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# The Semantics of Modern Greek Preposition *Apo*

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## ABSTRACT

This research examines the quantificational distributional behavior of the Greek preposition *apo* "from".We aim to examine the function of *apo* in specific sentence constructions in which it occurs as the object, combined with a numeral and a noun in the accusative case. These structures contain a noun phrase as their subject or the quantifier followed by a noun. Our hypothesis is that *apo* resembles Serbian *po*, as it also places itself in the same structures as already described, while the subject position features the quantifier *svaki* ("every"). To support our hypothesis, we conduct a review of both prepositions. The analysis indicates that Greek *apo* conveys a broader range of meanings beyond the simple notion of distributive share described by Knezevic and Demirdache (2018) regarding Serbian *po*. Specifically, the former exhibits distributive qualities similar to the universal quantifier *kathe(nas)* ("every") in specific syntactic constructions, as evidenced by our questionnaire results. This research proves the universality of this concept of distributivity and helps us to apprehend how it is processed mentally. It also highlights how distributive constructions are cognitively processed, reinforcing their universality across languages like Greek and Serbian, which are not closely related. We consider this work to be unique, as there has been no experimental examining the distributive properties of *apo* in Greek. Given the shared universal principles across languages, our findings could be extended to other natural languages that exhibit similar quantificational structures to those of the prepositions we have examined.

***Keywords:*** Distribution; Modern Greek; Natural Language; Preposition apo; Prepositional Quantification

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# 1. Introduction

Quantification is a well-studied semantic feature in our language in question, which features several types of quantifiers appearing as noun phrases (NPs), quantification modifiers (QMods), partitives, or even affixes. Our attention is drawn to a Greek expression which may show distributive interpretation: the Greek preposition *apo*.

Our analysis centers on the quantificational and distributive functions of *apo* within certain structural patterns in syntax, particularly when it occurs with a numeral and an accusative noun. As part of our discussion, we will also consider sentence structures in which *apo* co-occurs with quantifiers or NPs.

By exploring the patterns, we aim to demonstrate the cross-linguistic relevance of quantification, thereby enhancing our understanding of how such a concept is mentally processed. We will also shed light on how different languages, such as Greek and Serbian, are semantically similar or distinct.

# 2. Defining the Profile of Modern Greek από (*apo*)

To set the groundwork for our analysis, we begin by outlining the Syntax and Semantics of *apo*. Etymologically, *apo* is related to the Ancient Greek preposition *ek* (ἐκ), which governs the genitive case. By contrast, Modern Greek *apo* typically takes a noun in the accusative case [1].

## 2.1. Syntactic Behavior of Modern Greek *apo*

Various syntactic constructions involving *apo* exist in Modern Greek [2]. As a preposition, *apo* follows the syntactic patterns typical to prepositions, forming preposition + NP constructions in the accusative. Joseph and Philippaki-Warburton [3] define a preposition as a word placed before an NP to indicate its relation to another phrase, forming a prepositional phrase [2].

Holton et al. [2] note that *apo* generally combines with accusative NPs, including emphatic personal pronouns. Modern Greek *apo* has several meanings, but our focus is its distributive use, where *apo* combines with a numeral and an accusative noun.

This distributive function is emphasized by Holton et al., who observe that in the *apo* + numeral form, *apo* functions similarly to the English construction "numeral + each." This use is illustrated in the following examples (1) and (2), adapted from Holton et al. [examples (14) and (15) in their work] [2] (p. 383):

(1) φάγαμε **από** δυό αύγά
Fagame **apo** dio auga
"We ate two eggs **each**."

They also identify examples in which the NP following *apo* appears in a case that corresponds to its function in the clause's syntax. In the example below the subject is a noun and *apo* precedes the nominative:

(2) Δεξιά και αριστερά υπάρχει **από** ένας τοίχος (nom.)
Deksia kai aristera iparhi **apo** enas tihos
"There is a wall on **each** side" [lit. "right and left there-is from one wall"].

Our interpretation of such examples is further evidencing *apo*'s quantificational potential. In example (1), *apo* distributes two eggs among subjects, while in example (2), it effectively assigns one wall to each side; this reveals its role in semantic distribution.

## 2.2. Semantics of Modern Greek *apo*

Stavropoulos lists a variety of meanings for *apo*, primarily translated as "from," but also "by," "since," "than," "out of" and "off," depending on context [4]:

(3) **από** τήν αρχή ώς το τέλος
**apo** tin arhi os to telos
"**From** the beginning to the end."
(4) γράφτηκε **από** εμένα
graftike **apo** emena
"It was written **by** me"
(5) είναι καλύτερος **από** εμένα
ine kaliteros **apo** emena
"He is better **than** me"
(6) είμαι εδώ **από** τήν Κυριακή
Eimai edo **apo** tin Kiriaki
"I'm here **since** Sunday"
(7) **από** ζήλεια

**apo** zilia
"**Out of** jealousy"

(8) κατέβηκε **από** το τραίνο
katevike **apo** to treno
"He got **off** the train"

However, Stavropoulos does not discuss the distributive use of *apo*. This is also the case with Stafilidis[5], who offer a similar summary [(1) from, out of; (2) by, through; (3) than].

By contrast, Babiniotis[6] identifies the distributive function of *apo*, expressing *epimerismo* (allocation, apportionment, or distribution) and forming constructions with accusative NPs:

(9) πήρε **από** 10,000 δρχ ο καθένας
pire **apo** 10,000 drahmes o kathenas'
"**Each one** took 10,000 drachmas"

Example (9**)** demonstrates how *apo* co-occurs with universal quantifier καθένας "*kathenas*" (meaning "everyone"). In this manner *apo* participates in syntactic structures that support a quantificational interpretation.

Holton et al. similarly highlight this use, noting that *apo* followed by a numeral (e.g., *apo ena*) functions similarly to "each" in English[2]. Together, these observations by Babiniotis and Holton et al. support our hypothesis that *apo* carries both quantificational and distributive meaning.

# 3. Core Examples from Modern Greek

This section analyzes representative examples that illustrate the quantificational behavior of *apo*. These examples provide the foundation for a detailed semantic interpretation of its function in context:

(10) τα κορίτσια πήραν ενα βιβλίο
Ta koritsia piran ena vivlio
"The girls took a book"

(11) τα κορίτσια πήραν ενα βιβλίο **το καθένα**
Ta koritsia piran ena vivlio **to kathena**
"The girls took a book **each**"

(12) τα κορίτσια πήραν **από** ενα βιβλίο
Ta koritsia piran **apo** ena vivlio
"The girls took **DISTRapo** one book"

(13) τα κορίτσια πήραν **από** ενα βιβλίο **το καθένα**
Ta koritsia piran **apo** ena vivlio to kathena
"The girls took **DISTRapo** one book each"

(14) **το καθέ(να)** (από ta κορίτσια) πήρε **από** ενα βιβλίο
**To kathe(na)** (apo ta koritsia) pire **apo** ena vivlio
**"Each (from the girls) took DISTRapo** one book"

Consider our examples below in relation with those discussed before:

(15) *το κορίτσι πήρε **από** ένα βιβλίο
**to koritsi pire **apo** ena vivlio*
"*the girl took **DISTRapo** one book"

(16) το κορίτσι πήρε ένα βιβλίο
*To koritsi pire ena vivlio*
"The girl took a book"

These examples show that *apo* must be preceded by a plural subject, which further indicates how distributive *apo* behaves. When the subject is singular, as in example (8), the sentence becomes grammatically inaccurate. Likewise, in (16), the singular subject and object do not produce any distributive effect. By contrast, when the subject is plural, distributive interpretations arise.

