

PROPERTIES AS ANAPHORS*

CEM BOZSAHIN

Middle East Technical University

1 Introduction

It has been observed, to my knowledge first in print by Göksel (2006), that Turkish nominal inflections, in particular the plural and the possessive, facilitate pronominal readings, in addition to their commonly accepted functions. From *pencere-ler* (window-PLU), we get the expected plural, and an anaphor, as in (1).¹

- (1) Pencere-ler mavi ol-sun iste-miş-ti-m.
Window-PLU blue be-OPT want-PERF-PAST-1s
'I wanted the windows to be blue.'

Notice that in (1) we do not necessarily have multiple windows, therefore this is not a reading we can read off the semantics of the plural noun.² Imagine the example in a context where I asked the decorators to have a blue frame in my only window, and red mirrors, and they got them mixed. The relevant aspect seems to be that the referent is a set but not necessarily a non-singleton set; it is necessarily a property.

The property-as-anaphor reading is more evident when we turn an individual into a property. In (2), there is no referential reading for *Oğuz Atay*; we are referring to a (set of) thing(s) related to him, i.e. to a property. The referent might be a single person, therefore this use too is orthogonal to a collection of authors that might be designated by the plural on the proper name. In other words, the situation is similar to above, where the plural noun reading does not instigate the pronominal reading.

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¹I use the term *anaphor* descriptively, to mean an element that does not refer by itself and needs a referent. I will avoid the term *antecedent* in the discussion of referents because it inevitably ties to a linguistic resolution of the referent. Descriptive use of the term keeps both syntactic and contextual binding as possible mechanisms.

²I will continue to gloss the morpheme in its pronominal sense as -PLU. This might look contradictory to my claim. With this choice I hope to keep the discussion on a descriptive footing on which we all agree. My analysis in later chapters will make it evident that I believe different syntactic categories and meanings—therefore different morphemes—are involved.

- (2) Oğuz Atay’lar iste-diğ-i gibi yaz-abil-ir.
 O.A.-PLU want-REL-3s like write-ABIL-AOR
 ‘People like Oğuz Atay can write in any way they desire.’

The process might appear to relate to mass/count-noun distinction, but its difference from that property can be observed when we put the same construction to work on mass nouns: *su-lar kes-il-di* (water-PLU cut-PASS-PAST) ‘the water is off.’ Therefore a mass noun can take the “plural” too, in which case it delivers an anaphor.

Anaphoric possessive is exemplified below.

- (3) Başka-sı bunu anla-ma-z.
 Other-POSS.3s that understand-NEG-AOR
 ‘Nobody else would understand.’

Observe also the following example from the web, where the italicized morpheme is neither a possessive nor compound marker (Turkish conflates the surface forms of these constructions). It is necessarily anaphoric.

- (4) Her biri başka bir yöre İstanbullu-*su* olanların da,..
 every one-POSS.3s another one region Istanbuler-POSS.3s be-REL-PLU-GEN and
 ‘And for the ones who are Istanbulers from some region..’

Compare the cases where the expected function of the possessive (5a) and compound marker (5b) are at work: there is no anaphoric reading. In this regard, the possessive and the plural behave the same way.

- (5) a. Her gösterge-ye ekonomi-nin durum-u yansı-dı.
 every metric-DAT economy-GEN.3s condition-POSS.3s reflect-PAST
 ‘The condition of the economy is reflected in every measure.’
 b. Her biri taş usta-sı ol-du.
 every one-POSS.3s stone master-COMP.3s be-PAST
 ‘They all became a mason.’

The purpose of the current paper is to show that this is a general property of Turkish grammar. It is not construction-specific or morphological. Properties can be syntactically bound or contextually bound when they arise from certain kinds of nominals.

The phenomenon is an expected consequence of type-dependence of syntax, and of syntax-semantics co-dependence, by which properties, or $((e,t), (e,t))$ type nominals in Montaguean terms, can serve as (e,e) type nominals in syntax. Therefore they are similar to “donkey anaphora” (Geach, 1962): *every farmer who owns a donkey_i beats it_i*, and to similarly constrained Bach-Peters sentences (1970): *The man who shows he_i deserves it_j will get [the prize he_i desires]_j*. These kinds of anaphors can be syntactically bound as shown by the coindexation, or contextually bound (imagine the donkey sentence where all farmers beat a particular donkey that nobody owns).³

Following Jacobson (1999), I take (e,e) to be the semantic type of the syntactically or contextually bound anaphors and look at its consequences. A crucial aspect is that syntactic

³Throughout the paper, *syntactic binding* refers to cases where surface syntax conspires to bind them.

derivation, therefore constituency, distinguishes the two kinds. This will form the basis of my analysis.

