Inverse Scope in CLLD: Why numerals have it?

1 Introduction: Inverse scope & CLLD

Numerical expressions have been analysed in different ways reflecting their mixed behavior (Barwise and Cooper 1981, Krifka 1998, Landman 2003, 2004, Kennedy 2015 a.o.). In this work, I discuss the peculiar scope behavior of numerals which are Clitic Left Dislocated (CLLD-ed) in Greek. In particular, whereas sentences involving a CLLD-ed indefinte do not exhibit inverse scope readings, sentences with CLLD-ed numerals do have an inverse scope interpretation, as shown in (1a) vs. (1b):

(1) a. Kapjo vivlio to diavase kathe mathitis.
Some book IT.CL read.PERF.PAST.3SG every student.NOM.
'Some book, every student read it.'
✓ Surface: *There is some book such that every student read this book.*
✗ Inverse: *For every student there is a possibly different book that he read.*

b. Dio vivlia ta diavase kathe mathitis.
two books THEM.CL read.PERF.PAST.3SG every student.NOM.
'Every student read two books.'
✓ Surface: *There are two books such that every student read these two books.*
✓ Inverse: *For every student there are two (or more) possibly different books that he read.*

Both constructions in (1) involve a CLLD-ed phrase. As it has been long observed in the literature, CLLD-ed phrases obligatorily take wide scope (Cinque 1990, Iatridou 1995, Alexiadou & Anagnostopoulou 1998, Alepoulou 2008 a.o.). Alexopoulou & Kolliakou (2002) explicitly argue that CLLD-ed numerals in Greek cannot take narrow scope. However, experimental work in progress shows that there is a clear contrast between CLLD-ed indefinites and numerals in the acceptability of inverse scope, which is not attested in sentences with broad-focus intonation. Crucially,the sentences are episodic, so the inverse scope cannot be due to a generic interpretation (Alexopoulou 2008). I argue that inverse scope is partly an illusion and that only the noun phrase (NP) has narrow scope, whereas the numeral takes wide scope. This is possible under an analysis of numerals as quantifiers over degrees (Kennedy 2012, Kennedy 2015), which licenses split scope between the numeral and the NP (Kennedy & Stanley 2009).

2 Experimental evidence: Numerals vs. plain indefinites

Following the intuition in (1), we tested inverse scope with a CLLD-ed indefinite (*kapjos* 'some') (**Exp**eriment 1) vs. a numeral (**Exp**eriment 2). In Exp1, 30 native speakers of Greek were presented with a truth judgment task in which they had to answer whether a sentence could describe a picture. The sentences varied with respect to the syntactic role of the CLLD-ed indefinite (subject (2) vs. object (3)) and they were recorded to ensure a CLLD intonation. Notice that in the case of the indefinite subject (2) the only clue that there is CLLD is intonation since there is no overt clitic. The pictures varied with respect to their scope (surface vs. inverse) and they involved diagrams with arrows matching the agent(s) with the theme(s). Stimuli involved 20 sentence-picture pairs (5 items per condition) plus 33 fillers.

(2) Kapjos ipurgos sinantise kathe epihirimatia.
some minister.NOM met every entrepreneur.
'Some minister met every entrepreneur'

(3) Kapjo vivlio to diavase kathe mathitis.
some book IT.CL read every student.NOM.
'Some book, every student read it.'

Surface: 1Min → 3Ents	**Cond(ition) 1**
Inverse: 3Mins → 3Ents	**Cond(ition) 2**

Surface: 3Stu → 1book	**Cond(ition) 3**
Inverse: 3Stu → 3books	**Cond(ition) 4**

Experiment 2 is exactly the same modulo substituting the indefinite with the numeral *dio* 'two' (with the necessary adjustments in diagrams). So far, we have tested 20 speakers but the difference in the acceptability of inverse scope is indicative for the contrast in (1a-1b). The acceptance rate of surface scope is high in both experiments (*Exp1*: 92% in **Cond1** and 85% in **Cond3** - *Exp2*: 90% in **Cond1**