Gil observes that semantically, universal and distributive quantifiers inherently refer to sets of plurality. Thus, NPs like *all men* or *every man* implicitly refer to groups containing more than one member. In most contexts, such NPs are semantically plural, even when grammatically singular[7].

Given this, let us consider examples (10)–(16).

In (10) the absence of a quantifier and *apo* results in a plain affirmative sentence with no distributive meaning.

In (11) the quantifier *kathena* introduces a distributive reading. Haspelmath notes that *kathenas* (< *kathe* + *enas*) is the standard way to express "everyone" in Modern Greek and it functions as a universal distributive quantifier[8].

According to Stafilidis, *kathenas* as can be rendered as "each, each one, everyone, everybody, anybody"[5], noting its equivalence to the English quantifiers *each* and *every*.

Stavropoulos lists a range of valid syntactic constructions using *kathenas* [4]:

(17) kerdisame mia lira **o kathenas**
"We won a pound **each**"
(18) **kathenas** mas
"**Each one** of us"
(19) o **kathenas** mbori na to kani auto
"**Anyone** can do this"

Joseph and Philippaki-Warburton further analyze it as a compound quantifier derived from *kathe* ("each") and *enas* ("one"), resulting in masculine, feminine, and neuter forms: *kathenas*, *kathemia*, and *kathena*, respectively [3]:

(20) **kathenas** fititis na feri ena filo tou
"**Each** (male) student should bring a friend of his"

Although we do not aim to give a full semantic profile of *kathenas*, we consider it relevant as it frequently appears alongside *apo* in distributive, quantificational constructions. Notably, as Joseph and Philippaki-Warburton show in their examples (71 a, b), *kathenas* is a floating quantifier appearing at both the beginning and end of a sentence [3]:

(21) ta pedia na feroun (to) **kathena** (tous) ta lefta
"The children should bring **each one** (of them) the money"
(22) ta paidia na feroun ta lefta (to) **kathena** (tous)
"The children should bring **each one** (of them) the money"

Haspelmath traces the origin of *kathenas* to the Ancient Greek distributive preposition *kata*, which governed the accusative case and meant "along," "throughout," or "all over" [8] (p. 376). Over time, the expression kath'hena ("one by one") changed to mean "everyone," with *kath'* being reinterpreted as a marker of general distributivity and eventually forming nominative (e.g., *katheis*) and genitive (e.g., *kathenos*) forms. In Modern Greek, kaθis (from < κατheίς) commonly means "everyone," whereas the use of the Ancient Greek word *pas* is limited to especially formal or archaic contexts. The form κάθε, a shortened version, conveys the meaning "every."

Therefore, in Modern Greek, kaθís (<katheís) or *kathenas* is the usual way to say 'everyone' and its abbreviated form is κάθe, which serves as determiner 'every' as in his example *káθe kanónas éxi ké tís ekserésis tu* meaning ("Every rule has its exceptions"). In such a sentence, *kathe* takes the meaning of ("every") or ("each") and it is placed in the beginning of the sentence like any other determiner; the same is noticed in examples like *kathe mera* ("every day"), *kathe hrono* ("every year") or *kathe agori* ("every boy"). There is no sign of quantification or distribution in such cases where *kathe* is just a determiner in a noun phrase. What makes it a distributive operator is its function in certain syntactic environments as in *kathe koritsi pire ena vivlio* ("Every girl took a book") where *kathe* is responsible for distributing a book to each girl. It is therefore obvious that these two lexemes: *apo* and *kathe* construct in a way that diverges from each other and the only common ground they share is when they are found in constructions like (13) and (14) mentioned above.

*Apo* is a preposition while *kathe* is a determiner which makes the two very different in terms of Syntax and Semantics. In addition, *apo* cannot be in the subject position while *kathe* can, even in sentences where distribution takes place. *Apo* is always in the object position combining with a numeral and a noun while *kathe* functions as a determiner in the subject position; this is demonstrated in sentences like ***Kathe*** *koritsi pire ena vivlio* ("Each girl took a book") and *Ta koritsia piran* ***apo*** *ena vivlio* ("The girls took a book each"); constructions like **apo koritsi pire ena vivlio* or **koritsia piran kathe ena vivlio* are ungrammatical and semantically odd.

As stated above *apo* in different constructions means 'from, away from, because of, as a result of' as already stated in examples (1–8), while *kathe* means 'every, each, everyone, all' as in examples (17–22).

And it is in sentences like ***kathe*** *koritsi pire ena vivlio* ("Every girl took a book") where *kathe* is as quantificational as *apo* in *piran* ***apo*** *ena vivlio* ("They took a book"); quantification and distribution are also demonstrated in sentences where they coexist as in ***kathe*** *koritsi pire* ***apo*** *ena vivlio* literally meaning ("Each girl took from one book").

Considering our previous sentence (11), *kathena* enforces a distributive interpretation. Likewise, in (12) (Ta *pedia efagan apo ena milo*), *apo* plays the distributive role

typically associated with the quantifier *each* in English.

The plural subject triggers one-to-one distribution: for three children, there must be three apples. That is, *apo* serves as a universal, exhaustive, and distributive quantifier, equivalent to *each*.

Example (13) includes both *apo* and *kathenas*, yielding a distributive reading as *each*. This raises a question: Do *apo* and *kathenas* share the same quantificational role? When used exclusively, each appears to trigger a distributive reading; but when they co-occur, does one reinforce reading without adding meaning?

We test this hypothesis by administering a questionnaire to assess native speakers' intuitions. To explore this, we compare *apo* and *po* as discussed in the works of Gil, Knezeric and Demirdache, Bosnic and Spenader, as well as Bosnic et al.[7,9–11]. This analysis allows us to clarify the way *apo* behaves.

In the following section, we present all relevant syntactic structures in which *apo* occurs.

## 3.1. *apo* + Numerals + Accusative NP

Sentences illustrated in (12) and (13) demonstrate that *apo* appears alongside numerical elements and an accusative noun.

Holton et al.[2] (p. 383) describe this as a distributive use of *apo*, where the structure *apo* + numeral conveys the meaning "numeral + each," as shown earlier in example (1) from Chapter II:

*φάγαμε από δυό αύγά* – "We ate two eggs each."

## 3.2. *apo* + Quantifiers

Although the most typical syntactic pattern involves *apo* followed by a numeral, *apo* can also co-occur with quantifiers, as demonstrated in the following sentences:

(23) a. Edosa sta koritsia **apo ola** ta vivlia
Gave-I to-the girls **apo all** the books
"I gave to the girls **DISTRapo all** the books"

b. Edosa sta koritsia **apo ola** ta vivlia.
Gave-I to-the girls **apo all** the books
"I gave to the girls **DISTRapo all** the books"

(24) a. Edosa sta koritsia **apo to kathe(na)** vivlio
Gave-I to-the girls **apo the every** book
"I gave the girls **DISTRapo every** fruit"

b. Edosa sta koritsia **apo merika** vivlia
Gave-I to-the girls **apo some** books
"I gave the girls **DISTRapo some** books"

c. Edosa sta koritsia **apo liga** vivlia
Gave-I to-the girls **apo** a bit of books
"I gave the girls **DISTRapo some** books"

(25) a. pare (dio) **apo ola** ta vivlia
Take (two) **apo all** the books
"Take two **DISTRapo all** the books"

b. Pare (dio) **apo to kathe(na)** vivlio
Take (two) **apo the every** book
"Take (two) **DISTRapo every** book"

(26) den perneis **apo kanena** (vivlio)
Not take **apo none** (book)
"Do not take **DISTRapo any** book"

The sentences in (23a, b) and (24a) demonstrate the use of *apo* along with strong universal quantifiers**,** *ola* and *kathe(na)*.