The general availability of the construction can be observed in Turkish syntax. Similar to nominal inflections, in all the constructions where a property of the type $((e,t), (e,t))$ is involved, we see the anaphoric behavior: the headless relative (6a–b), the adjective (6c) and the *-ki* relative (6d).

- (6) a. Sinema-yı sev-en bu film-e gid-er.
 Cinema-ACC like-REL this film-DAT go-AOR
 ‘Cinema lovers must see this movie.’
 lit. ‘The ones who love cinema must see this movie.’
- b. Gör-düğ-üm bana yet-ti.
 See-REL-1s I-DAT suffice-PAST
 ‘I’ve seen enough.’
 lit. ‘What I’ve seen is enough.’
- c. Zengin kriz-den etkile-n-me-di.
 Rich crisis-ABL affect-PASS-NEG-PAST
 ‘The rich has not been affected by the crisis.’
- d. Akşam-ki zor bir soru-y-du.
 Night-ki difficult one question-COP-PAST
 ‘Last night’s question was hard.’
 lit. ‘Last night’s one was a hard question.’

The anaphoric readings appear to be headed by the relativizers (6a–b), the adjective (6c) and the *ki* (6d). Witness *akşam zor geçti* (night hard passed) ‘the night was tough’ versus *akşamki zor geçti*, literally ‘the one at night was tough’, perhaps referring to a night exam. Without *-ki* there is no anaphoric reading.

Compare also *zengin adam* ‘rich man’ versus *zengin* ‘rich’ in (6c), where it is necessarily anaphoric. Notice that, in contrast with the English gloss where the property is specific (‘the rich’), the Turkish expression is not necessarily specific but it is necessarily anaphoric. Both aspects relate to referential dependency, but the pervasive one in these examples (and in others that I can think of in similar conditions) seems to be their anaphoric dependence.

The examples in (6) are all contextually bound. They can be syntactically (i.e. linguistically) bound as well:

- (7) a. Her sinema-yı sev-en bu film-e gid-er.
 Every Cinema-ACC like-REL this film-DAT go-AOR
 ‘Every cinema lover must see this movie.’
- b. Bazı gazete-ler-de gör-düğ-üm ben-i üz-dü.
 some newspaper-PLU-LOC see-REL-1s I-ACC sadden-PAST
 ‘The things i’ve seen in some newspapers saddened me.’
- c. Zengin kriz-den etkile-n-me-di ama hepsi şikayetçi.
 Rich crisis-ABL affect-PASS-NEG-PAST but all complain.
 ‘The rich has not been affected by the crisis but they all complain.’

- d. Akşam-ki her öğrenci-nin çöz-ebil-eceğ-i bir soru değil-di.
 Night-ki every student-3s solve-ABIL-REL-3s a question not
 ‘It wasn’t a question that any student can solve last night.’
 lit. ‘The one last night wasn’t a question that any student can solve.’

My claim is that the differences in (6) and (7) arise mainly because there is no overt syntactic binder in the first set of examples whereas surface syntax conspires to bind in the second set. The possessive can be syntactically unbound and bound too, as was shown in (3–4).

2 ‘One’

One possible analysis of the phenomenon, suggested by a reviewer, is to treat the “missing” head as ‘one’, or *biri* in Turkish (one-POSS.3s). It is possible in Turkish to use *biri* in most of the examples I have covered so far. However, there is a difference. All the examples can be quantificational without *biri*. With *biri/şey* (one/thing), they are non-quantificational, cf. (6) and (8). Note also (8b).

