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Quantifier scope and information structure in Greek

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In this paper, we investigate the availability of inverse scope interpretation in doubly-quantified sentences in Greek. A rather coarse and, as we show, inaccurate empirical generalization is that languages with relatively free word order do not have inverse scope readings, since movement is always spelled-out. In Greek there is little experimental work testing inverse scope with DP-quantifiers and there is considerable disagreement among linguists regarding its availability. Our goal is two-fold: i) to contribute towards a better understanding of the empirical facts and ii) to explore the relation between inverse scope availability and the syntax and semantics of different configurations. As we show, inverse scope is generally acceptable by Greek speakers, with the exception of environments with Clitic Left Dislocation. Our data add up to recent studies in other languages which suggest that the critical factor for the (non)-availability of inverse scope is the properties of each individual construction and not a dichotomy between different types of languages.

Keywords: Quantifier Scope; Information structure; Clitic Left Dislocation; Focus; Preverbal subjects; Greek

1 Introduction

In this paper, we investigate the availability of inverse scope with DP-quantifiers in Greek. Whereas in English it is well-established by now that sentences like (1) are ambiguous between the surface reading in (1a) that *there is a particular girl who chased all the cats* and the inverse reading in (1b) that *for every cat there is a possibly different girl that chased it*, there is no consensus so far regarding the availability of inverse scope for the corresponding Greek sentence in (2).

- (1) A girl chased every cat.
a. $\exists x. \text{girl}(x) \wedge \forall y. \text{cat}(y) \rightarrow x \text{ chased } y$
b. $\forall x. [\text{cat}(x) \rightarrow \exists y [\text{girl}(y) \wedge x \text{ chase } y]]$

- (2) Ena koritsi kinigise kathe gata.
A girl chased every cat.
'A girl chased every cat.'

As noticed in many works, there is considerable disagreement among linguists as to whether inverse scope is available for default SVO sentences as in (2) (see the discussion in Kotzoglou 2013). Given that the (non)-availability of inverse scope in SVO sentences is used as an argument in favor or against certain syntactic analyses of SVO sentences (Alexiadou & Anagnostopoulou 1998; Sifaki 2004; Spyropoulos & Revithiadou 2009; Kotzoglou 2013), it is important that we gather further empirical evidence for its avail-

ability or absence in our grammar. In this direction, this study tests the availability of inverse scope in Greek with different word order patterns, namely the neutral VSO and *default*-SVO and the marked ones in which either the subject (marked SVO) or the object (OVS) has undergone focus fronting or Clitic Left Dislocation (CLLD). In this way, we aim to clarify the picture regarding the “distribution” of inverse scope readings and therefore narrow our hypotheses regarding the syntactic analysis of certain debated constructions, namely default SVO and CLLD. That said, our goal is rather moderate; we do not intend to provide a syntactic analysis for SVO or CLLD, but rather present experimental data and evaluate the existing hypotheses in view of these data.

At the same time, the present study can be seen as part of a larger body of literature which tries to identify under which conditions inverse scope readings become available cross-linguistically. It is well known that there are differences among languages in the availability of inverse scope, especially with DP-quantifiers. For example, several languages including German, Japanese and Chinese, have been shown to resist inverse scope readings in constructions like their English counterparts in (1).

Within the generative framework, a fruitful idea explaining the cross-linguistic variability relies on the assumption that the inverse scope reading in sentences like (1) is derived by covertly moving the object quantifier over the subject (May 1977). Based on this, Huang (1982) introduces the constraint in (3) to account for the lack of inverse scope in Chinese (cf. Wei et al. 2014 showing that inverse scope is possible with adverbial quantifiers in Chinese).

- (3) The Isomorphic Principle (Huang 1982; Aoun & Li 1989):
Suppose A and B are Quantifier Phrases. Then if A c-commands B at S(urface)-Structure, A c-commands B at LF.

According to Huang (1982), the contrast then between English and Chinese is that English can violate this principle whereas Chinese does not because there is an alternative surface structure (see also Scontras et al. 2017).

Bobaljik & Wurmbrand (2012) build on the same assumptions but they model cross-linguistic variation in optimality terms. Taking as a starting point the correlation between scope-rigidity and free word order, emphasized by Szabolcsi (1997), they introduce the Scope Transparency Constraint, which is quite the mirror picture of (3):

- (4) Scope Transparency (ScoT):
If the order of two elements at LF is $A \gg B$, the order at PF is $A \gg B$.

In their system, there is a given LF which is the input to spell-out and different PFs compete as to which one is the best for the particular LF. Given the Scope Transparency constraint, we would expect that, whenever a language has the means to generate a PF that does not violate ScoT, this PF will win. This would predict that languages like German and Greek where arguments can move overtly are scope rigid.¹ Crucially, however, the constructions must have identical LFs, which excludes cases where a special topic or focus feature triggers movement. Bobaljik & Wurmbrand (2012) discuss the A/A'-distinction, suggesting that this is not the crucial property but rather whether there is a discourse-feature (topic/focus) driving movement.² However, as it is also acknowledged by Bobaljik

¹ This is in line with Sæbø (1997); Miyagawa (2012) who analyse QR as covert scrambling, predicting scope-rigidity in languages which have overt scrambling like German. Under this view, it is important to differentiate scrambling from other types of movement e.g. topicalization in English.

² Thanks to a reviewer for commenting on this point.

& Wurmbrand (2012), it is not always easy to differentiate between let's say scrambling in German and topicalization in Greek, since scrambling is also not neutral with respect to information structure. Beyond German and Greek, other languages like Japanese (Bobaljik & Wurmbrand 2012: 402, ft.4) or Russian (Ionin & Luchkina 2018) present a puzzle when it comes to decide what is discourse-marked or not.

Given these issues, we avoid outlining our predictions for Greek based on Bobaljik & Wurmbrand's analysis. What we keep from their work is that they explicitly dissociate scope-rigidity as a property from particular languages, arguing instead that scope-rigidity is characteristic of particular constructions derived from their special properties.

Greek, being a free word order language, has often been taken to lack inverse scope in certain configurations, i.e. in typical SVO sentences. However, the present experimental study indicates that inverse scope is available in unmarked SVO sentences. By investigating the distribution of inverse scope in different configurations, we are able to show a correlation between information structure and its availability.

These findings support a view where the derivation of inverse scope, unless it is ruled out by independent grammatical constraints, is available. However, we also notice large variation among participants suggesting that the accessibility of inverse scope readings depends on a number of competing factors including processing and contextual factors.

In the following section (Section 2), we introduce some background information on the semantics of quantifiers and the way scope ambiguities can be derived for the different word order patterns for Greek. In Section 3, we introduce our experimental study, starting with the experiments that tested inverse scope availability in the so-called unmarked word orders (VSO and SVO). In Section 4, we present the second part of our experimental work which investigates inverse scope availability in prosodically (and structurally) marked word orders (SVO and OVS), involving focus fronting or CLLD. Section 5 presents a general discussion of the results and concludes the main points.

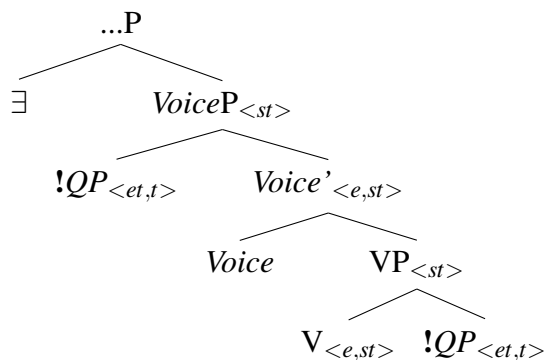
2 Deriving scope ambiguities in Greek

Following a long tradition in Generalized Quantifier Theory (Barwise & Cooper 1981) we take quantificational determiners like *every* to denote relations between sets of entities. As in Heim & Kratzer (1998), we represent the denotation of quantifiers as functions taking as their arguments characteristic functions of sets and returning a truth value, i.e. they are of type $\langle \langle e,t \rangle, \langle e,t \rangle \rangle$, allowing in this way for a straightforward compositional analysis.

Crucially, we assume a structure as in (5) for transitive sentences, where the external argument is introduced by Voice. Moreover, we take verbal predicates to denote properties of eventualities, i.e. a verb is a function with two arguments taking an event and entity and giving as output a truth value (*type* $\langle e, st \rangle$). Given (5) and the semantic type of quantifiers, there is a type mismatch both for the subject-QP and the object-QP which must undergo Quantifier Raising (henceforth QR) in the sense of May (1977), in order to be interpreted in a position above the VoiceP where the event argument has been saturated (Landman 1996; Lechner 2018).³

³ This is a long discussion made short for reasons of space here. The issue of type-mismatch is more general and independent from event semantics. For example, assuming that transitive predicates are two-place predicates, i.e. $\langle e, et \rangle$, the object-QP is in a non-interpretible position. However, if this were the only type-mismatch, we would derive the wrong results for Greek VSO word order; assuming that the subject is interpreted in-situ, inverse scope could be derived by one-step movement of the object-QP, whereas surface scope would require one more step movement of the subject-QP above the QR-ed object.

Since the problem of combining event-semantics with the semantics of *quantifiers* was noticed (Condoravdi & Beaver 2007) there have been suggested different ways, aside from QR, to solve it, mostly type-shifting rules either for the verbs (Champollion 2017) or even for the quantifiers (Alexeyenko 2018).

(5) *Syntax and semantics of VoiceP*

Given these basic assumptions, below we briefly outline the predictions we make for the derivation of surface and inverse scope on the basis of the different word order patterns.

2.1 Word order in Greek and the derivation of scope ambiguities

Greek is often described as a flexible word order language because it exhibits a variety of word orders depending on context.⁴ As it has long been observed (Philippaki-Warburton 1985; 1989; Catsimali 1990; Alexiadou & Anagnostopoulou 1998; Lascaratou 1998; Tzanidaki 1998; Alexiadou 1999; Spyropoulos 1999; Georgiafentis 2001; Keller & Alexopoulou 2001; Spyropoulos & Philippaki-Warburton 2002; Georgiafentis 2004; Georgiafentis & Sfakianaki 2004; Sifaki 2004; Roussou & Tsimpli 2006; Spyropoulos & Revithiadou 2009; Kotzoglou 2013; Sifaki 2013) the different patterns are associated with variation in information structure.

2.1.1 The default cases: VSO and SVO

We use the term *default* in terms of information packaging. That is, a sentence is characterized “default” if it can be uttered as an answer to the question “What happened?” without any previous context. There are two word orders satisfying this criterion; the VSO and the SVO word order.

Structurally, the VSO word order is considered to be the basic in Greek. VSO is derived by moving the verb to Tense leaving type-*e* arguments in-situ (see Philippaki-Warburton 1985; 1989; Alexiadou & Anagnostopoulou 1998; Lascaratou 1998; Spyropoulos & Revithiadou 2009; Kotzoglou 2013, but cf. Roussou & Tsimpli 2006). Given what we said in the previous section, a generalized quantifier, being of type $\langle et, t \rangle$, needs to raise (both from a subject and object position) to resolve a type-mismatch. Now there is a question about the timing of the operations. Assuming standard bottom-up derivations, we also adopt the cyclicity condition which guarantees that lower nodes move first. This, in minimalist terms, is formulated as the strict cycle condition in (6) (Chomsky 1993, especially for QR, Lechner 2018; Wurmbbrand 2018):⁵

In principle, we think that the two analyses make similar predictions regarding inverse scope availability, since in both cases an additional operation, QR or type-shift, is required in order to derive inverse scope readings (see Anderson 2004 for an overview of the two mechanisms in relation to processing cost). For the rest of this paper, following the argumentation in Fox (1998); Heim & Kratzer (1998); Hackl (2000); Lechner (2018) among others we assume that type-mismatch and scope ambiguities are derived via QR.