In (23a), girls take some of each type of book available. Similarly, (23b) means that if the desk has literature, science, and medicine books, some of each kind must be taken.

Example (24a) conveys the same idea but explicitly requires taking some books from each kind.

The sentences in (24b) and (24c) illustrate how *apo* combines with weak existential quantifiers such as *merika* ("some") and *ligo* ("bit", "a few"), indicating that only a small number of each type of book is given.

In (25a), *apo* paired with *ola* ("all") and a numeral means that two of each book are to be taken.

Example (26) uses *apo* with negative quantifier *kanena* ("none"), expressing the absence of distribution, that is, no one receives any book.

A scenario in (27) illustrates distributive *apo*: Andrew divides 18 books among three girls so that each receives two literature, two science, and two medicine books. A similar distribution applies in (28) and (29) when *apo* is used with

*ligo* and *meriko*.

In (25b), *apo* combines with *kathe(na)* ("each"/ "every"), conveying the same meaning but with different syntax. Across these cases, *apo* ensures distribution.

Example (26) involves negation with the quantifier *kanena* ("none"), meaning that no distribution occurs; whoever wants books gets none.

These examples underscore the distributive nature of *apo*, regardless of whether it is paired with strong or weak quantifiers.

A scenario in (27) further illustrates distributive *apo*:

(27) O Andreas ehei 18 vivlia kai edose **apo ola** ta vivlia sta tria tou koritsia.
The father has 18 books and he-gave **apo all** the books to-the three his girls
"The father has 18 books and gave **DISTRapo** all the books to his 3 girls"

Therefore, it is expected that if Andreas distributes 18 apples, each of his three girls will receive two literature, two science, and two medicine books.

The same principle applies in examples (28) and (29), where *apo* is used with existential quantifiers.

(28) O Andreas ehei 18 vivlia kai edose **apo liga** vivlia sta tria tou koritsia
The Andrew has 18 books and he-gave **apo a few** books to-the three his girls
"Andrew has 18 books and gave **DISTRapo** a few to his three girls"

(29) O Andreas ehei 18 vivlia kai edose **apo merika** sta tria tou koritsia
The Andrew has 18 books and he-gave **apo some** to-the three his girls
"Andrew has 18 books and gave **DISTRapo some** to his three girls"

In examples (28) and (29), distribution occurs, but those amounts are approximate owing to quantifiers like *ligo* ("a few") and *meriko* ("some"). The total of 18 books is unevenly shared among three girls. In (28), for instance, Susan, Mary, and Helen receive differing quantities, with some books potentially left over. In (29), the quantity distributed is somewhat larger but still not exhaustive as in (27).

## 3.3. *apo* + Accusative NP

*apo* may also appear directly before an accusative NP without a numeral or quantifier, as in the following examples:

(30) O Andreas edose sta dio tou koritsia **apo** ta vivlia (ohi **apo** ta tetradia)
The Andreas he-gave to-the two his girls **apo** the books (not **apo** the notebooks)
"Andrew gave to his two girls **DISTRapo** the books, not **DISTRapo** the notebooks"

(31) O Andreas edose sta dio tou koritsia **apo to megalitero karpouzi** (ohi **apo** to mikrotero)
The Andrew he-gave to-the two his girls **apo** the biggest watermelon (not **apo** the smallest)
"Andrew gave to his two girls **DISTRapo** the biggest watermelon (not **DISTRapo** the smallest)"

(32) O Andreas edose sta dio tou koritsia **apo to gliko** (ohi **DISTRapo** to **σάντουιτς**)
The Andrew he-gave to-the two his girls **apo the desert** (not **apo** the sandwich)
"Andrew gave to his two girls **DISTRapo** the desert (not **DISTRapo** the sandwich)"

In the sentence in (30), both children receive books, but not notebooks. The use of *apo* suggests that each girl receives a portion of books, though not necessarily the same amount. Without *apo*, the sentence would likely imply that all the books were given collectively to both girls.

The same applies to (31) and (32), where Susan and Mary take unspecified amount of watermelon and desert, respectively.

In these cases, *apo* combines with an NP but does not enforce distribution. It also appears in partitives, as in (31), where the context clarifies the noun's reference. Though *apo* allows partial distribution, it remains inherently distributive.

## 3.4. *apo* as a Prepositional Prefix

The preposition *apo* changes form before vowels (απ-, αφ- preceded by /h/ in Ancient Greek)[2].

In words such as αποσύνθεση ("decomposition"), απομαγνητισμός ("demagnetization"), and αφαλατώνω ("I

desalinate")[2], από- appears as a prefix (here, meaning de-). Although its prefixal use does not involve an apparent distributive function, further research may reveal more.

# 4. Modern Greek *apo* in Comparison with Serbian *po*

With the aim to outline the semantic characteristics of Modern Greek από, we examine its syntactic constructions and compare it with Serbian *po*, as analyzed by Knezevic and Demirdache, Bosnic and Spenader, and Bosnic et al.[9–11]. This will help determine the quantificational nature of *apo* and its syntactic/semantic constraints.

## 4.1. Serbian *po* in the Analysis by Knezevic and Demirdache

Knezevic and Demirdache analyze *po* as a distributive element in Serbian, particularly in constructions where the universal quantifier *svaki* ("every") is in the subject position, while *po* appears with a numeral and noun in the object[9] (p. 116). They argue that *po* is a robust marker of distribution, ruling out collective readings and allowing both individual-level (atomic) and group-level (non-atomic) distributions. In their framework, "distributive key (DK)" refers to the agent over which the distribution applies, and the "distributive share (DS)" refers to the item or quantity being distributed[9] (p. 117).

*Po* serves as a DS marker, whereas *svaki* functions as a DK marker[12]. Following Choe[13], Knezevic and Demirdache assume distributive shares as dependent indefinites indicating a defined quantity. The Serbian *po* always precedes the NP serving as the DS and combines only with indefinites, non-specific cardinal expressions, or weak quantifiers. They illustrate this distinction with examples.

In a sentence expressing "The girls are painting a box each" [example (1)], *po* combines with the NP denoting the distributed entity ("box"). Conversely, the above-mentioned construction means that "Every girl is painting the same/a different box" [example (2)] has *svaki* modifying the NP that serves as the DK—the set being distributed over (in this case, "girls").

Two key differences emerge between *po* and *svaki*. First, *po* must remain adjacent to the NP it modifies, whereas *svaki* allows internal splitting between the quantifier and the noun it quantifies. Second, while *svaki* allows only participant-distributive readings (e.g., multiple girls painting simultaneously), *po* also permits event-distributive readings. For instance, with *po*, the same three girls may collectively paint a box on different days, distributing the event over time and location[9] (p. 119, 120).

According to Knezevic, *po* expresses true distributive, in contrast to *svaki*, which—like its English *every*—exhibits so-called "pseudo-distributivity"[9] (p. 121). Because *svaki* is demonstrably quantificational, comparing it with *po* provides insight into the syntactic and semantic differences between the two.

Consider example (10) of Knezevic and Demirdache[9] (p. 122):

(10) [Distributive key Svaka devojka] farba kutiju
Every-Nom.F.SG girl-Nom.F.SG paint-3SG box-ACC.F.SG
i. √Participant-distributive: "Every girl is painting a (different) box."
ii. √Collective: "Every girl is painting the same/ a specific box."

In this example, *svaki* ("every") allows both participant-distributive and collective readings in order to enforce exhaustivity. This means all girls must participate in painting a box, and none can be excluded. *Svaki* also enforces atomic distribution, ensuring that each individual (atomic) girl is an agent in the event of box-painting.