- (8) a. Sinema-yı sev-en ?şey/biri(si) bu film-e gid-er.
 Cinema-ACC like-REL thing/one(POSS) this film-DAT go-AOR
 ‘One who loves cinema must see this movie.’
 b. *Her sinemayı seven biri bu filme gider.
 Every
 c. Gör-düğ-üm şey/biri bana yet-ti.
 See-REL-1s thing/one I-DAT suffice-PAST
 ‘What/who I’ve seen is enough.’
 d. Akşam-ki şey zor bir soru-y-du.
 Night-ki thing difficult one question-COP-PAST
 ‘The thing last night was a hard question.’
 lit. ‘The thing last night, it was a hard question.’

There is another difference. The aorist helps to facilitate quantification in *biri/şey* examples (9). *Biri*-less examples do not need it for the same effect. It suggests that a “missing *one*” analysis is probably not the right way to proceed.

- (9) a. Zengin şey/biri kriz-den etkile-n-me-di/z.
 Rich thing/one crisis-ABL affect-PASS-NEG-PAST/AOR
 ‘A rich one has not been affected by the crisis.’ past/non-quant.
 ‘A rich one may not be affected by the crisis.’ aor/quant.
 b. Akşam-ki şey/biri tadımı kaçır-dı.
 Night-ki thing/one disappoint-CAUS-PAST
 ‘The person/thing last night disappointed me.’
 c. Sinema-yı sev-en bu film-e git-ti/gid-er.
 Cinema-ACC like-REL this film-DAT go-PAST/go-AOR
 ‘Cinema lovers saw this movie.’
 ‘Cinema lovers go see this movie’.

3 Analysis

We can summarize the Turkish data presented so far as follows: Properties as anaphors can be (i) syntactically unbound and (ii) contextually bound. (iii) They can be syntactically bound as well, by a conspiracy of (a) wh operators, (b) tense, (c) verbs, and (d) quantifiers. Therefore the phenomenon has something to do with grammar. The binders (iii.a–d) and the conspirators of the binding process are highlighted in the following examples.

- (10) a. *Her sinema-yı sev-en bu film-e gid-er.*
Every Cinema-ACC like-REL this film-DAT go-AOR
'Every cinema lover must see this movie.'
- b. *Bazı gazete-ler-de gör-düğ-üm ben-i üz-dü.*
some newspaper-PLU-LOC see-REL-1s I-ACC sadden-PAST
'The things i've seen in some newspapers saddened me.'
- c. *Zengin kriz-den etkile-n-me-di ama hepsi şikayetçi.*
Rich crisis-ABL affect-PASS-NEG-PAST but all complain.
'The rich has not been affected by the crisis but they all complain.'
- d. *Akşam-ki öğrenci-nin çöz-ebil-eceğ-i bir soru değil-di.*
Night-ki student-3s solve-ABIL-REL-3s a question not
'Last night's wasn't a question that a student can solve.'

The outline of my proposal is as follows. These facts are predicted in part by three global properties that need not be stipulated for individual grammars: (i) type-dependence of natural grammars, (ii) radical lexicalization of all grammars, and (iii) direct compositionality and surface compositionality, by which every surface constituent is interpretable (Jacobson 1999, Barker and Jacobson 2007, Steedman 2011). However, the construction seems to be Turkish-specific, therefore, to complete the picture, it must arise from constraints on Turkish grammar.

3.1 Type-dependence

The proponents of type-dependence suggest that structure of natural language strings, which are structure-dependent, can be explained by type-dependent grammars, rather than structure-dependent grammars. The idea constitutes the foundation of all categorial grammars, including Type-Logical Grammar (Morrill, 1994, Moortgat and Oehrle, 1994) and Combinatory Categorical Grammar (hereafter CCG; Steedman 2000, 2011).

The idea is explained in detail from CCG's perspective in Bozsahin (2012). For our purposes, it suffices to note that, by type-dependence, any anaphoric nominal string exemplified in the current paper leads to a lexicalizable syntactic type which is a function from NPs to NPs, i.e. NP/NP and $NP.^{NP}$. This is irrespective of the underlying structure of these strings, and it is in this sense that the grammar in general and the process currently discussed are not structure-dependent but type-dependent. These strings can be (inflected) substantives, personal NPs, complex NPs, adjectives, headless relative clauses and *ki*-relatives, as exemplified earlier in (1), (2) and (6). We can show that the classic examples of the structure-dependence of natural language strings, yes/no questions, relative clauses, etc. are type-dependent as well, therefore type-dependence claims that auxiliary assumptions (empty categories, traces, chains, cycles, phases, minimal links, etc.) are not needed to explain differential structures that behave the same syntactically.