⁴ As emphasized by a reviewer, flexible word order should not be confused with non-configurationality. As the reviewer points out, although some studies analyse Greek as non-configurational, (Catsimali 1988; 1990; Horrocks 1994), most studies support a configurational approach.

⁵ Notice that Lechner (2018) takes cyclicity to be obeyed only by movement that happens at overt syntax, i.e. not by covert shifting operations. In this way, he derives the contrast between scope-rigid and scope-flexible languages, arguing that overt scrambling in German needs to obey (6) whereas in English it is possible to first move the subject and then the object, thus deriving inverse scope. However, under this view it would be difficult to explain why inverse scope is generally less preferred even in English. In this work, we consider movement always cyclic, whether covert or overt.

- (6) The strict cycle: Movement proceeds bottom up affecting lower nodes first.

In addition, we assume that QR is subject to locality constraints (see Cecchetto 2004), i.e. the object quantifier will move to the edge of the AspP, where the event argument has been existentially bound and it is a position where the QP can be interpreted.⁶ Given these assumptions, for a sentence as in (7) the surface scope reading is derived by the LF in (8b) where the object moves first and the subject follows to a higher position. As we see in (9b), in order to derive the inverse scope interpretation, an additional step of movement is required above the moved subject.⁷

- (7) Kinigise enas astinomos kathe klefti.
Chased a.NOM policeman.NOM every thief.ACC
'A policeman chased every thief.'

- (8) Surface Scope:

- a. $\exists x. \text{policeman}(x) \wedge \forall y. \text{thief}(y) \rightarrow x \text{ chased } y$
b. $[_{TP} [_{...P} \text{ a policeman}_2 \lambda_2 [_{...P} \text{ every thief}_1 \lambda_1 [_{\text{VoiceP}} t_2 \text{ Voice } [_{\text{VP}} \text{ chased } t_1]]]]]$

- (9) Inverse Scope:

- a. $\forall x. [\text{thief}(x) \rightarrow \exists y [\text{policeman}(y) \wedge y \text{ chase } x]]$
b. $[_{...P} \text{ every thief}_1 \lambda_1 [_{...P} \text{ a policeman}_2 \lambda_2 [_{...P} t_1 \lambda_1 [_{\text{VoiceP}} t_2 \text{ Voice } [_{\text{VP}} \text{ chased } t_1]]]]]]$

Under this view, we expect that in Greek VSO, surface scope will be the most accessible reading as the inverse scope reading involves one more step movement.

Things are not so clear for the default SVO word order. We should emphasize that when we talk about default SVO, we distinguish it from marked SVO in which the subject is obviously a focus or a contrastive topic, as indicated by the marked intonation. These cases are discussed below in parallel with the marked OVS word order. The default SVO word order involves broad focus, realized with a Nuclear pitch Accent (NPA) on the last stressed syllable and it can felicitously answer "what-happened" questions.⁸

The *unmarked* SVO word order presents a puzzle because, on the one hand, it cannot be simply analysed as focus or topic movement (i.e. A'-movement) and, on the other hand, there are strong arguments against the existence of an EPP- feature in Greek, which would trigger English-type A-movement (Alexiadou & Anagnostopoulou 1998). Given these

⁶ It is an open question what the relevant phase-boundary is in Greek (VoiceP or TP). If we assume that QR is subject to the Phase Impenetrability Condition (PIC), i.e. that in order for the quantifier to be accessible for future derivations it should first move to the edge of a phase, the only way to explain this one-swoop movement would be to argue that the VoiceP is not the phase boundary. This possibility has been expressed in different ways in the literature, e.g. with a dynamic view on phasehood (Den Dikken 2007; Gallego 2010). Especially for Greek, evidence comes from different angles that the phase extends up to TP (Mavrogiorgos 2010; Spyropoulos & Stamatogiannis 2011; Christopoulos & Petrosino 2017; Revithiadou et al. 2019). If this is true then at least up to the TP-level there shouldn't be any restrictions on QR and there is no need to assume an intermediate step movement for the object. We are grateful to two Glossa reviewers for their feedback on this point as well as pointing to the relevant literature.

⁷ Following a reviewer's suggestion we would like to point out that in the case of VSO, the inverse scope reading cannot be derived by quantifier lowering or reconstruction (e.g. Johnson & Tomioka 1997; Johnson 2000; Lechner 2018) because there is no feature-driven movement that would allow the subject to move before the object (see footnote 3). Following Lechner (2018)'s assumptions, we could argue that reconstruction is possible for the SVO word order. However, given that both quantifier raising and lowering (or semantic reconstruction) have been argued to involve a processing cost (Anderson 2004; Wurmbrand 2018) this shouldn't make any different predictions in our study.

⁸ Whereas with one-argument clauses, VS is preferred over SV (Spyropoulos & Revithiadou 2009), when the clause involves a transitive predicate, an SVO word order has been found to be more frequent. As a reviewer points out, this is first argued for in Lascaratou (1989) and there is also experimental evidence that even in out-of-the-blue contexts speakers prefer SVO, and VSO comes second in preference, although much higher than other marked word orders (Keller & Alexopoulou 2001).

complications, some argue more in favor of an A-movement approach (Sifaki 2004; Roussou & Tsimpli 2006; Spyropoulos & Revithiadou 2009) whereas others analyse SVO as A-movement or CLLD (Philippaki-Warbuton 1985; 1989; Tsimpli 1990; Anagnostopoulou 1994; Alexiadou & Anagnostopoulou 1998; Kotzoglou 2013). The two analyses make different predictions. Under a movement analysis, we expect inverse scope to be available by QR of the object quantifier above the moved subject, as in (9b). Under a hypothesis that the subject is CLLD-ed and (according to some analyses) base-generated in its position (see e.g. Alexiadou & Anagnostopoulou 1998), we expect wide scope only. Since all possibilities are open, our strategy is to test availability of inverse scope in default-SVO and in SVO sentences with CLLD and compare the two cases. Below we discuss CLLD and focus fronting.

2.1.2 The marked cases: CLLD and focus (SVO & OVS)

As it has been emphasized in Alexopoulou & Kolliakou 2002, Greek has different topicalization strategies. Here we focus on CLLD with contrastive topics.⁹

As we mentioned in the Introduction, the syntax of CLLD is still an open issue in linguistics not only for Greek but also for Romance languages. Before presenting the existing analyses of CLLD, it is important to clarify that whereas when an object is CLLD-ed, a clitic serves as the witness for CLLD (10b), in the case of a CLLD-ed subject there is no such witness because there is no overt clitic (10a).¹⁰ The only clue for a CLLD-ed subject is the contrastive context and the prosody which follows the same pattern as CLLD-ed objects. In (10a), the contrastive topic is the subject *Ira*, contrasted with *Ana*. In (10b) the object *ton ktiniatro* ‘the vet’ is CLLD-ed contrasted with *ton nosokomo* ‘the nurse’. At this point we should mention that all instances of object-fronting are translated with a passive in English in order to avoid an information marked construction in English because there is no one-to-one correspondence with Greek marked word orders. The reader should keep in mind that the Greek sentences are active and the fronted objects have a marked intonation pattern.

- (10) a. i Ira plirose ton ktiniatro. I Ana ohi.
the Ira.NOM paid the vet.ACC the Anna.NOM not.
‘Ira paid the vet. Anna didn’t.’
- b. Ton ktiniatro **ton** plirose i Ira. Ton nosokomo ohi.
the vet.ACC CL.HIM paid the Ira.NOM the nurse.ACC not
‘The vet was paid by Ira. The nurse wasn’t.’

Broadly, we can distinguish two approaches for CLLD:

- i. *Movement*: Kayne (1975); Cinque (1977); Agouraki (1992); Cecchetto (2000); Kupula (2014); López (2014); Angelopoulos & Sportiche (2019)
- ii. *Base generation*: Cinque (1990); Anagnostopoulou (1994); Iatridou (1995); Alexiadou & Anagnostopoulou (1998); Alexopoulou & Kolliakou (2002); De Cat (2007)

⁹ The reason why we want to focus on CLLD-ed contrastive topics is because the aboutness topic syntactically correlates with Hanging Topic Left Dislocation (HTLD) which is expected to have a wide scope interpretation. Under all analyses, HTLD involves base-generation (above CP) of an *aboutness topic* (Alexiadou 2006; Angelopoulos & Sportiche 2019). Ways to distinguish between the two involve their prosodic pattern, the context they appear in and certain distributional differences which favor a different syntactic analysis of the two. From all types of topic (i.e. familiarity topics, thematic topics, see Reinhart 1981) we consider contrastive topics one of the clearest cases to test.

¹⁰ In this case an issue arises, because although CLLD is the most common way to express a contrastive topic, as Alexopoulou & Kolliakou (2002) discuss, it is not the only way. Plain topicalisation (i.e. without the clitic) can be employed under certain circumstances. Given that there is no clitic to witness CLLD for subjects, it is possible that Contrastive Topics that are subjects are simply topicalized. However, given that plain topicalization is very restricted as Alexopoulou & Kolliakou (2002) show, we take a subject contrastive topic to be analysed on a par with the CLLD-ed objects. In other languages there is also a clitic for subjects, making it easier to distinguish topicalization from CLLD (see Angelopoulos & Sportiche 2019).

The movement approach is in principle consistent with an inverse scope interpretation. Of course, there are important differences between different authors. In order to be more specific, we focus on Angelopoulos & Sportiche's (2019) analysis. They analyse CLLD of DPs as involving first an A-movement step (like German scrambling) and then A'-movement towards the left periphery. As it has been observed, binding reconstruction is possible in CLLD, providing the main evidence for such an analysis. Under this view, we expect that if a CLLD-ed object has first moved to an intermediate position above VoiceP where it is interpretable, it can have an inverse scope reading via reconstruction (13b).

- (11) Kapjon klefti ton sinelave kathe astinomos.
 some thief.ACC CL.HIM arrested every policeman.NOM
 'Some thief was arrested by every policeman.'

(12) *Surface Scope*

- a. $\exists x. \text{thief}(x) \wedge \forall y. \text{policeman}(y) \rightarrow y \text{ arrested } x$
 b. $[\dots_P \text{some thief}_1 \lambda_1 [_{TP} [\dots_P \text{every policeman}_2 \lambda_2 [\dots_P t_1 \lambda_1 [_{VoiceP} t_2 \text{Voice} [_{VP} \text{arrested } t_1]]]]]]$

(13) *Inverse Scope via reconstruction*

- a. $\forall y. [\text{policeman}(y) \rightarrow \exists x[\text{thief}(x) \wedge y \text{ arrested } x]]$
 b. $[\text{some thief}_1 \lambda_1 [\dots_P \text{every policeman}_2 \lambda_2 [\dots_P \text{some thief}_1 \lambda_1 [_{VoiceP} t_2 \text{Voice} [_{VP} \text{arrested } t_1]]]]]]$

A CLLD-ed subject can get inverse scope if the object-QP raises via a second- step movement above the CLLD-ed subject (16b):

- (14) Kapjos astinomos sinelave kathe klefti.
 some policeman.NOM arrested every thief.ACC
 'Some policeman arrested every thief.'