In another example (11b), where a group of four girls is divided into two subgroups, each serve as an agent responsible for painting a box. By contrast, *po* does not allow atomic distribution. They highlight a sharp contrast between the truth conditions of sentences with *po* versus those with *svaki*/*every*. Their findings show that while *po* supports this non-atomic distribution, it blocks collective readings when appears in the object position. Similarly, with *po*-numeral in the subject position, *po* distributes quantities over three girls without imposing atomicity[9].

In sentences containing both *svaki* and *po*, Knezevic and Demirdache argue that the semantics of *svaki* should ensure strong distributivity, exhaustivity, and atomicity.

1. Greek *apo* in light of Serbian *po* as analyzed by Knezevic and Demirdache

Greek *apo* mirrors Serbian *po* in both syntactic construction and semantic function. Based on Knezevic and Demirdache's account of *po*, we suggest that *apo* occupies a comparable position in Greek. As shown in example (13), Greek *apo* and the quantifier *kathenas* ("each") can both appear in a sentence, just like *po* and *svaki* do in Serbian, in the object and subject positions, respectively [9] (p. 116).

In example (14), *apo* marks the DS, denoting the object being distributed (in this case, *an apple*), whereas *kathenas* signals the DK in the subject. If three people participate in the event, then three apples are involved—one for each participant. This ensures that distribution is both exhaustive and balanced.

A similar case is seen in *ta koritsia vafoun ena kouti* ("The girls are painting a box") (example 1b in ref. [9]), which is ambiguous between a collective reading ("the girls paint one box together") and a distributive reading ("Each girl paints a different box").

However, adding *apo*, as in *ta koritsia vafoun apo ena kouti* ("The girls are painting a box each"), removes ambiguity, allowing only the distributive interpretation. Knezevic and Demirdache state that *po* occupies a fixed position in the sentence, immediately preceding the NP serving as DS [9] (p. 118). Modern Greek *apo* behaves similarly to *po*. This is evident from examples (14) and (12) where *ena milo* ("an apple") is the DS NP.

The sentence does not allow *apo* to appear in any other position; moving *apo* elsewhere results in an ungrammatical sentence, as seen in examples (33a–c):

(33) a. *To koritsi pire ena vivlio **apo**
"*The girl took a book **apo**"
b. *To koritsi pire ena **apo vivlio**
"*The girl took one **apo** book"
c. *To koritsi **apo** pire ena vivlio
"*The girl **apo took** one book"

It is also observed that, unlike universal quantifier *kathenas* ("each", "every"), which can float and be separated from the noun, *apo* cannot float in a sentence. This is demonstrated by examples (69)–(73) of Joseph and Philippaki-Warburton [3] (p. 54):

Indefinite NPs can include the numeral *enas* (M), *mia* (F), or *ena* (N). When *kathe* precedes these numerals, the result is a compound quantifier such as *kathenas* (M), *kathemia* (F), and *kathena* (N). The following examples should be taken under consideration:

(69) kathenas fititis na feri ena filo tu
"Each male student should bring a friend of his own."

When a definite article is added, it precedes the quantifier, giving it a more emphatic meaning akin to "each and every".

(70) o kathenas fititis na feri ena filo tu
"Each and every male student should bring a friend of his own."

In constructions with plural NPs, kathena is separable from the noun and may be followed by a possessive pronoun. The definite article is optional in such cases.

(71a) ta pedja na feroun (to) kathena (tus) ta lefta
"The children should each bring the money."
(71b) ta pedja na feroun ta lefta (to) kathena (tus)
"The children should bring the money, each one of them."

So far, we have observed that *apo* contributes to quantificational readings, but further evidence is needed to confirm its function as a quantifier.

Knezevic and Demirdache discuss *po*, which demonstrates similarities to *apo* in terms of Syntax and Semantics. They classify the former as a DS marker and *svaki* as a DK marker, similar to English *every*. However, English lacks corresponding words for either one of these prepositions.

Knezevic and Demirdache show that *svaki* enforces exhaustivity and *po reinforces* atomicity. *Po* is strongly distributive, but *svaki* is pseudo-distributive. Our survey aims to clarify whether a similar distinction holds for *apo*.

## 4.2. Serbian *po* in the analysis by Bosnic and Spenader

Bosnic and Spenader analyze *po* as a multifunctional element in Serbian: it serves not only as a preposition and prefix but also as a marker of distribution [10] (p. 95, 103).

Their study investigates how children interpret different uses of *po*, replicating a previous study involving Dutch quantifiers *elke* and *iedere*, which are similar in function to Serbian *svaki* and *po*.

They analyzed constructions that allow *po* and *svaki* to co-exist, previously discussed by Knezevic and Demirdache. Their findings suggest that Serbian children acquire the meanings of *po* and *svaki* relatively late, both as DK and DS markers in the sentence. They propose that a third distributive marker may be causing interference, slowing acquisition[10] (p. 106). While we do not delve into the experimental design here, their results offer insight into *po*'s grammatical behavior, which seems to parallel Greek *apo*.

Bosnic and Spenader point out that languages across the world convey a distributive reading with different distributive markers. They broadly classify these markers as DK and DS markers, which vary syntactically and semantically[13]. The fundamental syntactic difference lies in attachment: DK markers modify the restrictor set (DK) or the argument associated with the scope of the sentence (DS). While each in English example (1) targets to the *child* as the restrictor, Serbian example (2) shows *po* combining with *one present*, the distributed entity. See the following examples[10] (p. 94):

(1) [**Each child**] is carrying a present
(2) Deca nose [po jedan poklon].
Children.NOM carry.PL DISTR one present.ACC
"Children are carrying one present each."

Such sentences yield distributive readings. However, (2) also allows a collective reading, where children carry a single present together, as demonstrated through images, as well as an event-distributive reading, where different present-carrying events occur over time and space.

The study confirms that *po* is a strong distributive marker, and it can combine with *svaki*, just as the Greek distributive *apo* combines with the quantifier *kathenas*. While discussing the syntax of *svaki* and *po*, Knezevic and Demirdache proposed that combining the two markers blocks collective readings and enforces exhaustive distribution over atomic distribution to individuals, mirroring the behavior of *each* in English[9]. The results of Bosnic and Spenader's experiment confirmed their hypothesis, with adult Serbian speakers accepting only distributive readings that were exhaustive and atomic[10] (p. 94).

Given that our focus is on the use of *svaki* and *po* by Serbian speakers, either alone or together, we do not address data involving younger participants. In their study, *svaki* is described as a distributive quantifier and *po* as a DS marker. The following examples (4a–c) from their study illustrate these uses of *po*:

(4) a. Dečaci guraju dva /tri autića.
Boys are pushing two /three toy cars.
b. Svaki dečak gura dva /tri autića.
Every boy is pushing two /three toy cars.
c. Dečaci guraju po dva /tri autića.
Boys are pushing DISTR two /three toy car.

The experimental data they used, indicate three readings: distributive, where each boy pushes three toy cars (i.e., three boys and nine toys); simple (1-to-1) distributive, where each boy pushes one toy car (i.e., three boys and three toys); and collective, where all three boys together push a total of three cars[10].

Collective interpretations can only be correct in the null condition, and should be rejected if the sentence is quantified or *po*-marked[10] (p. 101).

Building on Knezevic and Demirdache's analysis, the authors argue that children acquire an understanding of *po* before *svaki* because *po*'s "the truth conditions of *po* […] are comparatively simpler and constrained. *Po* is nonatomic and nonexhaustive, while *svaki* places atomicity and exhaustivity constraints on its interpretation"[10] (p. 103).