and 85% in **Cond3**). However, acceptability of inverse scope varies significantly in the two experiments. In *Exp1*, with the indefinite, speakers only accepted inverse scope 11% of the times in both conditions (**Cond2&4**). In *Exp2*, with the numeral, on the other hand, in **Cond4** the acceptance rate is 55%. In **Cond2** the acceptance rate is much lower (but still higher than in Exp1), 27%. Although, the collection of the data and the analysis of the results is still in progress, we observe a significant difference in the inverse scope acceptability between the two experiments. In order to double-check results from previous experiments which showed that the indefinite *kapjos* tolerates inverse scope in other environments, we used the exact same design as in *Exp1* with the same pictures but with broad-focus intonation and indeed we found that speakers accepted inverse scope readings 57% of the times in **Cond2** (19 participants so far). Since plain indefinites (like numerals) generally allow inverse scope readings, the question remains as to what differentiates numerals from plain indefinites in CLLD.

3 Split scope: numerals as quantifiers over degrees

Preserving the idea in Alexopoulou & Kolliakou (2002) that CLLD-ed numerals in Greek take wide scope, we argue that the contrast between (1a-1b) can be explained if we take the numeral to have split scope with the noun phrase as it has been proposed by Kennedy & Stanley (2009), Kennedy (2013), Kennedy (2015). Under this view the numeral is CLLD-ed but the noun phrase is interpreted in object position, licensing an inverse scope interpretation. In order to derive a split scope, we need an analysis of numerals as quantifiers over degrees as in Kennedy (2013, 2015). According to this analysis, a numeral, e.g. *two*, is true of a property of degrees if the maximum number that satisfies the property is two (4a).

Whereas Kennedy's analysis works in terms of deriving the split scope, it is still problematic because (4a) gives rise to an upper-bounded reading which is too strong for sentences like (1b). As indicated for (1b), CLLD-ed numerals get a lower-bounded interpretation. Kennedy's treatment of lower-bounded numerals as singular terms wouldn't work in our case because the advantage of deriving split scope is lost. What we need is a meaning which licenses split scope but instead of a maximum introduces a minimum restriction (4b) deriving the lower-bounded and split-scope reading in (4c):

(4) a. $[\![\text{two}]\!]_1 = \lambda D_{\langle d,t\rangle}.max\{n|D(n)\} = 2$
b. $[\![\text{two}]\!]_2 = \lambda D_{\langle d,t\rangle}.min\{n|D(n)\} = 2$
c. $[\![(1b)]\!] = min\{n|\forall y.\exists x.[student(y) \wedge read(x)(y) \wedge books(x) \wedge \#(x) = n]\} = 2$

In the spirit of Geurts (2006), we take numerals to be ambiguous between (4a) and (4b). Notice that (4a)-(4b) are the meanings Nouwen (2010) suggests for *at most n* and *at least n* accordingly, leading us to adopt Kennedy's (2015) alternative account for the differences between bare and modified numerals. Additionally, an ambiguity analysis raises the question why we only get a lower-bounded interpretation in CLLD. I argue that this relates with the semantics of CLLD-ed constructions which seem to pattern with English sentences involving a Rise-Fall-Rise (RFR) accent. RFR-intonation (and CLLD-ed structures) invoke *uncertainty/incomplete information* inferences (see e.g. Bolinger (1982), Ward and Hirschberg (1985) and Constant (2012) for a critical explanation) yielding the most informative upper-bounded reading inappropriate in this context. Finally, we need to explain the lower acceptability of inverse scope in **Cond2** (27%) as opposed to **Cond4** (55%) in *Exp2*. It is possible that speakers interpret the prosodic pattern in different ways (since there was no other clue indicating CLLD). In order to further test this hypothesis, we are currently designing a new experiment which differs only in providing a context facilitating CLLD. Our prediction, is that the acceptability of inverse scope will increase for numerals but not for indefinites. Future research should also focus on potential complications which can arise by introducing the meaning in (4b) to the analysis proposed in Kennedy 2015.

Selected References

Alexopoulou D. & Kolliakou. 2002. On Linkhood and Clitic Left Dislocation. *Journal of Linguistics 38*, 193-245. • **Kennedy, C**. 2015. A "de-Fregean" semantics (and neo-Gricean pragmatics) for modified and unmodified numerals, 1-44. *Semantics and Pragmatics 8* • **Kennedy, C. & J. Stanley**. 2009. On average. *Mind 118*, 583-646.