(15) *Surface Scope*

- a. $\exists x. \text{policeman}(x) \wedge \forall y. \text{thief}(y) \rightarrow x \text{ arrested } y$
 b. $[\dots_P \text{some policeman}_2 \lambda_2 [_{TP} [\dots_P \text{every thief}_1 \lambda_1 [_{VoiceP} t_2 \text{Voice} [_{VP} \text{arrested } t_1]]]]]]$

(16) *Inverse Scope*

- a. $\forall y. [\text{thief}(y) \rightarrow \exists x [\text{policeman}(x) \wedge x \text{ arrested } y]]$
 b. $[\dots_P \text{every thief}_1 \lambda_1 [\dots_P \text{some policeman}_2 \lambda_2 [_{TP} [\dots_P t_1 \lambda_1 [\dots_P [_{VoiceP} t_2 \text{Voice} [_{VP} \text{arrested } t_1]]]]]]]]$

However, empirically CLLD has been associated with wide scope readings. Partially, wide scope interpretation of indefinites in CLLD has constituted an argument in favor of base-generation approaches. For example, if we take the adjunction site of the CLLD-ed expression to be above the CP (Iatridou 1995; Anagnostopoulou 1997; Alexiadou & Anagnostopoulou 1998), then we predict that a QP from inside the CP cannot raise above the CLLD-ed QP, because of the clause-boundedness restrictions on QPs (see Farkas & Giannakidou 1996; Wurmbrand 2018 a.o. on clause-boundedness).

A different explanation is suggested by Alexopoulou & Kolliakou (2002) who associate wide scope in CLLD with the function of the CLLD-ed elements as discourse topics (links). However, Alexopoulou & Folli (2019) abandon this account since, as

they argue, it cannot explain why CLLD-ed indefinites in Italian can be in the scope of a universal. In Alexopoulou & Folli (2019), they develop an account according to which the clitic in Greek is obligatorily referential, therefore forcing a referential interpretation for the CLLD-ed indefinite. From the same reasoning, it follows that true quantifying expressions cannot be CLLD-ed. Alexopoulou (2009) among others (Anagnostopoulou 1994; Iatridou 1995; Tsimpli 1995; Giannakidou 1998) argue that quantifiers like *kathe* ‘every’ and *kanis* ‘nobody’ cannot be CLLD-ed unless the sentence expresses a generic context.¹¹ However, there is a series of arguments against the clitic being referential (e.g. expletive clitics in idiomatic expressions, generic clitics, clitics which double anaphors, see Angelopoulos & Sportiche 2019 and the references therein). From our perspective, a referential-clitic analysis seems to make no predictions for wide-scope of operators other than indefinites. Wide scope in CLLD seems to be a general phenomenon not restricted to indefinites. Focus operators like *mono* ‘only’ and *akomi ke* ‘even’ can be CLLD-ed along with the focused DP.¹² In (18) and (20) the *only-DP* and the *even-DP* are CLLD-ed and, consequently, they obligatorily get wide scope over the indefinite whereas their non-CLLD-ed version in (17) and (19) has both readings.

- (17) Kapja gineka filise mono ton Petro.
 some woman kissed only the Peter.ACC
 ‘Some woman kissed only Peter.’
 ✓*only* > \exists : Nobody except for Peter was woman-kissed.
 ✓ \exists > *only*: A specific woman kissed nobody except for Peter.
- (18) Mono ton Petro ton filise kapja gineka.
 only the Peter.ACC CL kissed some woman.
 ‘Only Peter is such that he was kissed by a woman.’
 ✓*only* > \exists : Nobody except for Peter was woman-kissed.
 # \exists > *only*: A specific woman kissed nobody except Peter.
- (19) Kapja gineka filise akomi ke ton Petro.
 some woman kissed even ADD the Peter.ACC
 ‘Some woman kissed even Peter.’
 ✓*even* > \exists : Even Peter, the least likely to be kissed, was woman-kissed.
 ✓ \exists > *even*: There is a woman who kissed (among others) even Peter.

¹¹ As Giannakidou (1998) notices, quantifiers can be CLLD-ed even in episodic contexts, as long as there is already a context where the set picked out by the quantifier is made salient. For example, we agree that (ia) is odd as a statement, however if there is a particular set of students we are referring to (d-linking), as in (ib), CLLD of ‘no student’ seems quite natural:

- (i) a. #Kanenan fititi den ton ida htes.
 no.ACC student.ACC not CL.3SG saw yesterday.
 ‘No student I saw yesterday.’
 b. ✓Kanenan fititi apo aftus pu les den ton ida htes.
 no.ACC student.ACC from those that say.2SG not CL.3SG saw yesterday.
 ‘No student from those you talk about I saw yesterday.’

¹² The semantics of these constructions are very interesting for the semantics of Focus and CLLD and their relation but we leave them for future research.

- (20) Akomi ke ton Petro ton filise kapja gineka.
 even ADD the Peter.ACC CL kissed some woman.
 ‘Even Peter is such that he was kissed by a woman.’
 ✓*even* > \exists : Even Peter, the least likely to be kissed, was woman-kissed.
 # \exists > *even*: There is a woman who kissed (among others) even Peter.

In this case the wide scope requirement cannot be due to the properties of the clitic because referentiality is satisfied under both readings. At best, we would have to assume two different explanations for different types of operators taking wide scope, but this sounds counterintuitive.

A third (related) possibility, for the observed wide scope of indefinites in CLLD, is that this is enforced by the semantics of CLLD which associates with a contrastive topic. This view is explored in Arregi (2003) who argues that only referential type <e> expressions can be CLLD-ed. Constant (2012; 2014) argues that contrastive topics establish a contrast between subsets of a larger set that is salient in the discourse. Therefore, when indefinite QPs are contrastive topics, they tend to be interpreted as denoting plural individuals, pointing to a particular subset of individuals, rather than generalized quantifiers. That said, as Constant (2014) points out, when the context facilitates a reading where we contrast proportions, it is possible that we interpret indefinite QPs which are contrastive topics as true quantifiers.

Given this complicated picture, our experimental findings will be telling only if we find that inverse scope is available with CLLD (which goes however against our intuitions and most of the literature). If we find that indeed inverse scope is not possible in CLLD, we will have to do some extra work to see if this can inform us further about the syntax of CLLD.

In the case of focus fronting, things are easier as there is general agreement that it is derived via focus-movement (Tsimplici 1995; Gryllia 2008 a.o.). Since there is movement we expect inverse scope to be available as in (13) and (16) where we postulated movement of the object and the subject accordingly. A most interesting question when it comes to focus is whether the pragmatics and the semantics of focus constructions affect speakers’ scope preferences. As we will see F-marking, depending on its position, can facilitate inverse scope interpretation. In what follows, we start with the unmarked VSO and SVO word orders (Section 3) and then we introduce the experiments with Focus and CLLD (Section 4).

3 Testing inverse scope in *default* word orders: Experiments 1 & 2

Experimental work on quantifier scope in Greek is scarce. Baltazani (2002) was the first to test experimentally scope ambiguities in Greek. Her work provides a solid basis for future studies, as she focuses on the interaction of prosody and scope preferences. Most importantly, she provides a detailed discussion on the prosody of doubly-quantified sentences and the general prosodic patterns for Greek which we take as a basis in our study (also Baltazani & Jun 1999; Arvaniti & Baltazani 2000; 2005, etc). Baltazani (2002) finds no interaction of prosody or word order for doubly quantified sentences. Instead, she finds a correlation between subjecthood and wide scope. However, in Baltazani’s (2002) experiment there are many different quantifiers also attested in different word orders, making it hard to make stronger claims about each one of them. The effect of prosody on scope is also investigated by Chatzikonstantinou et al. (2012). They focused on the interaction of negation with NPIs and universal quantifiers and they found an effect of prosody with NPIs but not with universal quantifiers (cf. Baltazani 2002). Finally, Katsimpokis (2015) investigates inverse scope, suggesting that inverse scope, although not the preferred interpretation, is available.

In the present study we focus on the existential quantifier *kapjos* ‘some’ with the universal quantifier *kathe* ‘every’ in unmarked and marked structures.¹³ First, we present the experiments with default VSO and SVO.

(21) Part#1: Default VSO & SVO

- **Exp1:** VSO word order with *kapjos* – *kathe* [25 participants]
- **Exp2:** SVO word order with *kapjos* – *kathe* [30 participants]

3.1 Design and materials

In both experiments we used a Truth Value Judgement (TVJ) task with pictures. The two experiments differ only in the word order (VSO vs. SVO). We used a 2 × 2 design with the position of the quantifiers (indefinite in the subject or object position) and the scope scenario (surface vs. inverse) as the two factors, providing four different conditions in total (Table 1).

In conditions 1 and 2, the indefinite is the subject and precedes the universal object as in (22). Con1 matches (22) with a picture where the same agent acts upon different themes (Figure 1), providing a surface scope scenario. In Con2, the same sentence (22) is matched

Table 1: Conditions in experiments 1 & 2.

Exp1	Exp2	Surface	Inverse
VS ₃ O _v	S ₃ VO _v	Con1	Con2
VS _v O ₃	S _v VO ₃	Con3	Con4



Figure 1: Inverse (Con1).

¹³ We chose *kapjos*, -a, -o because it is a pure existential in contrast with the indefinite *enas* which is “ambiguous” between a numeric ‘one’ interpretation and an indefinite ‘a’ interpretation. However, preliminary experiments we conducted showed that there is no significant difference between the two. In addition, we do not discuss the quantifier *oli* ‘all’ which has different properties from other universal quantifiers (see Brisson 2003).

with a picture where there is a different agent for every theme (Figure 2), providing an inverse scope scenario:

(22) Conditions 1 & 2

- a. Potise kapjos andras kathe luludi. VS_3O_V (EXP1)
 watered some man.NOM every flower.ACC
- b. Kapjos andras potise kathe luludi. S_3VO_V (EXP2)
 some man.NOM watered every flower.ACC
 ‘Some man watered every flower.’

In conditions 3 and 4, the universal is the subject and precedes the indefinite object as in (23). Con3 matches (23) with a picture where different agents act upon different themes (Figure 3), providing a surface scope scenario. In Con4, the same sentence (23) is matched



Figure 2: Surface (Con2).



Figure 3: Surface (Con3).

with a picture where different agents act upon the same theme (Figure 4), providing an inverse scope scenario:

(23) Conditions 3 & 4

- a. *Kathe zografos zografise kapja gineka.* VS_3O_V (EXP1)
 every painter.NOM painted some woman.ACC
- b. *Zografise kathe zografos kapja gineka* S_VVO_3 (EXP2)
 painted every painter.NOM some woman.ACC
 ‘Every painter painted some woman.’

In each experiment, there were 24 sentence-picture pairs (i.e. 6 items per condition). A participant would never hear the same sentence across two different conditions. This means that we had a between-design, i.e. for a given target half of the participants would see the inverse scope scenario and half the surface scope scenario.