The following types are therefore predicted to be borne by the items that led to the anaphoric readings in the earlier examples:

- (11) a. [Pencere-ler]_{NPNP} mavi ol-sun iste-miş-ti-m.
 Window-PLU blue be-OPT want-PERF-PAST-1s
 ‘I wanted the windows to be blue.’
- b. [Oğuz Atay’lar]_{NPNP} iste-diğ-i gibi yaz-abil-ir.
 O.A.-PLU want-REL-3s like write-ABIL-AOR
 ‘People like Oğuz Atay can write in any way they desire.’
- c. [Sinema-yı sev-en]_{NP/NP} bu film-e gid-er.
 Cinema-ACC like-REL this film-DAT go-AOR
 ‘Cinema lovers must see this movie.’
 lit. ‘The ones who love cinema must see this movie.’
- d. [Dün sokak-ta gör-düğ-üm]_{NP/NP} bana yet-ti.
 yesterday street-LOC see-REL-1s I-DAT suffice-PAST
 ‘What I’ve seen on the street yesterday is enough.’
- e. [Zengin]_{NP/NP} kriz-den etkile-n-me-di.
 Rich crisis-ABL affect-PASS-NEG-PAST
 ‘The rich has not been affected by the crisis.’
- f. [Akşam-ki]_{NP/NP} zor bir soru-y-du.
 Night-ki difficult one question-COP-PAST
 ‘Last night’s question was hard.’

How these types arise from complex NPs, relative clauses and adjectives are covered in the next section. I wrap up the relevant global properties first.

3.2 Radical lexicalization

Radical lexicalization claims that any phrase-structure grammar up to and including the class of linear-indexed grammars can be rewritten in such a way that all the rules that make no use of a lexical item can be eliminated in favor of incorporating them into the categories of lexical items. The term is due to Karttunen (1989), but the idea goes as far back as Lambek (1961).

CCG is a radically lexicalist theory. The relevance of this result for the current purpose is that, once we radically lexicalize the fragment of Turkish grammar that includes the categories of heads for the properties-as-anaphors construction, we are forced to take morphemes as heads of these constructions because they determine the semantics and syntax of the construction, and, because we are left with a lexical correspondence of syntax and semantics of every lexical item in a radically lexicalized grammar, that is all we can work with to capture their syntactic behavior while assuring the delivery of their semantics at every step of the derivation.

As an example consider the following fragment of grammar of Turkish. It includes some bound elements such as tense and case.

(12)	S	\rightarrow	$NP_{nom} VP_{fin}$	V	\rightarrow	uyu (sleep)
	VP_{fin}	\rightarrow	VP Tense	V	\rightarrow	vur (hit)
	VP	\rightarrow	$NP V$	NP	\rightarrow	Ahmet
	NP_{case}	\rightarrow	NP Case	Case	\rightarrow	nom acc etc.

We can rewrite all the rules in the first column above as directionally-specific syntactic functions from a constituent on the right-hand side to the result on the left-hand side. The first rule can be recast as $NP_{nom}=S/VP_{fin}$, and $VP_{fin}=S\backslash NP_{nom}$ because it has two constituents, from which it follows that $NP_{nom}=S/(S\backslash NP_{nom})$. From the second rule we obtain $Tense=VP_{fin}\backslash VP$, which is equivalent to $Tense=(S_{fin}\backslash NP_{nom})\backslash(S\backslash NP_{nom})$. The third rule gives us the lexical category of the transitive verb because $V=VP\backslash NP=S\backslash NP_{nom}\backslash NP$. The fourth rule shows us that case markers become value-raisers because $Case=NP_{case}\backslash NP$, which, for the nominative, is equivalent to $Nom=(S/(S\backslash NP_{nom}))\backslash NP$. (Value-raised categories are those which have type-raised results.)

We rewrite every rule in the first column of (12) as equivalences to V, N, NP and $Case$, i.e. in terms of the lexicon in the second column of (12).