According to Bosnic and Spenader, *po* may co-occur with quantifiers like *svaki* ("every") or *svi* ("all"). By contrast, Knezevic and Demirdache assert that *po* is restricted to combining with weak or non-specific cardinal expressions[10].

One example is provided in (6):

(6) Svaki dečak gura po tri autića.
every boy push DISTR three toy-cars
"Each boy is pushing three toy cars."

***apo* in the light of Bosnic and Spenader (2019)**

All above-mentioned authors agree that *svaki*, like English *every*, marks the DK in the subject position, while *po* marks the DS in the object.

Knezevic and Demirdache, as mentioned earlier, argue that the co-occurrence of *svaki* ("every") and *po* yields an interpretation similar to binominal *each* in English. Because *each*, unlike *every*, is strictly an individual distributive quantifier, and *svaki* more closely resembles *every,* Serbian lacks a corresponding term for *each*. Instead, its effect is achieved when *po* and *svaki* co-occur[2] (p. 106). By contrast, Greek employs *kathe* to express the meaning of *each*, and *kathe(nas)* to convey the meaning of *every* in English[8].

To explore whether Greek mirrors Serbian in these constructions, we compare their semantic behavior through equivalent sentence pairs (4a–c) to their equivalent translated sentences in Greek (34–36):

Serbian:

(4) a. Decaci guraju dva/tri autica
"Boys are pushing two/three toy cars."
b. Svaki decak gura dva/tri autica
"Every boy is pushing two/three toy cars."
c. Decaci guraju po dva/tri autica
"Boys are pushing DISTR two/three toy cars."

Greek:

(34) *Ta agoria sprohnoun dio/tria autokintakia*
"The boys are pushing two/three toy cars."
(35) *kathe agori sprohni dio/tria autokinitakia*
"Every boy is pushing two/three toy cars."
(36) *ta agoria sprohnoun **apo** dio/tria autokinitakia*
"The boys are pushing **DISTRapo** two/three toy cars."

Sentences (34) and (4a) allow distributive and collective readings, whereas examples (35) and (36) enforce distributive readings, similar to Serbian (4b) and (4c). This suggests that Greek and Serbian share syntactic similarity but also comparable semantic outcomes in these constructions.

## 4.3. Serbian *po* in the Analysis by Bosnic et al.

Bosnic et al.[11] re-examine the semantics of Serbian *po*, asking whether DS markers should be analyzed as universal quantifiers or as markers of event plurality.

Of the experiments involving Serbian transitive sentences in which *po* marks the direct object, the first two explore exhaustivity effects in such constructions, whereas the third investigates homogeneity effects across three types of negative transitive sentences: ones with *po* on the object, those with *svaki* as the subject, and those without either marker.

Bosnic et al. hypothesize that if *po* functions as a universal quantifier, it is expected to impose exhaustive distribution relative to a DK and eliminate homogeneity effects in negative sentences with a definite subject. However, if *po* merely marks event plurality and lacks universal quantificational force, it should neither mandate exhaustive distribution nor eliminate homogeneity effects in such contexts[11].

They start their discussion by examining the English distributive marker *each*, which they describe as enforcing distributive readings in sentences that might otherwise be ambiguous, as shown in the following examples[11] (p. 3):

(1) a. Each boy is holding two balloons
→ Two balloons per boy
b. The boys are holding two balloons
→ Two balloons in total
(or two balloons per boy as a less preferred option).

To ensure a distributive reading, two arguments must be paired: the DK, which represents the plural set over which distribution applies, and the DS, denoting what is distributed[7,13,14]. In (1a), *a boy* is the DK (the restriction of the universal quantifier) and *two balloons* is the DS.

According to Bosnic et al., DK markers such as *each* act as universal distributive quantifiers, which, as Gil notes, are a typological universal[7]. These quantifiers demand that every member of the DK participate exhaustively in the event. In the sentence in (1a), for example, this means each boy in the set must be associated with the action of holding two balloons[11].

By contrast, there are no DS markers in English like the Serbian *po*. Consider example (2) from Bosnic et al.:

(2) a. Dečac-i drž-e **[po dva balon-a]**.
Serbian boy-pl.nom hold-prs.3pl

**distr two balloon-paucal.acc**
"(The) boys are holding **DISTR two balloons**."

They emphasize that the differences between DS and DK markers lie in both their syntactic behavior and semantic roles. While DS markers such as *po* can trigger individual-level distribution, they also allow distribution across events[15,16]. In (2), *po* can yield both an individual-distributive reading—where each boy holds a pair of balloons—and an event-distributive interpretation, where the balloon-holding event is divided into sub-events involving at least one boy and two balloons. These sub-events can vary temporally (e.g., boys carry balloons at different times) or spatially (e.g., boys carry balloons simultaneously but in different places), with potentially different participants in each event[12,16,17].

Based on such examples, Bosnic et al. contend that *po* lacks a key property of universal distributive quantifiers: it does not enforce exhaustive distribution of the DK by the DS.

This contrast is further illustrated in example (3), which compares English and Serbian[11] (p. 5).

(3) a. The children are carrying one suitcase each. English
b. Dec-a nos-e **po jedan kofer-∅**. Serbian
children-nom carry-prs.3pl DISTR **one suitcase-acc**
"(The) children are carrying DISTR one suitcase."

(3a) yields only one reading—an atomic and exhaustive scenario where each child carries exactly one suitcase.

Serbian (3b), however, supports four interpretations: (1) Atomic and exhaustive (like its English counterpart)—three children each carry one of three suitcases. (2) Atomic without being exhaustive—some but not all children carry a suitcase (e.g., in a group of four children, only three may each carry a suitcase, leading to a non-exhaustive reading with four children but only three suitcases). (3) Non-atomic but exhaustive reading—groups of children share suitcases (e.g., six children could be divided into three groups, each carrying one suitcase). (4) Non-atomic and non-exhaustive—groups of children carry two suitcases (e.g., seven children could be divided into three groups, with only certain groups carrying suitcases).

Due to these four possible readings, Knezevic[12] rejects the universal quantification analysis, arguing that *po* lacks a core property of universal distributive quantifiers: it does not require exhaustive distribution of the DK by the DS. Instead, Knezevic proposes that *po* and similar DS markers simply signal the plurality of events[11] (p. 5, 6).

Illustrations (a–d) in Bosnic et al.[11] support this explanation.

Bosnic et al. cite Knezevic and conclude that the truth conditions of *po* are independent of exhaustivity and atomicity. Because *po*-marked sentences do not enforce exhaustive or universal distribution relative to a DK, *po* cannot be interpreted as a universal quantifier[11].

Furthermore, it is exhaustivity, not atomicity, that defines universal quantifiers, an argument supported by the following points:

(i) Even a universal quantifier like *every* allows partially distributive readings, unlike *each*, which requires distribution to individuals (e.g., *John photographed every student but not separately* is acceptable, whereas *John photographed each student but not separately* is unacceptable).
(ii) DS markers such as *po* allow spatiotemporal distributive readings over events. Since time is a continuous, non-count domain, it cannot be divided into atomic parts[11].

1. Greek *apo* in light of Bosnic et al.[11]

They conclude that in the assumption that *po* were a universal quantifier, it would necessarily demonstrate exhaustive distribution over the DK and eliminate homogeneity effects in negative sentences. Whether *apo* shares these properties—being exhaustive, distributive, and atomic—is the focus of our questionnaire. However, the homogeneity test is not possible to be replicated in Greek because *kathe(nas)* translates to *none*, rather than *not any*, unlike English.

According to the phenomenon of Homogeneity, a plural statement implies 'all' which is the case with Greek *kathe(nas)*. The negation of 'all' in English would be 'none' or 'not any'. This is not the case in Greek; *kathe(nas)* ("all, every, each") would be negated as *kanenas* meaning ("none").