Sentences were recorded to ensure broad focus intonation. The sentences were annotated using Praat software to ensure that they patterned with a typical broad-focus contour, usually realized with a H^* NPA in the last stressed syllable (see Figures 1 and 2 in Appendix, Baltazani & Jun 1999; Baltazani 2002; Arvaniti & Baltazani 2005). All the sentences involved accusative objects (not prepositional complements) in order to avoid potential interaction between the status of the arguments and the scope preferences. In addition, all sentences were in past perfective to avoid any effect of generic interpretations arising with imperfective aspect (Fox & Sauerland 1997; Alexopoulou 2009).¹⁴

The pictures involved playmobil characters, as exemplified in Figures 1–4. Each scenario is represented with three different subpictures, to ensure event distributivity associated with the quantifier *kathe*, especially in conditions 1 and 4.



Figure 4: Inverse (Con4).

¹⁴ As a reviewer points out, imperfective aspect can also be interpreted as progressive. In this case, we do not know if the perfective – imperfective distinction affects inverse scope acceptability. Preliminary results from a pilot study we conducted at an earlier stage of this work (20 participants), where we tested an equal number of past perfective and present imperfective sentences with VSO word order, shows that there is no significant effect. It is still an open issue however, and to our knowledge there is no experimental work testing the role of aspect on the availability of inverse scope.

3.2 Procedure and participants

The participants first hear a sentence and right after, one picture appears on the screen. They have 10 seconds to decide if the sentence they heard *can* describe the picture they see. A yes-answer was recorded by pressing a green key on the right side of the computer and a no-answer by a red key on the left side. The experiment was designed using the 2nd version of E-Prime professional software (Schneider et al. 2002). Response time was recorded from the moment that the sentence stopped and the pictured appeared till the participant pressed a key.

25 participants participated in experiment 1 and 30 participants in experiment 2. All participants were recruited in the National and Kapodistrian University of Athens and The Panteion University of Social and Political Sciences both located in Athens. They were all native speakers of Greek, grown monolingually. The session lasted around 10–15 minutes.

3.3 Predictions

In general, we expect that surface scope is accepted by speakers since it is also the most accessible reading. The question is what happens with the inverse scope and, more particularly, in the critical condition 2, where the indefinite precedes and c-commands the universal. We should emphasize that condition 4, where the universal precedes and c-commands the indefinite, is not a clear test case for inverse scope acceptability. As it has long been noticed (Reinhart 1997) the inverse scope reading is also consistent with a surface scope reading (i.e. inverse entails surface). According to Mayr & Spector (2010), the inverse scope reading in this case is excluded from the Generalized Scope Economy Condition since it is stronger than the surface reading.

- (24) Generalized Scope Economy Condition: A Covert Scope Shifting Operation (CSSO) cannot apply if the meaning of the resulting reading is equivalent to or stronger than (i.e. entails) the meaning that would have resulted without it.

Therefore, the critical word order in deciding whether inverse scope is available is the one in which the existential precedes and c-commands the universal (see also Scontras et al. 2017; Ionin & Luchkina 2018). In this case, the inverse scope scenario does not entail the surface and therefore, if inverse scope is available, there must be a scope-shifting operation. This means that our predictions for conditions 2 and 4 are different. In Con2, we test whether speakers accept an inverse scope interpretation. Given the theoretical discussion in Section 2, we expect that even in cases where inverse scope is predicted to be derived by our grammar (via QR), it may be less accessible since it involves some additional operation. In the case of Con4, where the universal precedes the indefinite the inverse scope entails the surface, so if the entailment pattern is directly available to the speakers we expect them to accept both readings.

Now there is a question if we expect different results for Con2 between the VSO and the SVO word order. Based on the possibilities we mentioned in Section 2.1 the availability of inverse scope with SVO word order is more debatable. Depending on the way we analyse SVO i.e. movement of the subject or base-generation, we make different predictions. It is also possible that the subject in SVO order has a topical status therefore favoring wide scope compared with the VSO order.

3.4 Results

We fitted Generalized Linear Mixed-Effects Models as implemented in the function `glmer` in the R package `lme4` (Bates et al. 2015). The only fixed factor was the condition. As random variables we modeled subject and the audio file the subjects listened to.

The full random structure with random slopes and the variance matrix for condition usually did not converge. We cut it down to a reasonable size. Random slopes for items (audio file) were disregarded. Random parameters for items are usually at least one order of magnitude below that for subjects, so intercepts should suffice here. For the subjects we removed the correlation parameters. Including them produced unrealistically high correlation parameters which usually are spurious. We evaluated the planned contrasts which test our predictions with the emmeans package (Lenth 2020).

Figure 5 and Table 2 show the results for Exp1. The transparent dots represent per person means of the binary answers given by the subjects. The size of the dots represents the number of subjects with a given mean in a given condition. The error bars are bootstrapped confidence intervals.

The difference between conditions 1 and 2 is significant ($p < .001$). The confidence interval reaches from 1.62 to 3.85 in the log_t space. This large distance from 0 confirms the impression of the clear difference in the exploratory Figure 5. Between conditions 3 and 4 there is no significant difference, but the confidence interval from -0.833 to 1.12 is wider than the figure alone would suggest. This is most likely due to the profound inter personal differences which can be deduced from the large spread of per person means in Figure 5. They are also reflected in the mean standard deviation of 1.39 estimated for the 2 random variance parameters for subjects.¹⁵

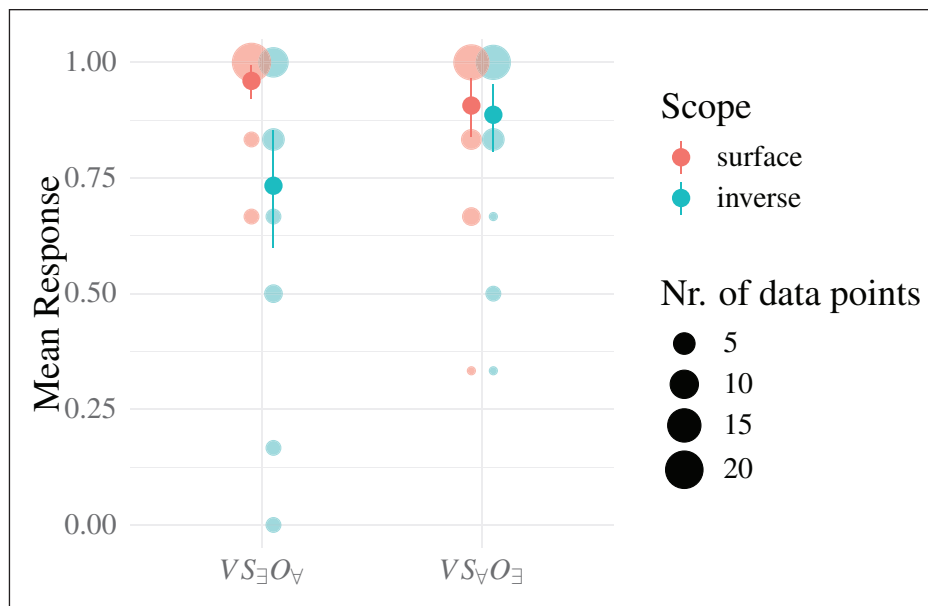


Figure 5: Exp1. The mean response of the participants is shown on the y axis. Larger semi transparent blobs correspond to a higher number of participants having this particular mean response. The error bars are boot strapped confidence intervals as computed with the `Hmisc` R package (Harrell et al. 2019).

Table 2: Mean proportion of acceptance for Exp1.

Exp1	Surface	Inverse
VS _∃ O _∇	96%	73%
VS _∇ O _∃	91%	89%

¹⁵ Due to boundary fits for 2 variance parameters we removed them from the model.

Figure 6 and Table 3 show the results for Exp2. The design of Figure 6 and all following figures displaying the results of individual experiments are completely analogous to the design of Figure 5.

The results are structurally very similar to Exp1. The difference between conditions 1 and 2 is significant ($p < .001$) with a confidence interval from 1.61 to 4.19. Between conditions 3 and 4 there is no significant difference, again with a large confidence interval from -2.64 to 0.169 . Again, this corresponds to a mean standard deviation of 1.24 estimated for the 4 random variance parameters for subjects.

3.5 Discussion: Availability of inverse scope with default word orders

As we expected surface scope is generally acceptable by speakers. What is interesting is that inverse scope in the critical condition 2 is quite high in both experiments (73% in the VSO word order and 60% in the SVO word order). These results are comparable to previous studies of inverse scope in English (e.g. in Scontras et al. 2014 inverse scope in sentences like *A shark attacked every pirate* has mean acceptance 53%).

Regarding the difference depending on word order, we observe that there is indeed a difference between SVO (60%) and VSO (73%). In order to test its significance, we combined the data for Experiments 1 and 2 and added an interaction for the variable indicating the experiment, or, equivalently, the word order. The interaction is not significant, neither is the main effect for the experiment variable. That is, the data are compliant with the hypothesis that there is no difference between Experiments 1 and 2, against our predictions. This can mean either that indeed there is no difference depending on word order

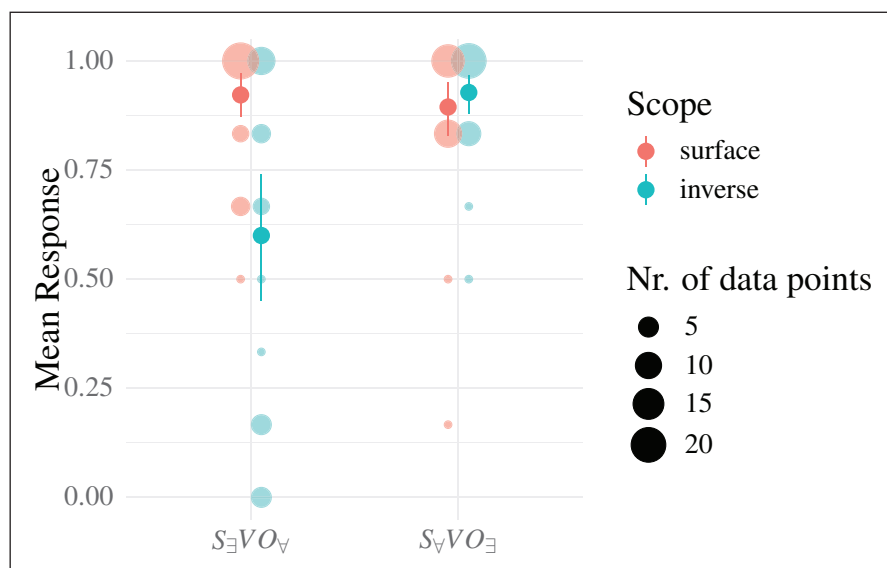


Figure 6: Exp2. The mean response of the participants is shown on the y axis. Larger semi transparent blobs correspond to a higher number of participants having this particular mean response. The error bars are boot strapped confidence intervals as computed with the `Hmisc` R package (Harrell et al. 2019).

Table 3: Mean proportion of acceptance for Exp2.

Exp2	Surface	Inverse
S_VVO_V	92%	60%
S_VVO_Ξ	89%	92%

or it might be a power problem. In any case, the data clearly suggest that inverse scope is available also with SVO word order.

In addition, an important finding of this experiment, which is in line with what Scontras et al. (2014; 2017) find, is that when a universal precedes an indefinite (Con4) both the surface and the inverse scope are highly acceptable. This correlates with the Generalised Scope Economy Principle in (24) since it suggests that inverse scope readings in conditions 2 and 4 are derived via completely different paths. From now on, when we use the term “inverse scope” without further explanation, we will refer to cases where the indefinite precedes the universal.

