demonstratives are rarely determiners.

Demonstratives are present in all or almost all languages. Unlike determiners, demonstratives are always optional, and can stand alone without an NP. Demonstratives very often co-occur with determiners rather than replacing them, and demonstratives also frequently co-occur with quantifiers.

- (24) *Languages in which demonstratives co-occur with determiners, and/or in which demonstratives and determiners occupy clearly different syntactic positions*: Ambae, Erromangan, Fongbe, Hoava, Itzaj Maya, Koromfe, Kwaio, Malagasy, Maltese, Maori, Muna, Tuvaluan.

An example from Hoava is given in (25).

- (25) *ria ninani keana heri*
 ART:PL food sweet DEMON:PROX:PL
 ‘these sweet foods’ (Davis 2003)

Incidentally, St’át’imcets is also a language where demonstratives are a separate syntactic category from determiners as well as from lexical quantifiers, as shown in (26).

- (26) (a) *melyíh-s-as=ku7* *ni7=na=n-kúk7=a*
 marry-CAUS-3ERG=REPORT DEMON=DET=1SG.POSS-grandmother=EXIS
pináni7
 TEMP.DEIC
 'And then he married my grandmother.' (Matthewson 2005: 397)
- (b) *lán=lhkan=tu7* *wa7 páqw-ens [tákem iz'=i=púk7=a]*
 already=1SG.SUBJ=then IMPF look-DIR [all DEMON=DET.PL=book+EXIS]
 'I already looked at all those books.' (Matthewson and Davis 1995)

There are only two (and a half; see n. 17) languages which satisfy the standard assumption that determiners and demonstratives are in complementary distribution:

- (27) *Languages in which demonstratives and determiners seem to be the same category:* Basque, O'odham, Tzutujil?¹⁷

The co-occurrence of demonstratives with determiners, even in some cases in languages with a systematic argument/determiner correlation, raises questions for the standard analysis. If determiners turn things into an argumental type, what do co-occurring demonstratives do?

Turning now to lexical quantifiers, one of our questions concerns what type of phrase quantifiers can combine with. One *prima facie* piece of evidence against a simple semantic determiner analysis would involve quantifiers attaching to pronouns (without the presence of an *of*-like element), since these otherwise appear independently and are therefore by hypothesis of argumental type.

- (28) Gen3: It is common for quantifiers to be able to take pronouns directly as their sister, even when adjectives, demonstratives, or articles may not.
- (29) *Languages where quantifiers can directly take pronouns as sisters:* Erromangan, Fongbe, Hoava, Koromfe, Malagasy, Passamaquoddy, Shoshone, Slave.

Déchaine and Wiltschko (2002) argue that pronouns can be syntactically DPs, NPs, or ϕ Ps (a category in between), and pronouns of the NP or ϕ P type are able to function as main predicates. Co-occurrence of NP or ϕ P pronouns with a lexical quantifier would therefore not constitute evidence against a semantic determiner. As far as can be ascertained from the works consulted, the pronouns here are probably of the argumental type, although further investigation is clearly required. Note however that even if pronouns can have flexible types, the difference between quantifiers and determiners with respect to whether they can take pronouns as their sister needs to be

¹⁷ In Tzutujil, the definite determiner is in complementary distribution with the demonstratives. However, demonstratives freely co-occur with the indefinite determiner. Note that this relates to the issue raised above about whether demonstratives are necessarily definite; further investigation is required.

accounted for, and does not straightforwardly fall out from a semantic determiner analysis.

In many languages, lexical quantifiers can attach to demonstrative phrases; examples are given in (30) and (31) from Passamaquoddy and Basque. See also St'át'imcets (26b) above.

(30) *psite niktok pilsqehsis-ok yut 'c-eya-woltu-wok*
all those-3P girl-3P here from-be-Plural-3P
 'all the girls from here' (Bruening 2008: 86)

(31) *lagun hauek-in oro-rekin joango naiz*
friend these-COM all-COM go.FUT AUX.SG
 'I'll go with all these friends.' (Etxeberria 2008: 253)

Based on the discussion so far, we can draw an interim conclusion, namely that there is very little cross-linguistic evidence for a simple semantic determiner analysis, whereby articles, demonstratives, and lexical quantifiers all attach to NPs and produce GQs. There is at most one language—Basque—which seems to straightforwardly lend itself to a standard analysis. (See Etxeberria 2005 for detailed discussion of Basque GQs, including the claim that the definite article in Basque contributes domain restriction and composes with lexical strong quantifiers.) However, because of the prevalence of bare nouns and the lack of analyses of them, many languages so far contribute no evidence one way or the other about the type of their lexical quantifiers. Let us continue then with a second set of generalizations, which relate to specific quantifiers. The first of these generalizations relates to the range of quantifier meanings languages possess.

(32) Gen4: Many languages do not display evidence for the insufficiency of \exists and \forall .

(33) *Languages whose only strong quantifiers are universal (including 'both')*:¹⁸
 Ambae, Chalcotongo Mixtec, Comanche, Evenki, Finnish, Fongbe, Hoava, Igbo, Itzaj Maya, Kham, Koromfe, Kwaio, Manam, Maori, Muna, Shoshone, Slave, Thai, Turkmen, Tuvaluan, West Greenlandic, Xhosa.

(34) *Languages with strong quantifiers other than universals (e.g. 'half', 'most')*:
 Basque, Cuzco Quechua, Erromangan, Hebrew, Kawaiisu, Malagasy, Maltese, Sochiapan Chinantec, Taba, Tzutujil.