We can perform this process of rule reduction for any grammar up to and including the class of linear-indexed grammars. If there is no empty category in a theory (as is the case for CCG), which is to say no rule of the kind $X \rightarrow \epsilon$ need be stipulated or governed by any grammar, then, at the end we are left only with lexical items with complex categories (technically called *combinatory categories*). We can completely eliminate the “rules component” by this process, and let the grammar contain only lexical items with combinatory categories. We cannot eliminate the right column of (12) because lexical items cannot be rewritten like this (it amounts to saying eg. $uyu=V$), and eliminating them changes the empirical coverage of the grammar.

Notice that, when we are done, case, tense, relative affix etc. will all get a combinatory type *in the lexicon*; they are bonafide lexical items with clearly defined syntax and semantics. This is crucial for the proposed explanation, as follows.

The heads of the constructions in (11) are shown below, along with their types. Some of them are words, but most of them are bound morphemes. By radical lexicalization, any string that is meaning-bearing can materialize in the lexicon, therefore this is expected. Bozsahin (2002), Çakıcı (2008), McConville (2006) show how they can be parsimoniously represented, and effectively and efficiently parsed.

- (13) a. $Pencere[-ler]_{NP} NP \backslash NP$ mavi ol-sun iste-miş-ti-m.
 Window-PLU blue be-OPT want-PERF-PAST-1s
 ‘I wanted the windows to be blue.’
- b. $Oğuz Atay'[lar]_{NP} NP \backslash NP$ iste-diğ-i gibi yaz-abil-ir.
 O.A.-PLU want-REL-3s like write-ABIL-AOR
 ‘People like Oğuz Atay can write in any way they desire.’
- c. $Sinema-yı sev[-en]_{(NP/NP)\backslash(S\backslash NP_{nom})}$ bu film-e gid-er.
 Cinema-ACC like-REL this film-DAT go-AOR
 ‘Cinema lovers must see this movie.’
 lit. ‘The ones who love cinema must see this movie.’

- d. Dün sokak-ta gör[-düğ-üm]_{(NP/NP)\(S'\NP'_{obl})} bana yet-ti.
 yesterday street-LOC see-REL-1s I-DAT suffice-PAST
 ‘What I’ve seen on the street yesterday is enough.’
- e. [Zengin]_{NP/NP} kriz-den etkile-n-me-di.
 Rich crisis-ABL affect-PASS-NEG-PAST
 ‘The rich has not been affected by the crisis.’
- f. Akşam[-ki]_{NP/NP} zor bir soru-y-du.
 Night-ki difficult one question-COP-PAST
 ‘Last night’s question was hard.’

3.3 Compositionality and reference

Direct compositionality and surface compositionality propose that every surface constituent is interpretable (Jacobson 1999, Barker and Jacobson 2007, Steedman 2011). The differences in their syntactic behavior is evident when we consider the resolution of references to syntactically bindable items. In this respect, the concepts relate to our present concern.

Direct compositionality suggests that any constituent must be model-ready for interpretation. Therefore, if there are potential bindings in a partially derived constituent, then this must be evident from its syntactic type, eg. expecting a “bindable pronoun” type rather than an NP. Surface compositionality (Steedman, 2011) suggests that one-to-one correspondence as needed in a model-theoretic interpretation needs a further model for bindable elements, which relaxes direct compositionality but maintains compositionality at the surface structure; see Barker and Jacobson (2007), Steedman (2011), Bozsahin (2012) for extensive discussion.

Jacobson’s proposal for direct compositionality begins with what might be called *exponent types*, X^Y which are functions from Y to X . Unlike their “syntactically active” equivalent $X|Y$, which are also functions from Y to X , they do not bear a slash, hence do not subcategorize for an argument. In particular, syntactic bindability as broadly conceived in current work assumes (following Jacobson 1999) that such referentially dependent elements are of the type NP^{NP} not NP . Semantically they are identity functions, which for nominals narrows down to (e, e) type. But, unlike the English pronoun (14a), *zengin* in (13e) (‘the rich’) must assume the type (14b) where two constant substantive meanings compose to deliver an anaphor.⁴ *Zengin* in *zengin adam* ‘rich man’ must bear the type in (14c). We note that *sinemayı seven* and *dün sokakta gördüğüm* of (11) must bear the same types too because they are substitutable for anaphors like (14a–b):⁵