Finally, in both experiments we observe huge inter participant variation (Figures 5 and 6) whereas item variation was considerably smaller. Though some of the data suggest a bimodal distribution (most prominently Exp2 in Con2), no sound statistical support for this could be found. Therefore, we cannot argue for the the existence of a split between speakers who accept inverse scope and speakers who do not. Interestingly, speaker variation is something that we observed already among the Greek linguistic community, and is now confirmed by the present experimental study. The fact that there is large variation suggests that the availability of inverse scope cannot be purely explained as allowing a grammatical mechanism but it should be mediated by some pragmatic factors. We come back to this issue after we present the second part of our experimental study.

4 Information structure effects: Experiments 6, 7 & 8

Having established that inverse scope readings are available with the default, SVO/VSO word orders, the second round of experiments explores scope preferences in marked environments, i.e. sentences in which the indefinite QP is focused (Exp7) or CLLD-ed (Exp8). In addition, we tested again SVO sentences with broad-focus intonation (unmarked/default, Exp6), using the new design and items, in order to have a direct comparison between the marked and the default cases.

(25) Part#2: The role of information structure

- **Exp6:** Default SVO with *kapjos – kathe* [33 participants]¹⁶
- **Exp7:** Focused SUBJ & OBJ IND with *kapjos – kathe* [36 participants]
- **Exp8:** CLLD-ed SUBJ & OBJ IND with *kapjos – kathe* [27 participants]

The design in this set of experiments is similar to the design of the previous experiments (using the 2nd version of E-Prime professional software, Schneider et al. 2002). We used a picture TVJ task with a 2 × 2 design, varying the position of the quantifiers and the scope scenario. The scenarios were presented diagrammatically and not with playmobil characters, in order to have more flexibility to contrast properties (i.e. ministers, singers, tourists etc.), a requirement both in the case of focus and CLLD. In all experiments (Exp6, 7 and 8) we used the same sentence- picture pairs (modulo information structure differences) and we had 20 items (5 per condition) and 44 fillers.

The procedure was exactly the same as in the previous experiments. After hearing a sentence, the participants had to decide if it could describe the diagram on the screen. A

¹⁶ The numbering of the experiments follows the convention we used in our statistical analysis. We skip experiments 3–5 which are not relevant for this paper. The statistical analysis for all experiments is available upon request.

yes-answer was recorded by pressing a green key on the right side of the computer and a *no*-answer by a red key on the left side. Similarly to Exp1 and 2, participants had 10 seconds to answer and the response time was recorded.

In Exp6 (default SVO) 33 participants were tested. In Exp7 we had 36 participants and in Exp8 27. All participants were recruited in the National and Kapodistrian University of Athens and The Panteion University of Social and Political Sciences both located in Athens. They were all native speakers of Greek, grown monolingually, between 20 and 45 years old. Each session lasted around 8–12 minutes.

4.1 Experiment 6 (default SVO): A replication of Exp2

Exp6, replicating Exp2, tests SVO sentences with broad focus intonation (see Appendix, Figure 3). The conditions (repeated in Table 4 for convenience) match exactly the conditions in Exp2, in which the same quantifiers were tested in the same word order (default SVO). The only difference is the items we used and the use of diagrams instead of play-mobil pictures.

The surface scope for a sentence like (26) is represented using a diagram with an agent (*minister x*) arrowed to three themes (*Entrepreneur A, B and C*) as shown in Figure 7. Inverse scope for the same sentence is represented as in Figure 8 with three agents, each mapping to a different theme.

- (26) Condition 1 & 2
 Kapjos ipurgos sinatnise kathe epihirimatia. $S_{\exists}VO_{\forall}$
 some minister.NOM met every entrepreneur.
 ‘Some minister met every entrepreneur.’

Table 4: Conditions in Exp6.

Exp6	Surface	Inverse
$S_{\exists}VO_{\forall}$	Con1	Con2
$S_{\forall}VO_{\exists}$	Con3	Con4

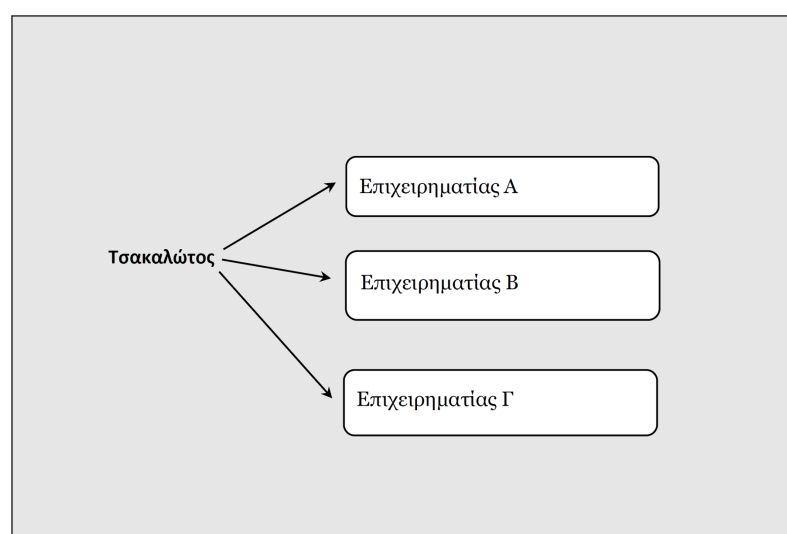


Figure 7: Surface (Con1).

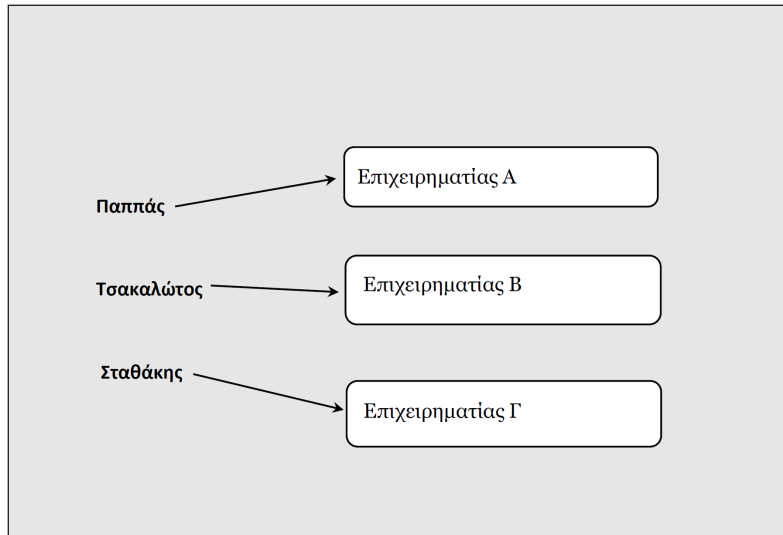


Figure 8: Inverse (Con2).

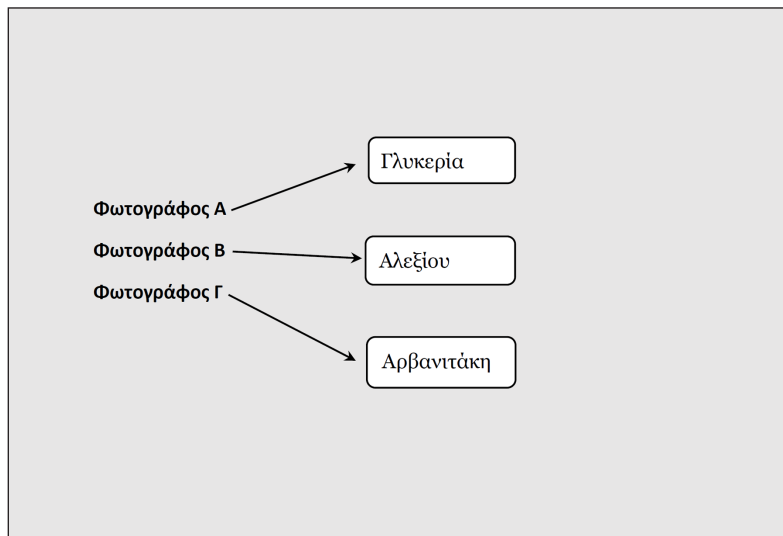


Figure 9: Surface (Con3).

Accordingly, for a sentence where the universal precedes the indefinite as in (27), surface scope is represented again with a three to three mapping (Figure 9) whereas inverse scope is represented as in Figure 10 with a mapping from three agents (*photographer A, B and C*) to a single theme (*singer x*).

- (27) Condition 3 & 4
 Kathe fotografos fotografise kapja tragudistria. S_VVO_3
 Every photographer photographed some singer.

As one can see by comparing the sentences and the scope scenarios in (26–27) with the ones in Exp2, Exp6 and Exp2 test exactly the same conditions, i.e. the availability of inverse scope in broad-focus (unmarked) SVO sentences with the same quantifiers. Therefore, the expectation is to find similar results with Exp2.

4.1.1 Experiment 6 (default SVO): Results & discussion

Figure 11 and Table 5 summarise the results for Exp6. Both contrasts are significant. The difference between conditions 1 and 2 ($p < .001$) has a confidence interval from 1.18 to 3.36. The confidence interval for the difference between conditions 3 and 4 ($p < .001$) shows a confidence interval from 2.52 to 5.79.

Partially, the results conform to our expectations. Surface scope in Con1 is high whereas inverse scope in Con2 is significantly lower but still accepted above 50% of the times. Crucially when we compare Exp2 with Exp6 we find that the difference in the critical

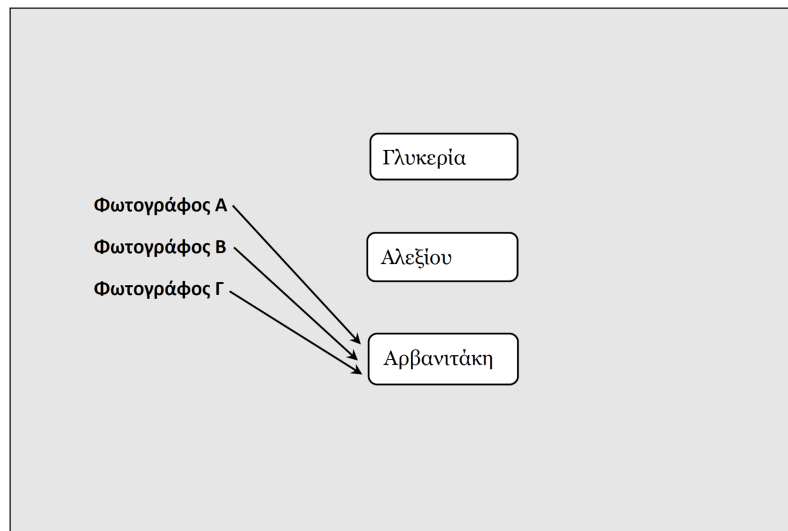


Figure 10: Inverse (Con4).