There is no Greek equivalent of English polarity item 'not any' which is expressed also as *kanenas* ("none") perhaps with the additional help of *dhen* ("not") which would result in double negation in Greek as in the sentence *Dhen eida kanenan* which would literally mean ("I did not see nobody") but would translate into English as ("I didn't see any").

Therefore, the test of homogeneity in this questionnaire would not add any important information and for this, it has been disregarded.

As previously noted, for a distributive reading to be licensed, the sentence must contain two arguments: a DK (the plural set being distributed over) and a DS (the entity being distributed). This structure is paralleled in Greek syntax. In (12), *ta paidia* (the children) serves as the DK, while *apo ena milo* (DISTR one apple) is the DS.

*Po* allows distribution over individuals, where each child takes one apple, or over events, where each child participates in the act of eating an apple. Greek *apo* similarly influences semantic interpretation when appearing in the object position.

Since *po* does not demonstrate either type of distribution over the DK, it differs semantically from Greek *apo*, despite their syntactic similarities. Whether *apo* behaves more like a true universal quantifier remains an open question; our current questionnaire seeks to resolve this.

## 4.4. A cross-Linguistic Analysis

Serbian *po* and Greek *apo* may at first appear to share both syntactic and semantic properties. They follow comparable syntactic structures, regardless of whether they co-occur with Serbian *svaki* ("every") or Greek *kathe(nas)* ("each"/ "everyone"). Knezevic and Demirdache describe the structures that Serbian *po* favors and which in our analysis, are parallel those of *apo* in Greek[9]. Similar to *po*, *apo* can occur either independently or in combination with *kathe(nas)*, just as *po* can co-occur with *svaki*, as demonstrated in (13).

When *apo* appears alone, like *po*, it occupies the object position, along with a numeral and an accusative noun phrase. Conversely, the distributive Greek *kathenas*, like Serbian *svaki*, appears in the subject position, while *apo*, like *po*, is in the object position[9]. According to their analysis, in example (14) to *kathena* (*apo ta koritsia*) pire *apo ena vivlio* ("each took a book"), *apo* is a DK in the object position, denoting the event participant (as indicated by *pire*, meaning "took"), whereas *kathenas* is the DS in the subject position, representing the set over which the distribution occurs. Therefore, if three girls took books, an equal and exhaustive one-to-one correspondence between the three participants and three books is presumed.

In Serbian, *po* consistently appears directly before the NP that serves as the DS[9]. Likewise, Greek *apo* always precedes the DS NP, as in (14) and (12), where *ena vivlio* ("a book") is the DS NP. Importantly, neither *po* nor *apo* can occur elsewhere in the sentence or exhibit syntactic "floating."

Bosnic and Spenader note that combining *svaki* ("every") with *po* yields a reading comparable to English binominal *each*. Since *svaki* more closely resembles *every*, Serbian does not have a direct equivalent for *each*. Instead, combining *po* and *svaki* achieves a similar distributive interpretation[10]. Conversely, Greek has *kathe*, which corresponds to *each*, and *kathe(nas)*, which corresponds to *every*, thus eliminating the need for such a combination[8].

Bosnic et al. note that Serbian *po* allows distribution over individuals (where each child gets one apple) or over events (where each child participates in the act of eating an apple). This also applies to Greek *apo*, influencing the semantic interpretation of sentences where it appears. However, in Greek, the homogeneity test is not applicable because the universal distributive quantifier *kathe(nas)* only translates as *none* in negative contexts, unlike the English *not any*.

Another distinction, noted by Knezevic and Demirdache[9], is the potential combination of *po* with weak quantifiers, although they do not discuss it further. By contrast, as discussed in Section (ii) of Chapter III, *apo* is found in constructions with both weak and strong quantifiers in object position.

We are aware that this research is based on a comparison of two linguistically unrelated languages, that is Modern Greek and Serbian. However, both languages belong to the Indo-European linguistic family. Greek is an independent branch of the Indo-European family while Serbian belongs to the Slavic branch. Similarities between *apo* and *po* could be explained as a possible linguistic influence resulting from a certain cultural and religious contact between Serbs and Greeks. In terms of word order both are SVO languages. Both languages also follow grammatical cases that determine the syntactic function of words; both are pro-drop languages which use 3 genders. Therefore, Greek and Serbian might

not be completely unrelated linguistically. Regarding the similarities between *apo* and *po*, we should take the following into consideration: for the Greek sentence *to koritsi efage ena milo* ("The girl ate an apple"), the equivalent Serbian sentence would be *devojka je pojela jabuku* ("The girl ate an apple"). Both follow a SVO word order, with the difference that Serbian doesn't use articles. *Devojka* is *koritsi* 'girl', *je pojela* is the equivalent of *efage* 'ate' and *jabuku* is *milo* 'apple'.

Note that we use the Latin alphabet for both languages to simplify our sentences for our readers, since Greek is written in the Hellenic script and Serbian in the Cyrillic.

Chapter V will present a questionnaire designed to test whether Greek *apo* meets the defining criteria of exhaustivity, distributivity, and atomicity, which are properties essential for determining its status as a quantificational operator, and how it ultimately compares to Serbian *po*.

## 5. The Questionnaire and Its Analysis

To design our questionnaire, we adapted those used by Knezevic and Demirdache and Bosnic et al.[9,11], aiming to investigate the semantic properties of Modern Greek *apo*. We surveyed 10 native speakers whose English is a second language, with the intention to provide a questionnaire that defines our research goal in proving the quantificational properties of *apo*. It is based on questions and default examples whose answers would give evidence to what we call Prepositional Quantification.

Data was collected, based on only 10 informants of Modern Greek, specifically of the Athenian dialect. Nevertheless, their small number, informants came from different educational backgrounds, of both genders and a variety in age group in order to test how *apo* is perceived as a quantificational operator.

The language we have used in our examples was in plain Greek, taking into consideration the informants' educational background and age. It is worth noticing that all adults and the 2 youngsters included in the survey, had the same understanding of the quantificational usage of *apo*. It was an online survey because the informants were all Greek nationals who reside in different parts of the world i.e., in Canada, U.K and Greece. It was important that they had a good knowledge of English in order to be able to respond to all the questions. We did not consider anyone who did not have Greek as a mother tongue to ensure the authenticity of our results.

Our qualitative research was based on non-numerical data and a written text of questions directed to 10 native speakers of Greek, in order to understand the quantificational function of *apo* in certain constructions, taking into consideration the participants' responses. The majority of participants chose the preferred answer to each question.

Our questionnaire included default examples featuring constructions with Greek universal quantifier *kathe*, the preposition *apo*, both *kathe* and *apo*, or neither.
The questionnaire aimed to determine whether these constructions exhibit the three core properties of universal quantifiers: exhaustivity, distributivity, and atomicity. The default examples used in the questionnaire were as follows:

(37) Ta paidia metaferoun **apo** mia valitsa
"The kids are carrying **DISTRapo** one suitcase."

(38) Oi maimoudes kratane **apo** mia ombrella
"The monkeys are holding **DISTRapo** one umbrella."

(39) Ta koritsia bafoun **apo** ena kouti
"The girls are painting **DISTRapo** one box."

(40) **Kathe** koritsi evapse ena kouti
"**Each** girl painted one box."

(41) dio koritsia vafoun ena kouti
"Two girls are painting one box."

(42) **Apo** dio koritsia vafoun ena kouti
"**DISTRapo** two girls are painting one box."

(43) Tria koritsia kratoun **apo** dio ballonia
"Three girls are holding **DISTRapo** two balloons."