- (14) a. he := $NP^{NP} : \lambda P.P$
 b. zengin := $NP^{NP} : \lambda x.one'(rich'x)$
 c. zengin := $NP/NP : \lambda P\lambda x.and'(Px)(rich'x)$
 d. sinemayı seven := NP/NP
 e. dün sokakta gördüğüm := NP/NP

The debate on the resolution of reference and the nature of syntactic types bears on constituency and computation. For constituency, Jacobson (1999) points out that the NP^{NP} type for pronouns

⁴: $\lambda x.one'(rich'x)$ is equivalent to $\lambda x.(B'one'rich')x$, where **B** is the compositor of Curry and Feys 1958.

⁵We omit the semantics of the relative clauses to avoid digression.

maintains (a) the across-the-board Coordinate-Structure Constraint (CSC) asymmetry without extra assumption, and (b) that it is impossible to bind *out* of one conjunct in (15a), and possible to bind *into* just one in (15b). The “like-category constraint” for CSC is not enough if we do not make the three-way type distinction $\{S, S^{NP}, S|NP\}$; see Bozsahin (2012) for further discussion.

- (15) a. Every man_i loves and no man_j marries his_{i&j/*i/*j} mother.
 b. Every man_i thinks he_i lost and Mary won.
 c. Every man loves and no man marries his mother
- $$\begin{array}{c}
 \frac{S/(S\backslash NP)}{\quad} \quad \frac{(S\backslash NP)/NP}{\quad} \quad \frac{S/NP^{NP}}{\quad} \quad \frac{NP^{NP}}{\quad} \\
 \frac{\quad}{(S\backslash NP)/NP^{NP}} \\
 \frac{\quad}{S/NP^{NP}} \rightarrow^{\mathbf{B}} \\
 \frac{\quad}{S/NP^{NP}} \rightarrow^{\&} \\
 \frac{\quad}{S} \rightarrow
 \end{array}$$
- d. Every man_i thinks he_i lost and Mary won.
- $$\begin{array}{c}
 \frac{NP^{NP}}{\quad} \quad \frac{S\backslash NP}{\quad} \quad \frac{(X\backslash_*X)/_*X}{\quad} \quad \frac{S}{\quad} \\
 \frac{\quad}{S^{NP}\backslash NP^{NP}} \xrightarrow{g-NP} \quad \frac{\quad}{S\backslash_*S} \rightarrow \\
 \frac{\quad}{S^{NP}} \leftarrow \quad \frac{\quad}{S^{NP}\backslash_*S^{NP}} \xrightarrow{g-NP} \\
 \frac{\quad}{S^{NP}} \leftarrow
 \end{array}$$

Jacobson’s handling of the constraint is previewed in (15c–d). The next section describes its mechanism. That, we claim, is adequate to explain the properties-as-anaphors phenomenon in Turkish. Its computational repercussions remain to be assessed. I will be more specific about this aspect in conclusion.

4 Deriving properties as anaphors

The potential syntactic binders of properties-as-anaphors need NP^{NP} and $S,^{NP}$ as exemplified in (10) and (15c–d). The latter kind is a function from e -type nominals to t .

The binder types are engendered in syntax by Jacobson’s z , which is a syntacticization of Schönfinkel’s (1920/1924) **B**, **S** and **C**:

$$(16) (X|_i NP)|_j Y: f \rightarrow (X|_i NP)|_j Y^{NP} : \lambda g \lambda x. f(gx)x \quad (z-NP)$$

They are projected in syntax by another syntacticized combinator, **B**. Jacobson calls this version g , for ‘Geach rule’:

$$(17) X|Y: f \rightarrow X^Z|Y^Z : \lambda g \lambda x. f(gx) \quad (g)$$

Compare this version of **B** with the “syntactically active” version below. There are good empirical, theoretical and computational reasons to stay away from rules such as (18); see Bozsahin (2012) for a summary.

$$(18) X|Y: f \rightarrow (X|Z)|(Y|Z): \lambda g \lambda x. f(gx) \quad (\mathbf{B})$$

The unary rules in (16–17) are what keep the properties-as-anaphors idea model-ready without extra devices. Examples of the process have been shown in (15c–d).

