# $\varphi$-feature Accumulation via the Labeling Algorithm

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This work presents a theory of $\varphi$-feature accumulation within the nominal projection based on evidence from Turkish possessive constructions. We show that $\varphi$-features introduced by independent heads in the nominal projection must be accumulated at the maximal nominal projection and we propose that this accumulation is carried out by the Labeling Algorithm (Chomsky 2013, et seq.).

**Introduction.** Research on $\varphi$-features (PERSON, NUMBER, and GENDER) converge on a decompositional analysis where $\varphi$-features are introduced by independent heads inside the nominal projection (Déchaine & Wiltschko 2002, Harley & Ritter 2002, Bernstein 2008, Kramer 2015, i.a.). The tree in (1) illustrates the distribution of $\varphi$-features, remaining mostly agnostic

(1)
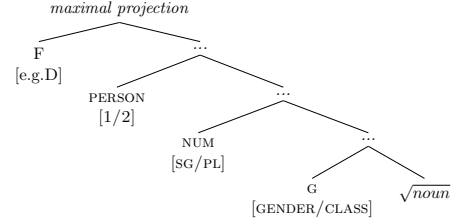


to the distribution of other elements in the nominal phrase. While the decompositional approach accounts for a wide range of semantic, syntactic, and morphological phenomena internal to the nominal projection, it raises several significant problems in the interaction of the nominal projection with the clausal syntax. As Danon (2011) points out, operations of the clausal syntax target the features of the maximal nominal projection. Major operations interacting with the features on the maximal projection are *Agree* (Danon 2011), *Selection* (Grimshaw 2000), and *Binding* and the major constraints indicating the presence of accumulation of features at the maximal projection are *locality* and *c-command*. In the following, we first show that the $\varphi$-features (specifically NUMBER) in Turkish nominals are introduced below the maximal projection. Then, we show that binding in Turkish requires c-command and only $\varphi$-features of the head noun can co-vary with the $\varphi$-features of the bound anaphor *kendi* 'self'.

**Premise 1 - Number is introduced low.** Turkish possessive constructions are instructive regarding the position where $\varphi$-features are introduced within the nominal projection. In the following we focus our attention to the NUMBER feature. In possessive constructions, NUMBER morpheme appears between the possessed noun and possessive morpheme.

(2)  Ece-nin  kardeş-i
    Ece-GEN sibling-POSS
    "Ece's sibling"
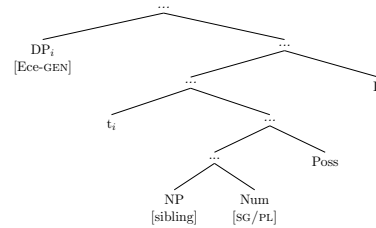
(3)  Ece-nin  kardeş-ler-i
    Ece-GEN sibling-PL-POSS
    "Ece's siblings"

(4)



Adopting the decompositional $\varphi$-feature approach, standard Distributional Morphology (Halle & Marantz 1993) assumptions and the Mirror Principle (Baker 1985), we assume that the morpheme order reflects the merge history in the syntax. For possessive constructions, following Öztürk & Taylan (2016), we assume the structure in (4), where the possessum is the complement the Poss head and the possessor is the specifier. The possessor can further move to some higher position (e.g. specifier of the maximal projection) for reasons like specificity/definiteness. The crucial point is that the NUMBER feature is deeply embedded in the structure where it cannot c-command anything outside the maximal projection.

**Premise 2 - Binding requires c-command.** The anaphor *kendi* 'self' obligatorily agrees with its antecedent in $\varphi$-features and the antecedent must c-command the anaphor locally.

(5)  Ben kendi-m-i  gör-dü-m.
    I  self-1SG-ACC see-PAST-1SG
    "I saw myself."

(6)  Ben-im kardeş-*ler*-im       kendi-*ler*-in-i        gör-dü-ler.
     I-GEN   sibling-PL-POSS.1SG self-PL-POSS-ACC see-PAST-1SG-PL
     "My siblings saw themselves."

Sentence (6) is quite instructive. The anaphor *kendi* shows plural agreement with the Num feature introduced in a position that doesn't c-command it. On the other hand, the possessor *benim* cannot bind the anaphor, neither does it show any agreement with the anaphor. This not surprising as it does not c-command the anaphor. Instead, it is the maximal nominal projection that c-commands and binds the anaphor. Yet, the maximal nominal projection is headed by D, which does not have any NUMBER features. The NUMBER feature introduced low in the extended nominal projection must become visible at the maximal noun projection to interact with clausal operations like Agree and Binding. The problem we highlight here is similar to what motivated the Extended Projections (Grimshaw 2000), where the nominal feature is considered to be present across the whole DP. Likewise, it is the same problem as "feature-percolation" which was proposed to account for pied-piping but fell from grace for conceptual reasons (Cable 2012). We call this the Feature Accumulation Problem.

(7)  **The Feature Accumulation Problem:** "Some" features introduced low in the nominal projection must accumulate at the top of the maximal nominal projection.

**Proposal.** Evaluating several potential mechanisms for the transfer of features, e.g. *feature movement, feature percolation, agreement via feature sharing* and their shortcomings, we propose a novel account of Feature Accumulation via the Labeling Algorithm (Chomsky 2013, et seq.). Slightly modifying the Labeling Algorithm, we propose that the labeling algorithm does not simply project the head as the label as in (8). Instead, it projects the set of Agreement Features copied from the head and the complement as in (9).

(8)   $Merge(\alpha, \beta) \Rightarrow \{\alpha\{\alpha, \beta\}\}$                          (Chomsky 2013, et seq.)

(9)   $Merge(\alpha, \beta) \Rightarrow \{\{F_1, F_\beta\}\{\{F_1, F_2, F_3\}\{F_\alpha, F_\beta, F_\gamma\}\}\}$          Our Modified Proposal

This proposal is compatible with both the Inclusiveness condition as well as the No Tampering Condition (Chomsky 2000) and it is a natural outcome of the Merge and the Labeling Algorithm. Given the modified Labeling Algorithm, the structure of a phrase like in (4) will be as in (10).

**Discussion.** The proposed account unifies the extended projection for Selection, feature-percolation for pied piping, and transfer of $\varphi$-feature transfer to the maximal projection for agreement and binding. They are all outputs of the Labeling Algorithm. One thing we leave open for future research is the precise set of features that are Agreement Features. We hypothesize that these are the set of interpretable (lexical) features that undergo various Agree operations, i.e. Category feature for Selection (for Agreeing/checking), $\varphi$-features for agreement and binding, Wh-features (for Agreeing/checking) but leave the matter open for empirical testing.

(10)
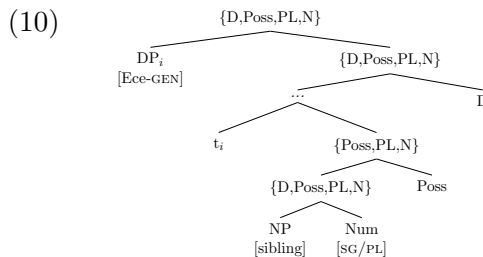
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