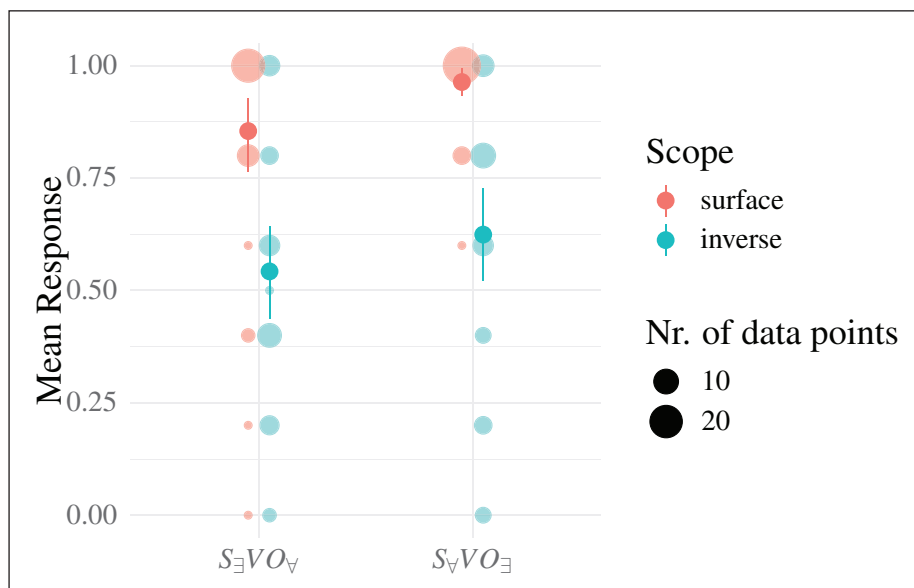


Figure 11: Exp6. The mean response of the participants is shown on the y axis. Larger semi transparent blobs correspond to a higher number of participants having this particular mean response. The error bars are boot strapped confidence intervals as computed with the `Hmisc` R package (Harrell et al. 2019).

Table 5: Mean proportion of acceptance in Exp6.

Exp6	Surface	Inverse
S ₃ VO _v	85%	54%
S _v VO ₃	96%	62%

Con2 (54% in Exp6 vs. 60% in Exp2) is not significant ($p > .05$). In addition, similarly to Exp2, we find great variation among speakers.

What is quite unexpected is the lower acceptability in Con4 (62%) where the universal precedes the indefinite and the speakers see an inverse scope scenario (which entails the surface). In Exp2, mean acceptance in the same condition was 92%. We checked if this is due to some particular sentence-picture pairs which cause a problem in general but although there is some item variation we did not find outliers which behaved qualitatively differently, but just a rather large spread. One possible explanation which can also account for the somewhat lower acceptability we observe in Con1 is that the diagrammatic representations are not so transparent as the playmobil pictures and in some cases it is possible that the distributivity condition associated with the quantifier *kathe* ‘every’ is not sufficiently met for some speakers (see Lazaridou-Chatzigoga 2015; 2009). For example, the picture in Figure 10 allows for a collective photographing event which might led some participants to reject the sentence. This was not possible in Exp1 and 2, where the distributive scenario was represented clearly by showing 3 distinct events.

If we are right, then we can say that Exp6 partially replicates Exp2. Now we can directly compare the default/broad focus with marked prosody and information structure in experiments 7 and 8.

4.2 Experiments 7 and 8: Design and materials

The new component comes with experiments 7 and 8 which involve a prosodically (and structurally) marked structure. In Exp7, the indefinite QP was focused. In conditions 1 and 2, the word order is exactly the same as in (26) but the intonation pattern is different with the NPA on the restrictor of the existential quantifier and the rest of the sentence being deaccented as in (28) (see Appendix, Figures 4 and 5). The representation of the scenarios was the same as in Exp6, i.e. surface as in Figure 7 and inverse as in Figure 8.

(28) Condition 1 & 2

Kapjos IPURGOS sinatnise kathe epihirimatia. S₃VO_v
 Some minister.NOM met every entrepreneur.
 ‘Some MINISTER met every entrepreneur.’

In addition to prosodic marking, the sentences in conditions 3 and 4 differ structurally from their corresponding sentences in Exp6. The indefinite object undergoes focus fronting and as a result at surface structure precedes and c-commands the universal quantifier (O₃VS_v). This means that now the surface scenario for (29) corresponds to a situation where *there is a particular singer that every photographer photographed* as shown in Figure 12 whereas the inverse is the one where *for each singer there are different photographers* as in Figure 13.

(29) Conditions 3 & 4

Kapja TRAGUDISTRRIA fotografise kathe fotografos.
 some singer.ACC photographed every photographer.NOM.
 ‘Some SINGER was photographed by every photographer.’

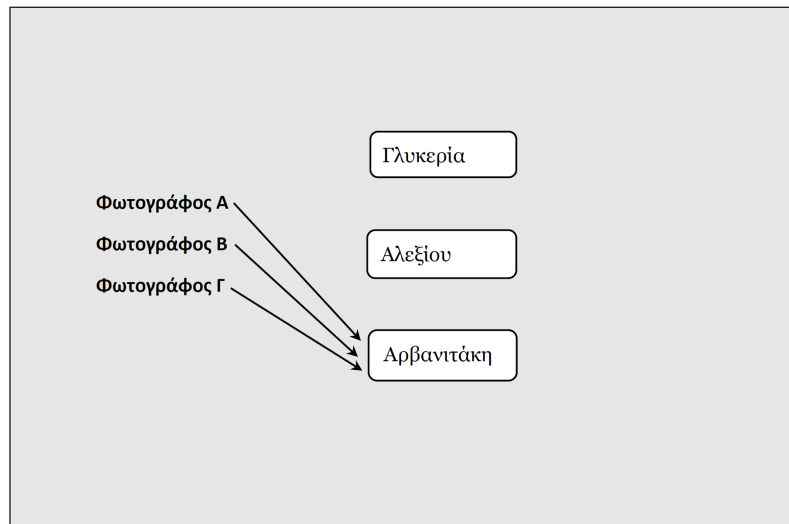


Figure 12: Surface (Con3).

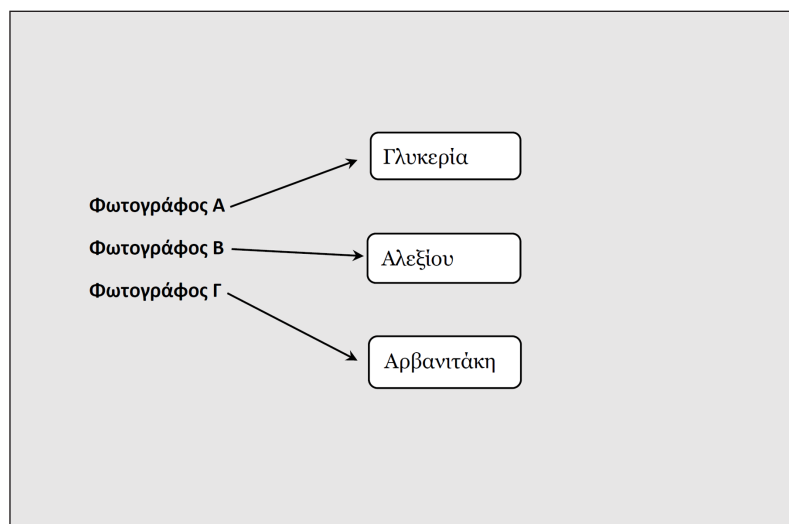


Figure 13: Inverse (Con4).

Table 6: Conditions in Experiments 7 and 8.

Exp7: Focus	Exp8: CLLD	Surface	Inverse
$\exists S^c VO_V$	$\exists S^{cT} VO_V$	Con1	Con2
$\exists O^c VS_V$	$\exists O^{cT}_{cl} VS_V$	Con3	Con4

Therefore, contrary to the situation in Exp1–2 and 6, in Exp7 (and as we will see Exp8) inverse scope in Con4 is real, i.e. it does not entail the surface scope. This means that both Con2 and Con4 (inverse scope conditions) are now critical for our conclusions regarding the availability of inverse scope (Table 6).

Exp8 differs from Exp7 in that the indefinite phrase is CLLD-ed instead of focused. In conditions 1 and 2, the only difference with the sentences in (26) and (28) is the intonation pattern, the subject-QP (e.g. *kapjos ipurgos*) has a contrastive topic intonation with a NPA on the restrictor (e.g. *ipurgos*) followed by a phrase accent (Baltazani & Jun 1999;

Baltazani 2002) and then narrow focus on ‘kathe’ (see Appendix, Figure 6). The scenarios are the same as in the previous experiments (Figures 7–8).

(30) Conditions 1 & 2

Kapjos ipurgos_{CT} sinatnise KATHE epihirimatia.
 some.NOM minister.NOM met every entrepreneur.
 ‘Some minister met every entrepreneur.’

In conditions 3 and 4, the indefinite object is CLLD-ed which means that there is also a clitic preceding the verb (agreeing in person, number and gender with the CLLD-ed phrase). Since the word order is the same as in Exp7, the surface and inverse scope scenario correspond to Figures 12 and 13 accordingly. The intonation signals again a contrastive topic.

(31) Conditions 3 & 4

Kapja tragudistria_{CT} ti fotografise KATHE fotografos.
 some singer.ACC her.CL photographed every photographer.NOM.
 ‘Some singer was photographed by every photographer.’

Table 9 summarizes the conditions for Exp7 and Exp8.¹⁷ As shown in the table, now in all conditions the existential precedes the universal since the existential object is fronted either with focus or CLLD.¹⁸

4.2.1 Experiments 7 and 8: Predictions

Exp7 differs from Exp6 in that the existential QP is focused. As we already discussed in the introductory part focusing should not affect negatively the availability of inverse scope. For the SVO word order, we expect inverse scope (Con2) to be available via raising of the universal object above the focused subject. For the OVS word order, as we discussed in Section 2.1, inverse scope can be derived either by raising the subject above the fronted

¹⁷ The subscript^f in Exp7 should be read as focus on the existential QP for the subject (₃S^f) and object (₃O^f) accordingly. Similarly, ^{CT} stands for contrastive topic marking.

¹⁸ A reviewer suggests that it would be interesting to also test other word orders including the $\forall > \exists$ order with focus and CLLD. As we mention above, this word order is not a reliable test for the availability of inverse scope because of its entailment pattern. However, in preliminary experiments we conducted, we did test this word order for a CLLD-ed object. In particular, we tested sentences where a universal object was CLLD-ed above an indefinite subject.

- (i) Kathe gineka ti fotografise enas andras.
 Every woman her,CL photographed a.NOM man
 ‘Every woman, a man photographed her’.

The results we derived confirmed the findings from experiments 1 and 2, that the $\forall > \exists$ order is not a good test case for inverse scope. Surface scope has an acceptance rate 75% whereas inverse 85%. As we will see, inverse scope is not possible with CLLD-ed indefinites. This finding, combined with the results from experiments 1 and 2, lead us to conclude that the large acceptability in the case of CLLD-ed universals is due to the entailment pattern.

The reviewer also suggests that different word orders with in-situ focus would provide us with a more complete picture. We agree that in-situ focus can also influence speakers’ preferences. Already Lakoff (1971) notes that heavy stress on the object results in obligatory surface scope for English (see also Jackendoff 1972). Sæbø (1997), elaborating on these intuitions, suggests that sentences like *Somebody loves everybody* with focus on the object favor indeed a surface scope reading. Although we have a similar intuition for Greek, we withhold any conclusions, given the variability of judgements we observe and the importance of context. We think that this type of differences need perhaps a slightly different experimental design providing also a context. Our work only provides some empirical results for the default vs. marked word orders. Further research into marked prosodic patterns (also with VSO or VOS word orders) are still to be explored.

subject or by reconstruction of the object to an intermediate position. It should be emphasized that Con4 now involves a true test-case of inverse scope ($\exists > \forall$) and therefore we expect lower acceptability in Con 4 than in Con3. Crucially, however, it is possible that focus semantics facilitate an inverse scope reading.

