

Labeling as two-stage process: Evidence from semantic agreement

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Abstract

This chapter provides novel empirical evidence that the distinction between grammatical and semantic agreement can be tied to two stages of labeling of a phase, namely, labeling by features projected from narrow syntax and labeling by the syntax-semantics interface (CI) (Chomsky, 2013, 2015). I use the term grammatical agreement as a shortcut for a morphological realization of features projected to the label from narrow syntax, be they valued or unvalued (then the morphology realizes them as a morphological default), and semantic agreement for a morphological realization of the feature representation provided during labeling by CI. The latter morphological realization is faithful to the intended semantic denotation but does not necessarily isomorphically realize ϕ -feature bundles present in narrow syntax (e.g., feminine gender on anaphors referring to grammatically neuter nouns, as in German *Mädchen* ‘girl’; Wurmbrand 2017). The distinction between the two types of feature bundles in the label can be empirically distinguished when we compare the locality domains of syntactic relations based on agree, and locality domains mediated by phase heads (anaphoric agreement). I argue that agree must be based on features projected from narrow syntax, and only as last resort the valuation may reflect features from the CI labeling. In contrast, anaphoric relations are primarily based on CI labeled features.

The proposal furthers our understanding of locality restrictions on grammatical versus semantic agreement and provides a principled account of otherwise puzzling locality differences. Furthermore, it contributes to our understanding of the representation of labels and the division of labor among modules of the grammar. Under the proposed model, syntax is a fully autonomous module, with no recourse to semantic information. Instead, interpretability of features arises only at the syntax-semantics interface. No notion of (un)interpretable features as, e.g., in Smith (2015), is needed. Empirical support for the proposal comes from nominal, anaphoric and conjunct agreement in Italian, Czech and English.

1 Introduction

Under the Y-model, narrow syntax builds structure and the interfaces interpret it. The notion of interpretability is, however, multiply ambiguous: while at the syntax-morphology branch interpretability means that the output of the narrow-syntax computation is readable and realizable by the morphology module (as in the Distributed Morphology framework, e.g., Halle and Marantz 1993), the syntax-semantics interface ultimately yields an interpretation in a compositional semantics sense (see, for instance, the explicit model presented in Heim and Kratzer

1998) but the primary purpose of the syntax-semantics interface is presumably parallel to that of the syntax-morphology interface, i.e., to make the narrow-syntax representation legible and realizable by the semantic module. Neither of these notions of interpretability matches the original notion of interpretable versus uninterpretable syntactic features of Chomsky (2000) and following work where the notion of interpretability concerns feature checking prior the narrow-syntax representation is externalized via the interfaces.

The lack of terminological clarity becomes particularly problematic in the domain of semantic interpretability of ϕ -features. Some authors argue that features like gender and number come to the narrow syntax derivation in two flavors: some instances of gender and number features are purely formal, while others are semantically interpretable. The proposals tend to associate the interpretable ϕ -features with a higher functional projection, such as D, and the formal version with a lower projection, such as n (sometimes directly, sometime via another semantically interpretable features, such as humanness, e.g., Veselovská 1998; Kramer 2009; Pesetsky 2013; Smith 2015; Landau 2016), or they leave the distinction purely to the interpretability of the feature (Kramer, 2015). Some authors, most prominently Wiltschko (2009), explore the idea that the difference is not only that of a structural height but of syntactic complementation versus adjunction as well.

This chapter puts forward a rather different view that fully utilizes the Y-model architecture, i.e., it is centered around syntax as a combinatorial module which does not utilize any semantic information. In particular, I argue that there is no notion of semantic interpretability within the narrow syntax module. Instead, ϕ -features become interpretable only in the course of the derivation, namely, at the syntax-semantics interface, as part of a two-stage labeling of phases: first by features projected from narrow syntax, then by features labeled by the syntax-semantics interface (CI; Chomsky 2013, 2015). The role of phase heads is then to map narrow syntax features (first labeling stage) onto features within the phase label making them legible to the semantics module (second labeling stage). Since these features become associated with semantically interpreted objects, they become indirectly interpretable via these objects. Furthermore, I argue that the association can yield a new set of ϕ -features that can value features left unvalued from narrow syntax and can participate in processes mediated by phase heads, such as anaphoric agreement (e.g., Kratzer 2009). Thus, there is only one type of ϕ -features in narrow syntax. The appearance of a structurally higher features being interpretable is a direct consequence of the role of phase heads (D for gender and number) in mapping narrow-syntax representations onto the syntax-semantics interface. This chapter explores two interrelated sets of data that support this theoretical position: the so called semantic versus grammatical agreement, and anaphoric agreement. The empirical novelty of the chapter lies in its focus on locality restrictions on interpretability of ϕ -features, instead of on the question of interpretability of ϕ -features per se, thus highlighting the role of the individual grammar modules and uncovering new empirical patterns.