Based on this preliminary survey, we might speculate that the centrality of generalized quantifier theory in natural language semantics results from an Indo-European focus. If it is true that in many languages, the only strong quantifiers are universals, perhaps predicate logic might have been adequate after all for these.

¹⁸ Finnish, Evenki, and Slave are languages whose only strong quantifiers are apparently plain universals and 'both'.

When it comes to universals, however, languages are surprisingly rich:

- (35) Gen5: Many languages have multiple universal quantifiers.
- (36) gives a typical example of the lists of universal quantifiers which are given in descriptive grammars.
- (36) (to'o)to'o-ni 'every'
 te'e-ni 'every'
 afrie-na 'all, every'
 risi-ma-=na 'every'
 'afu-ta-na 'all of, whole of' ('afu: 'be wrapped up')
 'ai-na 'all of' (set of things of the same kind) (Kwaio; Keesing 1985: 86)

Other languages with multiple universals include for example Cuzco Quechua, which has one necessarily distributive universal quantifier and three which allow either collective or distributive interpretations (Faller and Hastings 2008). Basque has four different universal quantifiers (Etxeberria 2008: 251), and Malagasy has at least eight (Keenan 2008). Keenan writes that these universals 'differ in distribution and somewhat in meaning, some being more collective, others being more distributive. A given sentence may contain several, all quantifying the same constituent' (Keenan 2008: 339). Interesting questions for future cross-linguistic research concern the semantic differences between different lexical items which are all translated as universals, and whether there are any systematic syntax–semantics correspondences among different types of universal quantifier (cf. Gil 1991, 1995; Keenan 2008 for discussion; see also Tunstall 1998 for English).

We turn now to syntactic differences between different lexical quantifiers.

- (37) Gen6: It is common for a word translated as 'all' to look as if it attaches to a full DP, even when other quantifiers do not.
- (38) *Languages where 'all' attaches to a full DP*: Tuvaluan, Maori, Muna, Finnish?, Maltese, Evenki, Kham, Koromfe, Itzaj Maya, Igbo, Fongbe.

An example from Maori is given in (39).

- (39) kaaori anoo ia kia moohio ki ngaa tamariki katoa
 neg yet 3sg subj know to the(pl) children all
 'She does not yet know all the children.' (Bauer 1993: 112)

It is interesting in this regard that Brisson (1998) claims that 'all' is not a quantifier, but rather a modifier which co-occurs with a D(istributivity)-Operator and enforces maximality. This would explain why 'all' typically adds to a DP rather than a bare

NP. Removing ‘all’ from the class of quantifiers would certainly seem to make things easier for the standard semantic determiner analysis.¹⁹

- (40) Gen7: In some languages, distributive universals appear to combine directly with NP, while other quantifiers do not.
- (41) *Languages where only distributive universals combine directly with NP*: Ambae, Finnish?, Maori, Muna, Maltese, Tuvaluan.

In Maori, for example, *ia* ‘each’ (unlike *katoa* ‘all’) occurs in pre-nominal position, and functions as the determiner (Bauer 1993: 112).

- (42) ko *ia* *tamiariki* i whiwhi ki teetahi pukapuka
 top *each* *child* T/A receive to a(spec) book
 ‘Each child received a book.’ (Bauer 1993: 113)

In Ambae, Hyslop (2001: 127) notes that ‘while the Q slot is post-nominal, there is one modifier, *vataha* ‘every, each’, which occurs before the head’. See also Lander (2009) for related discussion; Lander argues (2009: 247) that in various Western Indonesian languages, the quantifiers which are syntactically restricted to prenominal position are ‘exactly those which require the determiner interpretation’ (by which he means they relate two sets, i.e. are semantic determiners). Gil (2001: 1277) observes that in some languages, the same lexical item is used either as a distributive universal, or as a collective one, with a corresponding difference in syntactic position and plurality of the noun. This is the case, for example, in Maltese; cf. Putzu and Ramat (2001). Finally, see Etzeberria (2008) for detailed discussion of the different syntax of the Basque universal quantifiers; in particular, the purely distributive universal is the only one which cannot combine with a demonstrative phrase.

These results show that there is variation in the syntactic behaviour of different quantifiers within individual languages, and that the syntax–semantics relationship is not random. What is it about distributives which invites the structure whereby a lexical quantifier seems to function as a semantic determiner? This needs to be further investigated and explained. Note, however, that Gen7 is certainly not absolute. For example, Malagasy has a strongly distributive universal quantifier which still co-occurs with an article:

- (43) Inona no [p₁ andraikitry ny mpianatra tsirairay]?
 what Foc responsibility+gen the student each?
 For each student, what is his/her responsibility? [Rakotondranaivo 1986: 14]
 *What is the collective responsibility of the students? (Keenan 2008: 343)

¹⁹ Davis (2011, this volume) argues for a Brisson-style, non-truth-conditional analysis for several St’at’imcets strong quantifiers.

to which quantifiers attach directly to DPs, is universally valid. And as noted above, it may not even be the case that GQs are universally present. The conclusion I draw from this cross-linguistic study is that lexical quantifiers have the freedom to combine with elements of various types, in various ways. The places to look for interesting regularities may be at a more fine-grained level; some of the most interesting questions arising from the current study involve language-internal differences between individual quantifiers. I therefore suggest that rather than seeking a typology of languages with respect to quantification, what we need is a typology of individual quantifiers. If there are to be any cross-linguistically valid generalizations, it will be at the level of individual quantifiers, not at the level of ‘quantification’ in general.