(44) **Apo** tria koritsia kratoun dio ballonia
"**DISTRapo** three girls are holding two balloons."

(45) **Kathe** koritsi vafi **apo** ena kouti
"**Each** girl is painting **DISTRapo** one box."

(46) a. **Kathe** koritsi pire dio ballonia
"**Each** girl took two balloons."

b. **Kathe** koritsi pire **apo** dio ballonia

"**Each** girl took **DISTRapo** two balloons."

c. Ta koritsia piran **apo** dio ballonia "The girls took **DISTRapo** two balloons."

d. Ta koritsia piran dio ballonia "The girls took two balloons."

(47) a. **Kathe** koritsi pire dio ballonia "**Each** girl took two balloons."

b. **Kathe** koritsi pire **apo** dio ballonia "**Each** girl took **DISTRapo** two balloons."

c. Ta koritsia piran **apo** dio ballonia "The girls took **DISTRapo** two balloons."

d. Ta koritsia piran dio ballonia "The girls took two balloons."

(48) a. **Kathe** koritsi pire dio ballonia "**Each** girl took two balloons."

b. **Kathe** koritsi pire **apo** dio ballonia "**Each** girl took **DISTRapo** two balloons."

c. Ta koritsia piran **apo** dio ballonia "The girls took **DISTRapo** two balloons."

d. Ta koritsia piran dio ballonia "The girls took two balloons."

To enhance clarity and comprehension, each default sentence was paired with an illustration.

Our results show that informants consistently interpreted sentence (37) *ta paidia metaferoun apo mia valitsa* ("The kids are carrying 'from' one suitcase") as having an **atomic** and **exhaustive** reading.

Sentence (38) *Oi maimoudes kratane **apo** mia ombrella* ("The monkeys are holding 'from' one umbrella") was interpreted as enforcing an **exhaustive** reading, in which each monkey holds one umbrella.

Similarly, sentence (39) *Ta koritsia bafoun **apo** ena kouti* ("The girls are painting 'from' one box") was assigned an **exhaustive** and **atomic** reading—each girl paints one box.

Example (40) ***Kathe** koritsi evapse ena kouti* ("Each girl painted one box") also received an **atomic** and **distributive** reading.

Example (41) *dio koritsia vafoun ena kouti* ("Two girls are painting one box"), which lacks both *kathe* and *apo*, was interpreted as **non-atomic**, **exhaustive**, and **non-distributive**. This result suggests that the presence of *apo* is necessary to achieve an **atomic**, **exhaustive**, and **distributive** interpretation, as observed in examples (39) and (40). In this sense, *apo* appears just as essential for quantificational readings as *kathe* (see examples 45a–c).

In sentence (42) ***Apo** dio koritsia vafoun ena kouti* (" 'From' two girls are painting one box"), the inclusion of *apo* with the numeral *dio* ("two") leads to a **non-atomic**, **exhaustive**, and **non-distributive** interpretation—two girls paint one box together. If *apo* were used with *ena* ("one"), as in (38), the reading could become atomic.

Sentence (43) *Tria koritsia kratoun apo dio ballonia* ("Three girls are holding 'from' two balloons") received an **atomic**, **distributive** reading—each girl holds two balloons, totaling six balloons.

Sentence (44) *Apo tria koritsia kratoun dio ballonia* (" 'From' three girls are holding two balloons") was generally interpreted as **non-atomic** and **distributive**, implying that every group of three girls holds two balloons.

Sentence (45) *Kathe koritsi vafi apo ena kouti* ("Each girl is painting 'from' one box") consistently yielded an **atomic**, **distributive** reading, where the number of painted boxes equals the number of girls.

In example set (46), the first three sentences (46a–c) involve either *apo* or *kathe*, and each was interpreted as **distributive** and **quantificational**. This means every girl takes two balloons. Sentence (46d), lacking both elements, was interpreted differently.

Examples (47a–c) confirm that these sentences support the interpretation " each and every girl took two balloons", with both *kathe* and *apo* contributing to the universal quantificational force. Example (47d) omits these markers and does not receive the same interpretation. Similarly, in example set (48), sentences (48a–c) maintain consistent **distributive**, **atomic**, and **exhaustive** readings, while (48d) does not.

These findings imply that *kathe* and *apo* share the same quantificational, exhaustive, atomic, and distributive properties because sentences containing either one or both yield the same interpretations. We aim to show that *apo* is semantically equivalent to *kathe* in the context of distributive quantification. The criteria supporting this argument are as follows:

1) If *apo* functions as a distributive universal quantifier, it must be exhaustive and distributive, similar to the Greek *kathe* and the English *every*[8].
2) *Apo* should permit atomic interpretations.
3) Constructions using *apo* should yield the same interpretations as those using *kathe.*

Our questionnaire findings meet all three criteria. Sentences containing either or both yield identical interpretations. Thus, *apo* may substitute for *kathe* in examples (45–47a–c) without altering the meaning, demonstrating that *apo* carries the same distributive, atomic, and exhaustive force. Based on this, we argue that *apo*, like *kathe*, functions as a quantificational operator rather than a mere distributive marker, in contrast to Serbian *po*[9,11].

As a final effort to analyze the collected data we have produced a statistical **Table 1** (as given below) that shows that the majority of the participants agree in the way *apo* is semantically perceived. *Apo* appears to share quantificational, semantic similarities with a known quantifier *kathe* in specific default constructions we have already presented.

**Table 1.** Survey Results.

| | |
|---|---|
| Q1 (37a–d) | 10/10 chose (a) atomic/exhaustive |
| Q2 (38a–g) | 7/10 chose (a) exhausted individuals |
| Q3 (39a–c) | 9/10 chose (c) exhaustive/ atomic |
| Q4 (40a–d) | 8/10 chose (a) atomic/ distributive |
| Q5 (41a–b) | 9/10 chose (b) non atomic/ exhaustive/ non distributive |
| Q6 (42a–b) | 8/10 chose (b) non atomic/ exhaustive/ non distributive |
| Q7 (43a–b) | 8/10 chose (a) atomic/ distributive |
| Q8 (44a–b) | 6/10 chose (b) non atomic/ distributive |
| Q9 (45a–g) | 9/10 chose (a) atomic/distributive |
| Q10 (46a–d) | 8/10 chose (yes) in that (a, b, c) have same distributive meaning |
| Q11 (47a–d) | 7/10 agree that (a, b, c) mean 'each and every' |
| Q12 (48a–d) | 9/10 agree that (a, b, c) display distributivity |
| *Apo* is distributive, exhaustive, atomic | The majority agrees in all questions. |

# 6. Conclusions

Our survey confirmed the quantificational and distributive characteristics of *apo*. The findings reveal that the following:

1. *Apo* can be interpreted as "each" and "every," enforcing exhaustivity, similar to *kathe*.
2. It ensures one-to-one correspondence between participants and the distributed entities.
3. It allows the distribution of individual entities across individual participants.

*Apo* and *kathe* can co-occur in a sentence while retaining the same distributive reading, as in the following examples:

(48) Ta koritsia piran **apo** ena vivlio
The girls took **apo** one book
"The girls took a book **each**."

(49) Ta koritsia piran ena vivlio
The girls took one book
"The girls took a book"

(50) **Kathe** koritsi pire ena vivlio
"**Each** girl took a book."

(51) To **kathe** koritsi pire **apo** ena vivlio
The **each** girl took **apo** one book
"Each girl took **DISTapo** one book."

Both *kathe* and *apo* in (51) contribute to an exhaustive distributive reading, confirming their shared quantificational strength. Although we initially assumed that *apo* and *kathe(nas)* represent the DK and DS, respectively, our findings show that both elements encode distributivity, exhaustivity, and atomicity.