However, these rules are global properties; they are not language-specific. Therefore, we need Turkish-particular assumptions to be able to account for the language-particular mechanism of productive anaphor generation by properties. The correspondence between NP/NP types and NP^{NP} in Turkish, semantically $((e, t), (e, t))$ and (e, e) , can be established by a single lexical rule:

$$(19) NP/NP: \lambda P \lambda x. \text{and}'(Px)(n'x) \rightarrow NP^{NP}: \lambda x. \text{one}'(n'x)$$

where n' is the substantive element, e.g. *rich*.' The type-dependent relation between syntactic properties and nominals that have been exemplified throughout the paper can be established by a single lexical correspondence as well:

$$(20) NP: \lambda x. n'x \rightarrow NP/NP: \lambda P \lambda x^s. \text{and}'(Px)(n'x)$$

Here, the stage-level predicate constraint of Carlson (1977) is denoted as a superscript (λx^s), by which x can only substitute for arguments of stage-level predicates. These correspondences establish the properties-as-anaphors idea as follows, without further assumption:

- (21) a. [*Pencere-ler*] _{NP^{NP}} mavi ol-sun iste-miş-ti-m.
 Window-PLU blue be-OPT want-PERF-PAST-1s
 'I wanted the windows to be blue.'
- b. [[*Dün sokak-ta gör-düğ-üm*] _{NP/NP}] _{NP^{NP}} bana yet-ti.
 yesterday street-LOC see-REL-1s I-DAT suffice-PAST
 'What I've seen on the street yesterday is enough.'
- c. [[*Zengin*] _{NP/NP}] _{NP^{NP}} kriz-den etkile-n-me-di.
 Rich crisis-ABL affect-PASS-NEG-PAST
 'The rich has not been affected by the crisis.'

It remains to be shown how these potential anaphors can be syntactically bound, or left unbound to be resolved by discourse. (I offer no explanation for their contextual binding.) In the example below, the headless relative instigates the property as anaphor and the other constituents project an anaphor reading, to engender a syntactically unbound but contextually bindable anaphor. Notice that the result is not S but $S.NP$. This is one way in which a grammar can help discourse.

$$\begin{array}{c}
 (22) \quad \begin{array}{ccc}
 \text{Sinema-y}_1 \text{ sev} & \text{en} & \text{bu film-e} \quad \text{gid-er.} \\
 \text{Cinema-ACC like} & \text{-REL} & \text{this film-DAT go-AOR}
 \end{array} \\
 \hline
 \begin{array}{ccc}
 S \backslash NP_{\text{nom}} & (NP/NP) \backslash (S \backslash NP_{\text{nom}}) & S \backslash NP
 \end{array} \\
 \hline
 NP/NP \\
 \hline
 NP^{NP} \quad \text{---}^{(19)} \\
 \hline
 S^{NP} \backslash NP^{NP} \quad \text{---}^g \\
 \hline
 S^{NP}
 \end{array}$$

‘Cinema lovers must see this movie.’
 lit. ‘The ones who love cinema must see this movie.’

The syntactically bound version of the same example is shown below. The verb instigates the bound reading, which the quantifier binds as the others project.

$$\begin{array}{c}
 (23) \quad \begin{array}{ccc}
 \text{Her} & \text{Sinema-y}_1 \text{ sev-en} & \text{bu film-e} & \text{gid-er.} \\
 \text{Every} & \text{cinema-ACC like-REL} & \text{this film-DAT} & \text{go-AOR}
 \end{array} \\
 \hline
 \begin{array}{ccc}
 (S / (S \backslash NP^{NP})) / NP^{NP} & NP/NP & NP_{\text{dat}} & (S \backslash NP_{\text{nom}}) \backslash NP_{\text{dat}}
 \end{array} \\
 \hline
 NP^{NP} \quad \text{---}^{(19)} \\
 \hline
 S / (S \backslash NP^{NP}) \\
 : \lambda P \lambda y. P(\text{every-cinema-lover}'y) \\
 \hline
 (S \backslash NP_{\text{nom}}^{NP}) \backslash NP_{\text{dat}} \quad \text{---}^z \\
 : \lambda x \lambda g. go'x(gx) \\
 \hline
 S \backslash NP_{\text{nom}}^{NP} \\
 \hline
 S
 \end{array}$$

‘Every cinema lover must see this movie.’