For Exp8, things are less clear since as we said there are different analyses of CLLD which make different predictions regarding the availability of inverse scope. If CLLD involves movement (i.e. Angelopoulos & Sportiche 2019), then we expect inverse scope to be available unless it is ruled out due to independent properties of the construction. If however, CLLD is base-generation (Cinque 1990; Anagnostopoulou 1994; Iatridou 1995; Alexiadou & Anagnostopoulou 1998) then we do not expect inverse scope reading. In any case, our intuitions conform with the literature which reports that CLLD-ed indefinites take wide scope.

4.2.2 Experiment 7 (focused indefinite): Results & discussion

Results

Figure 14 and Table 7 summarize the results for Exp7. The mean proportion of acceptance in Con1 is 75% and in Con2 70%. The difference between conditions 1 and 2 is not significant with a confidence interval from -0.235 to 1.15 . The confidence interval for the difference between conditions 3 and 4 ($p < .01$) has a confidence interval from -3.07 to -0.624 .

In order to see how focus affects scope preference, we compared Exp7 with Exp6. We performed the same procedure as in the earlier inter experiment comparisons. The difference

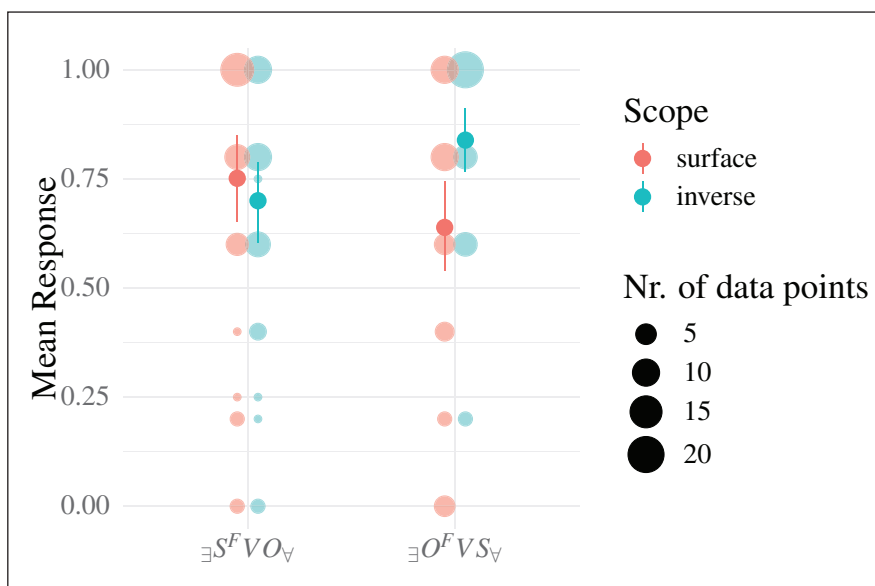


Figure 14: Exp7. The mean response of the participants is shown on the y axis. Larger semi transparent blobs correspond to a higher number of participants having this particular mean response. The error bars are boot strapped confidence intervals as computed with the `Hmisc` R package (Harrell et al. 2019).

Table 7: Mean proportion of acceptance in Exp7.

Exp7	Surface	Inverse
$S_{\exists} V O_{\forall}$	75%	70%
$O_{\exists} V S_{\forall}$	64%	83%

between the experiments is significant with a p-Value of 1.4×10^{-9} for the interaction. We then compared the results of the experiments within Conditions 1 and 2. We found no significant difference in Condition 1, but significant results in Conditions 2 ($p = 0.033$). Conditions 3 and 4 are not directly comparable between these two experiments because the word order is different in the two experiments.

Discussion

As becomes evident from this experiment, focus has an effect in making the inverse scope scenario more accessible to the speakers. The question is why this is the case. Below we show that at least in the case of SVO word order this cannot be due to focus fronting and instead we provide an explanation based on the semantic/pragmatic contribution of focus marking. As we discussed in Section 4.2.1, given the analysis of focus-fronting as A'-movement we expect inverse scope to be available. Let us, first, consider the syntax of surface and inverse scope when the subject is focused, as in (28), repeated in (32). As we can see, the surface scope involves less derivational steps since there is obligatory movement of both the object-QP and the subject-QP to resolve type mismatch. Moreover, we take the subject to move only once to a focus position and at the same time resolving type-mismatch (32a). Therefore, surface scope is expected to be at least as available as in the default cases that we encountered above. This expectation comes out true since as we saw in the results despite having a difference in mean acceptance (75% vs. 85% in Exp6), this difference is not significant.

Inverse scope, on the other hand, involves an additional derivational step, where the object undergoes QR for a second time above the moved subject (32b). In this sense, it seems that we cannot account for the higher acceptability in Con2 based on the syntactic configuration.

- (32) Kapjos IPURGOS sinantise kathe epihirimatia.
 some minister.NOM met every entrepreneur.ACC
 'Some MINISTER met every entrepreneur.'

- a. **Surface:** $\exists x. \text{minister}(x) \wedge \forall y. \text{entrepreneur}(y) \rightarrow x \text{ met } y$
 $[\text{FocP some minister}_2 \lambda_2 [\text{TP } [\dots_P \text{ every entrepreneur}_1 \lambda_1 [\text{VoiceP } t_2 \text{ Voice}$
 $[\text{VP met } t_1]]]]]$
- b. **Inverse:** $\forall y. [\text{entrepreneur}(y) \rightarrow \exists x [\text{minister}(x) \wedge x \text{ met } y]]$
 $[\dots_P \text{ every entrepreneur}_1 \lambda_1 [\text{FocP some minister}_2 \lambda_2 [\text{TP } [\dots_P t_1$
 $[\text{VoiceP } t_2 \text{ voice } [\text{VP met } t_1]]]]]]]$

In the case of object-fronting (conditions 3 and 4), there is the additional possibility of reconstruction. Assuming that the object moves first to an intermediate position, where it is interpretable, it is possible to derive the inverse scope reading via reconstruction of the object to this position, which is in the scope of the raised universal quantifier (33b).

- (33) Kapja TRAGUDISTRIA fotografise kathe fotografos.
 some singer.ACC photographed every photographer.NOM
 'Some SINGER was photographed by every photographer.'

- a. **Surface:** $\exists x. \text{singer}(x) \wedge \forall y. \text{photographer}(y) \rightarrow y \text{ photographed } x$
 $[\text{FocP some singer}_1 \lambda_1 [\text{TP } [\dots_P \text{ every photographer}_2 \lambda_2 [\dots_P t_1$
 $[\text{VoiceP } t_2 \text{ Voice } [\text{VP photographed } t_1]]]]]$

b. **Inverse via reconstruction of the object:**

$$\forall y. [\text{photographer}(y) \rightarrow \exists x [\text{singer}(x) \wedge y \text{ photographed } x]]$$

$$[\text{FocP } t_1 [\text{TP } [\dots_P \text{ every photographer}_2 \lambda_2 [\dots_P \text{ some singer}_1 \lambda_1$$

$$[\text{VoiceP } t_2 \text{ Voice } [\text{VP } \text{ photographed } t_1]]]]]]$$

Even if we consider that there is a processing difference between reconstruction and QR which would explain the fact that inverse scope is high,¹⁹ the lack of significant difference between Con1 and 2 is still not explained. This leads us to the idea that what facilitates inverse scope derivation is the semantics and pragmatics of focus.

As Krifka (2008) puts it *focus indicates the presence of alternatives that are relevant for the interpretation of linguistic expressions*. The alternatives of a sentence p vary depending on what is F(ocus)-marked. In our case, as we discussed, it is always the restrictor of the indefinite which bears the NPA. Based on the rules for focus projection (Selkirk 1995) the following possibilities arise: i) only the restrictor NP is focused or ii) the entire DP is focused (focus projection). Roughly, following Fox & Katzir's (2011) structural alternative mechanism which builds on Rooth's (1992) analysis, we encounter the following possibilities:

- If only the restrictor NP is focused, then alternatives will be generated by substituting the NP with other structurally less or equally complex NPs.

(34) a. Some [MINISTER]_F met every entrepreneur.
b. ALTERNATIVES:

$$\left\{ \begin{array}{l} \text{Some } \textit{secretary} \text{ met every entrepreneur.} \\ \text{Some } \textit{advisor} \text{ met every entrepreneur.} \\ \text{Some } \textit{officer} \text{ met every entrepreneur.} \\ \text{etc.} \end{array} \right\}$$

- If the entire QP is focused, then alternatives can be generated by any linguistic expression that is structurally less or equally complex, i.e. it can be substituted by other quantifying expressions or by referential expressions like proper names which are arguably less complex.

(35) a. [Some MINISTER]_F met every entrepreneur.
b. ALTERNATIVES:

$$\left\{ \begin{array}{l} \text{The } \textit{secretary} \text{ met every entrepreneur.} \\ \textit{John} \text{ met every entrepreneur.} \\ \cdot \\ \text{etc.} \end{array} \right\}$$

¹⁹ Notice though that reconstruction is also considered to be costly as discussed in Anderson (2004) and Wurmbrand (2018) a.o.

Which way speakers interpret prosodic cues for F-marking depends on the context. For example, if the Question under Discussion (QUD) to a sentence as in (32) is ‘*Did Paul meet every entrepreneur?*’ we get access to referential alternatives and therefore it is easier to get a specific (wide-scope) reading for the indefinite expression. On the other hand, the dialog in (36) favors an interpretation where only the NP is focused, alternatives of the sort {*Some lower official, some secretary, etc.*} become easily accessible. At the same time, this reading favors an inverse scope interpretation because the interest shifts from a particular individual to a set of individuals who share a common property (i.e. *minister*). In this sense, we conjecture that if we interpret F-marking only on the restrictor, inverse scope interpretation is facilitated.

- (36) A: Every entrepreneur is offended because this year only a low-ranked official met him.
 B: That’s not true! Some MINISTER met every entrepreneur.

In the absence of explicit alternatives, *property* alternatives (i.e. F-marking of the restrictor) which are in some way lexical are easier than entity alternatives (i.e. F-marking on the entire QP) which totally depend on context. We think that this is a factor which favored inverse scope interpretation and at the same time it can be the reason why surface scope in both conditions but especially in Con3 is rather low (64%).²⁰ Of course, for now this is only a hypothesis. It would be interesting to manipulate the contextual factor by adding property alternatives (i.e. *secretary, policeman, etc.*) in one case vs. specific entities in the other case (i.e. *John, Mary, etc.*) in order to check if there is a significant effect on scope preferences in the predicted direction.

Independently from the role of context, the results from this experiment clearly show that inverse scope is available when the indefinite phrase is focused. The results from this experiment become even more important once they are compared to the results from the experiment with CLLD-ed indefinite phrases, which exhibit the exact same word order and yet, as we will see, preferences are very different.

4.2.3 Experiment 8 (CLLD-ed indefinite): Results & discussion

Results

Figure 15 and Table 8 summarise the results for Exp8. Both contrasts are (obviously) significant. The difference between conditions 1 and 2 ($p < .001$) has a confidence interval from 4.33 to 9.28. The difference between conditions 3 and 4 ($p < .01$) shows a confidence interval from 4.5 to 14.5.