These results align with prior research[2,6,11], which acknowledges *apo* as a distributive quantifier. Unlike Serbian *po*, which allows non-atomic interpretations, Greek *apo* blocks collective readings and enforces exhaustive and universal distribution.

These findings build the foundations of exploring the possibility of another type of Quantification, what we would like to call Prepositional Quantification in natural language.

# 7. Further Research

The formalization of *apo* and its relation to Serbian *po* can be further refined to better understand their semantic distinctions.

At present, little empirical work has examined the potential quantificational role of prepositions in specific syntactic contexts. Both exhibit quantificational properties, functioning as distributive operators in specific syntactic environments, which we illustrate in our default examples and the specific structures used in our questionnaire.

Giannakidou[18] provides an insightful overview in "The Landscape of Greek Quantifiers," where she explores how the Greek language expresses quantification. Giannakidou asserts that her research covers the Greek structures used to "to express quantification"[18] (p. 285). However, she does not address cases like our example [(12) meaning "the kids ate DISTapo one apple"], which has enabled us to analyze *apo* as a distributive quantificational operator that enforces distribution across two sets, similar to how *kathenas* functions. Giannakidou mentions instances where apo is interpreted as "than" in constructions such as *papapano apo* "no more than"[18] (p. 297), or instances where apo means "of" and "from" as seen in the following example (58) a. Idha {tris/kapius/ligus/merikus/polus} apo tus fitites Saw. 1sg {three/some/a few/several/many} of the students"[18] (p. 305).

In these cases, it is clear that *apo* is not functioning as a quantificational operator. In addition, she mentions *kathe* as a universal distributive quantificational determiner in Greek (p. 309), but does not consider constructions like our example (46a) where both *kathe* and *apo* contribute to the sentence's quantificational reading. Such examples support our claims.

Giannakidou also mentions the example (77a) where "kathenas receives both generic and episodic uses"[18]. However, she neglects to comment on the role of the preposition *apo* in the sentence. She acknowledges that "kathenas is awkward without an overt distributor" (p. 314) and refers to the prepositional phrase *apo ena vivlio* as a typical distributive PP formed with the preposition *apo*. She notes that without this preposition, the reading strongly favors a collective interpretation[18] (p. 314).

While Giannakidou[18] hints at the possibility of *apo* having distributive properties, she does not explore this further.

Consequently, we advocate for additional research on cases like Greek *apo* across other natural languages, in order to demonstrate that Greek and Serbian are not isolated instances, but that Prepositional Quantification may be a more universal phenomenon.

In our attempt to establish Prepositional Quantification, we came across another interesting finding for which there is no academic references; that was the resemblance of the semantic interpretation of Albanian preposition *nga* to Greek *apo* in the same syntactic environment. Let us provide some background information on the syntax and meaning of Albanian *nga*. The Albanian Orel Etymological Dictionary mentions that *nga* is a preposition that means 'out' and goes back to Pro-Albanian "*en-ka, a compound consisting of *en- identical with IE *en 'in' and *ka) also preserved as dialectal ka 'out'), a reflex of IE *kom, cf. Slav *kъ 'to, towards'…; the unusual semantic shift of nga is a part of a general transformation of prepositional meanings in Albanian… (ka < Gk κατά 'down' with an unexplicable loss of the second syllable…"[19].

Duraj et al.[20] mention uses of *nga* as in sentences *e njoha nga te folurit* meaning ("I recognize him/her from the way he/she speaks") and *larg nga qyteti* meaning ("away from the city").

*Nga* combines with the nominative case as in *Eshten nga Prishtina* ("He/She comes from Prishtina")[20]. Other examples include *U rrezua nga lodhja* ("He/She crushed down out of exhaustion") and *Nga darka do te dukemi* ("We will show up by night"). In the above sentences *nga* takes the same meaning which is ("from")[20].

Fera[21] also mentions that *nga* means ("from") which is the also main meaning of Greek *apo*[1].

Agalliu et al.[22] provide further examples; according to them, *nga* combined with the nominative case shows the origin, from where something begins; it might also show the reason something took place as in *debora u shkri nga dielli* ("The snow was melted by the Sun") or it might describe an approximate time like in *nga fundi i dhjetorit* meaning ("around the end of December"), or as a partitive in *nje dele nga tufa e deleve* ("a sheep from a flock of sheep").

Besides these meanings attributed to *nga*, there is another important sentence mentioned that describes distribu-

tion; this is *ndane nga 10 kg ushqime per familie* ("they distributed 10 kg of food for each family") in which the preposition *nga* combines with the verb *ndane* ("to divide, to distribute"). This feeds speculations that Albanian could be another Indo-European language that allows Prepositional Quantification.

In our effort to further investigate preposition *nga* and its similarities to *apo*, we carried out a superficial survey by asking few native speakers of Albanian to translate our default Greek sentences (48), (49) and (50) in Albanian. The results are presented below:

For sentence (48) *ta koritsia piran apo ena vivlio* ("The girls took a book each") the Albanian equivalent would be *Vajzat moren nga nje liber* giving the same meaning ("The girls took a book each"). The equivalent of Greek *apo* is Albanian *nga* used in a way that provides the same distribution, so that if there are 10 girls, there must be 10 books in order for each girl to take a book. The syntax of the sentence is also the same in Albanian where the subject is *vajzat* ("girls"), the verb is *moren* ("took") *nga* is placed in the same position like *apo*, that is after the verb in a way that combines with a numeral and a noun like *nje* ("one") and *liber* ("book").

For sentence (50) *kathe koritsi pire ena vivlio* ("Each girl took a book"), the Albanian equivalent would be *Secila vajze mori nje liber* again providing the same meaning as in English sentence *Each girl took a book*. The syntax is the same in both Greek and Albanian and distribution in both is achieved with the use of quantifiers *kathe* and *secila* respectively, so that if we have 10 girls, we should also have 10 books.

Similarly, for sentence (51) *to kathe koritsi pire apo ena vivlio* ("Each girl took a book"), the Albanian equivalent would be *secila vajze mori nga nje liber* ("Each girl took a book"). This sentence allows the co-existence of quantifier *secila* and preposition *nga* in order to achieve the desired distribution. The interesting finding is that both quantifier *secila* and preposition *nga* allow the same distribution like Greek *kathe* and *apo*, whether or not combined together in the sentence; this hints that *nga* might favor the same quantificational, distributional analysis like Greek *apo*. Note that Marku[23] translates Albanian *nga* ("from") in Greek as *από* 'apo' ("from") and classifies both as prepositions.

Nevertheless, our findings further research into the quantificational properties of *nga* is vital in order to establish its quantificational profile and prove that we are dealing with a universal linguistic phenomenon that is of Prepositional Quantification. The case of Albanian *nga* along with our present research of Greek *apo*, allows us to believe that we are at the beginning of such findings that can be also expanded to additional natural languages, besides Serbian.


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# Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Research Ethics Committee in the College of Pharmacy in Taibah university KSA (COPTU-REC) (protocol code COPTU-REC-115-20241002 and date of approval 02/10/2024) for studies involving humans. Ethical review and approval were waived for this study due to the need to expand vital knowledge on how natural language expresses Quantification.

# Informed Consent Statement

Informed consent was obtained from all subjects involved in the study, proved by their willingness to actively participate in the survey included in the study.

# Data Availability Statement

Data have been saved in the researcher's personal computer and have respected the privacy and confidentiality of those who have provided the data.


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## Conflicts of Interest

The author declares no conflict of interest. Taibah university had no role in the design of the study, in the collection, analyses, or interpretation of data, in the writing of the manuscript or in the decision to publish the results.

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