The crucial step (z) in the last example shows that a whole class of **Z**’s must be operating in syntax for initiating the projection of bindable elements. The one we need for Turkish is given below. We can see (24) operating in (23). Compare it with (16).

$$(24) (X|_i Y)|_j NP: f \rightarrow (X|_i Y^{NP})|_j NP: \lambda x \lambda g. fx(gx) \quad \text{(z-NP)}$$

One issue we have left unsettled is the role of the plural and the possessive in this construction, as remarked in the introduction. The plural bears the type $-ler/-lar := NP \backslash NP: \lambda p. plu'p$ in its usual function. If the pronominal reading does not arise from plu' semantics, as I tried to argue in this work, then a “plural” noun such as *pencere-ler* ‘windows’ needs to be delivered as a pronominal by some other mechanism. I suggest that it too depends on properties, which is in this case $NP \backslash NP$, as in most nominal inflections including the plural and the possessive (but not case, which is a value-raiser). Such properties-as-anaphors engendered by inflections may have another category in the lexicon which does not refer to the plural or the possessive (i.e. they may be different morphemes; cf. footnote 2). This can be achieved by assuming them lexically to be $NP^{NP} \backslash NP: \lambda P \lambda x. one'(Px)$,

which has no substantive component hence it is a genuine pronominal. The proposal is tentative and further work is being done to test it.

5 Can syntax require a pronoun?

The preceding discussion showed that a grammar may need finer distinctions of S for anaphors to be syntactically bound. There are different ways to bind them, and, following the syntactic projection idea of a referential dependency, as is the case in direct compositionality accounts, it brings S^{NP} and NP^{NP} as syntactically necessary distinctions from S and NP . A question then arises, which will have implications for any linguistic theory: can these types be in the domain of locality of a head? In other words, can syntax require a pronoun?

The Welsh passive seems to me to be such a case; see Bozsahin (2012) for more discussion. Consider the example below.

- (25) Cafodd Wyn ei rybuddio.
 Got.3s Wyn his warning
 ‘Wyn was warned.’ Awbery (1976: 210)

Awbery explains: “The passive sentence has a sentence-initial inflected form of *cael* (get) of the same tense and aspect as the verb of the active. This is followed by a noun phrase identical to the object of the active. Then comes a pronoun of the same person, number and gender (if it is 3sg) as this noun phrase, and an uninflected form of the verb in the active” Awbery (1976: 47).

The pronoun and *cael* are obligatory. And Awbery’s data shows that what is dropped if the noun phrase after *cael* is a pronoun is the subject NP, not the possessive pronoun required by the passive:

- (26) Cawsom (ni) ein rhybuddio gan y ferch.
 Got.1pl (we) our warning by the girl
 ‘We were warned by the girl.’ Awbery (1976: 48)

If *cael* is the head of the passive, then the pronoun must be in its domain of locality. Bozsahin (2012) shows the mechanism of its binding. Steedman’s CCG, in particular its recent ways of referential processing (Steedman, 2011), predicts that referential dependencies are not resolved by syntactic types unless they are locally bound, therefore it predicts that pronominal domains of locality can be dispensed with by additional mechanisms.

6 Conclusion

The paper argues that properties (syntactic and semantic) can be anaphors in Turkish. They seem to be doing this in a type-dependent way. The underlying structures of these constituents may differ, but they show similar syntactic behavior with respect to anaphors. We assume that the process suggests a common syntactic type, rather than being structure-dependent. All structures with type $NP|NP$ arising from nominal inflections, stage-level predicates and predicative nominals behave the same referentially. This is in part due to global properties of all grammars: they must be type-dependent. It also depends on Turkish grammar systematically relating NP , $NP|NP$ and NP^{NP} types to S and S^{NP}

As the analysis showed, the syntactically relevant versions of properties-as-anaphors bear on constituency and computation. What remains to be worked out is their efficient parsing. This issue is critical because efficient parsing and immediate interpretability of all constituents determine the kind of categories that materialize in the lexicon. The potential threat to efficient computation arises from the lexical rules that create exponent types and their binders, which are unary rules. Work is underway to couch the problem as a case of lazy evaluation, where exponent types are generated and projected only when they are required in a given string.

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