Contrary to what we saw with focus-fronting, here we see a sharp contrast between surface and inverse scope acceptability. Both in the case of a CLLD-ed subject (marked exclusively by intonation) and in the case of a CLLD-ed object (marked by intonation and the presence of the clitic) surface scope remains high (with mean acceptance 92% and 84% accordingly) whereas inverse scope interpretation is very low (13% and 11% accordingly). While there is some variability, we observe that the majority of participants do not accept or accept to a very small extent inverse scope of CLLD-ed indefinite phrases.

Discussion

The observation that CLLD-ed indefinites get wide scope is confirmed by the present study. Despite the fact that in all other environments (broad-focus and narrow focus)

²⁰ Notice though that distributivity might also play role, in the same way that we hypothesized that might affect inverse scope readings in Con4 of Exp6. A follow-up with pictures which clearly control for distributivity would tease the two hypotheses apart. For the high acceptability of inverse scope however, it is clear that we need an explanation related with the effect of F-marking.

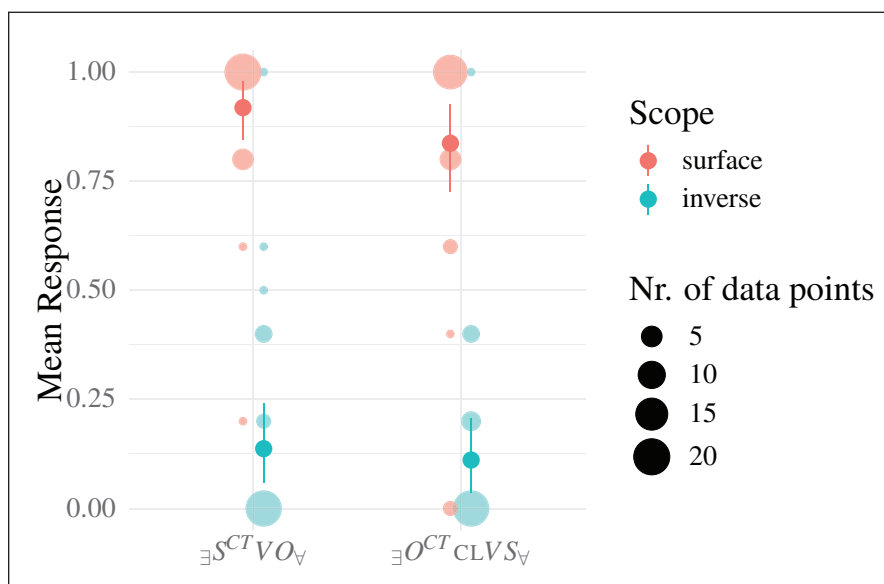


Figure 15: Exp8. The mean response of the participants is shown on the y axis. Larger semi-transparent blobs correspond to a higher number of participants having this particular mean response. The error bars are bootstrapped confidence intervals as computed with the `Hmisc` R package (Harrell et al. 2019).

Table 8: Mean proportion of acceptance in Exp8.

Exp8	Surface	Inverse
$S_{\exists}VO_V$	92%	13%
$O_{\exists}CLVS_V$	84%	11%

inverse scope seems to be available, in the case of CLLD we get a very strong preference for wide scope of the indefinite. Since in Section 2.1.2, we excluded alternative explanations such as the referential-clitic hypothesis or the contrastive-topic explanation for the non-availability of inverse scope with CLLD, we are remained with two options; either the CLLD-ed phrase is base generated high or if there is movement there is some other factor prohibiting inverse scope. Our data do not inform us further about the internal make-up of CLLD. A syntactic analysis of CLLD would require us to encounter facts from binding reconstruction (see e.g. Cecchetto 2001; Angelopoulos & Sportiche 2019) as well as additional properties of CLLD discussed among others in Cinque (1990); Anagnostopoulou (1994); Iatridou (1995).

What we can say at this point is that our data confirm a contrast between CLLD and other configurations (i.e. default-SVO and focus) suggesting that there is indeed a difference in their syntax. In what follows we briefly compare these configurations.

5 Concluding remarks and open questions

Our findings suggest that inverse scope is available in the so-called unmarked (broad-focus) environments, which involve the VSO and the *default-SVO* word order. On the other hand, a clear difference arises in the case of contrastive CLLD. Speakers reject inverse scope with CLLD-ed indefinites 90% of the times suggesting that the two constructions, the *default-SVO* and the CLLD-ed SVO, cannot be analysed on a par (cf. Alexiadou & Anagnostopoulou 1998). Although our experiments do not inform us further about the internal make-up of these two constructions, we conjecture that the difference between CLLD and *default-SVO* relates to their different structural position. CLLD-ed material lies at a higher level

in the so-called left periphery, whereas preverbal subjects lie lower, perhaps at spec,TP (Roussou & Tsimpli 2006; Spyropoulos & Revithiadou 2009). This does not entail that the preverbal subject moves there as the result of ϕ -agreement. Alexiadou & Anagnostopoulou (1998) provide a series of arguments, which are independent from the scope facts, presenting a puzzle for an A-movement analysis for preverbal subjects. A potential reconciliation of the two approaches would be to argue that preverbal subjects are discourse marked but they occupy the spec,TP position. Under Miyagawa's (2017) categorization of languages depending on whether ϕ and δ (i.e. topic/focus) features are inherited by T, we can treat Greek as a language with δ and ϕ -features at T (cf. Jiménez-Fernández & Spyropoulos 2013).²¹ Of course, further work is necessary in order to substantiate this hypothesis, but we think that it presents a point of departure for future work. Given QR locality restrictions, the difference in inverse scope acceptability between *default-SVO* and CLLD could be explained as the result of scope-shifting operations restricted inside a domain that excludes the CLLD-ed constituent.

In the same spirit, we can examine the syntax of focus fronting. Traditionally there are two analyses regarding the position of fronted foci. The most widely held view for Greek is that there is a FocP in the left periphery and the focused constituent moves there with the verb undergoing T-to-Foc movement (Tsimpli 1990; 1995). However, there is an alternative possibility which is that the Focus position can be in Spec,TP (for Greek: Drachman & Klidi 1992 cited in Anagnostopoulou 1994). In Miyagawa's system we can say that T inherits the relevant δ -feature from C. Under this hypothesis, focused fronted constituents and preverbal subjects compete for the same position. The choice among the two approaches is not easy and it would require exploring a variety of empirical data (see for example the relevant discussion in Anagnostopoulou 1994 regarding inversion in questions) which goes far beyond the purposes of this paper.²² What matters for our purposes is that the position where focused constituents land is lower than the CLLD-ed constituents, thus allowing for the inverse scope interpretation. Focus, in addition, facilitates inverse scope, at least in the cases we considered where the restrictor of the indefinite is focused, making salient the property (as opposed to entity) alternatives, shifting in this way the interest from a particular individual to a set of individuals. As we said we need to further test this hypothesis by manipulating the contextual factor.

Given the discussion so far, we distinguish three factors affecting scope preferences; i. grammatical constraints preventing QR (i.e. in CLLD), ii. context (showing up in the case of focus) and iii. the processing cost associated with the computation of a more complex derivation (Tunstall 1998; Anderson 2004; Scontras et al. 2017; Ionin & Luchkina 2018; Brasoveanu & Dotlačil 2019). The large variation we found among native speakers suggests that scope preferences is an interplay of – at least – these factors. The question is how we can put all these together in a model where processing scope economy interacts with grammatical and contextual factors to make inverse scope more or less *accessible*.

²¹ The nature of the δ -feature in *default-SVO* is difficult to identify. In some cases we could argue that they are familiarity topics, however as a reviewer correctly points out, there are cases in which preverbal subjects are not familiar (e.g. in generic middles as discussed by Roussou & Tsimpli 2006; Spyropoulos & Revithiadou 2009). Notice though that topicality is considered to be a genuine characteristic of genericity in many works (see Cohen & Erteschik-Shir 2002 a.o.). Therefore, preverbal subjects do not present counterevidence for treating preverbal subjects as topic-marked but they raise an interesting question regarding the *type* of topicality. Another interesting case are Free Choice Items as preverbal subjects (Spyropoulos & Revithiadou 2009). Again, they cannot be treated as familiarity topics but they are not discourse neutral either. We leave it for future work to identify the discourse character of preverbal subjects in *default-SVO*.

²² We are grateful to a reviewer for suggestions clarifying the discussion about the syntax of focus movement. Although the empirical data at this point do not allow us to take a stance between the two views, we hope that in future work we will be able to compare the two hypotheses based on further empirical data.

Meyer & Sauerland (2009) discuss how a speaker's semantic judgment is constrained in case of ambiguity and they suggest that an ambiguous sentence is always judged true on its most accessible reading without specifying what happens with the less accessible reading. They dub this constraint *Truth Dominance*:

(37) Truth Dominance:

Whenever an ambiguous sentence S is true in a situation on its most accessible reading, we must judge sentence S to be true in that situation.

(Meyer & Sauerland 2009: 140)

As Meyer & Sauerland (2009) explicitly suggest, inverse scope is the least accessible because of its additional complexity. However, when other factors come into play, i.e. context, then inverse scope can get more accessible (Kurtzman & MacDonald 1993; Brasoveanu & Dotlačil 2019; Zimmermann & Philipp 2019). When context and processing cost compete, the results might resemble those in the focus experiment with no significant difference between surface and inverse scope acceptability. Interparticipant variation can be attributed to some extent to individual differences in scope processing but in addition to this, it is possible that participants have assumed different contextual backgrounds (given that there was no context biasing a surface or inverse scope scenario) affecting in this way their preferences. On the contrary, in the case of CLLD, the uniform behavior of participants rejecting inverse scope suggests that there is a grammatical factor at stake and it is not just a matter of pragmatic accessibility.

Interparticipant variation within one language reflects to some extent crosslinguistic variation. As we discussed in Section 1, cross-linguistic variability has been explained in different ways. Greek, being a flexible word order language, had been considered a good candidate for a scope-rigid language, but as the present study clearly suggests this is not the case. Our study aligns with recent experimental studies in various “free word order” languages which contra expectations show availability of inverse scope (Gyuris & Jackson 2018 for Hungarian, Ionin & Luchkina 2018 for Russian, Zimmermann & Philipp 2019 for German). Of course, the question still remains for languages that inverse scope availability is clearly lower than in other languages (e.g. Chinese/German vs. English/Greek). It may indeed play a role how easily and under which conditions a language can move constituents around but whether one wants to integrate this as a grammatical constraint or as another factor which interacts with a general pragmatic mechanism and influences the accessibility of inverse scope in ambiguous sentences is under question (Brasoveanu & Dotlačil 2019).

Further cross-linguistic work is necessary in order to figure out under which conditions inverse scope is made accessible. At the same time we believe that more empirical scope data can contribute towards a better understanding of the syntax and semantics of particular constructions within a language, as in the case of Greek.

Abbreviations

ACC = accusative, NOM = nominative, PL = plural, SG = singular, CL = clitic, ADD = additive operator

Additional File

The additional file for this article can be found as follows:

- **Appendix.** List of experimental items. DOI: <https://doi.org/10.5334/gjgl.1183.s1>

Ethics and Consent

This study is in line with the ethics guidelines approved by the Deutsche Gesellschaft für Sprachwissenschaft (German Society for Linguistics).

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Competing Interests

The authors have no competing interests to declare.

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