2 Grammatical versus semantic agreement within and with nominals

Most of the current theoretical work that recognizes that only some ϕ -features are semantically interpreted, while others are not, centers on two empirical phenomena: (i) nominals with a set of grammatical ϕ -features that do not match the intended interpretation, and (ii) nominals with a set of grammatical ϕ -features that matches more than one semantic interpretation. The former

case can be exemplified by nouns like *děvče* ‘girl’ in Czech or *Mädchen* ‘girl’ in German (e.g., Wurmbrand 2017). The gender of these nouns is grammatically neuter but the noun itself denotes a female. As the Czech examples in (1) demonstrate, such a noun obligatorily triggers neuter agreement in a local agree domain (subject-predicate agreement, agreement within the extended nominal projection); however, cross-sentential agreement can either be neuter or feminine. I.e., the agreement can match the morpho-syntactically realized gender (here, neuter), or it can match the semantically intended gender (here, feminine).

- (1) To/ *ta pracovitě/ *pracovitá děvče šlo/ *šla na
 that.N.SG/ *F.SG industrious.N.SG/ *F.SG girl.N.SG went.N.SG/ *F.SG on
 jahody. Hned jich mělo/ měla plný košík.
 strawberries immediately of_them had.N.SG/ F.SG full basket
 ‘The industrious girl went strawberry-picking. She quickly filled a basket.’

As (2) demonstrates, anaphoric agreement can switch between grammatical and semantic agreement even within the same clause. Since Czech is a pro-drop language, a cross-sentential agreement is mediated by an anaphoric agreement¹ between a pro element and the linguistic antecedent present in the previous sentence. Thus, a local agreement must be based on agree with the morpho-syntactic features of the nominal but the anaphoric relation can be based either on the morpho-syntactic features realized on the nominal, or on the ϕ -features matching the intended interpretation (feminine for a female).²

- (2) Petr podal děvčeti jeho/ její kabát.
 Petr passed to-girl.N.SG its/ her coat
 ‘Petr gave the girl_i her_i coat.’

Note that Czech is a *pro*-drop language. This means that a cross-sentential agreement in (1) is mediated by an anaphoric agreement between a *pro* and the linguistic antecedent present in the previous sentence.³ I argue that the cross-sentential agreement and the anaphoric agreement have the same structural underpinning, albeit in distinct locality domains. Thus the cut between grammatical and semantic agreement is not between a local and long-distance agree but between agree and whatever operation underlies the anaphoric relation. The descriptive generalization of the pattern we have seen so far is given in (3).

¹I use the term anaphoric agreement somewhat loosely to have a cover term for a valuation of ϕ -features on pronouns.

²Nothing in the basic characterization hinges on Czech being a *pro*-drop language. We could replace the covert pronominal subjects of (1) with their overt counterpart, as in (i). The profile of the data doesn’t change but the examples are downgraded because overt pronominal subjects are natural only in contrastive contexts or as expletives.

- (i) To/ *ta pracovitě/ *pracovitá děvče šlo/ *šla na jahody.
 that.N.SG/ *F.SG industrious.N.SG/ *F.SG girl.N.SG went.N.SG/ *F.SG on strawberries
 ‘The industrious girl went strawberry-picking.’
 a. ?Ono jich hned mělo plný košík.
 3.SG.N of_them immediately had.N.SG full basket
 b. ?Ona jich hned měla plný košík.
 3.SG.F of_them immediately had.F.SG full basket
 ‘She quickly filled a basket.’

³The anaphoric agreement must refer to the linguistic antecedent, otherwise the grammatical – neuter – agreement would be unexpected.

- (3) *Descriptive generalization for type ‘girl.N’ nouns:*
- a. A local agreement must be based on agree with the morpho-syntactic features of the nominal. [in our examples, neuter]
 - b. An anaphoric agreement (relation) can be based either on the morpho-syntactic features realized on the nominal, or on the ϕ -features matching the intended interpretation. [in our examples, neuter or feminine for a female]⁴

The pattern is reminiscent of the behavior of so called imposters, i.e., nominals which grammatical features do not match their intended interpretation, as in English *yours truly* (e.g., Collins and Postal 2012). While subject-predicate agreement with imposters is strictly based on their morpho-syntactic ϕ -features, (4), their locally bound pronouns can either share the morpho-syntactically expressed ϕ -features of its antecedent, or can be based on the intended interpretation, as in (5).

- (4) Yours truly is/*am unhappy. (Collins and Postal, 2012, 3, (5c))

- (5) Your Majesty should praise yourself / herself. (Collins and Postal, 2012, vii, (1b))

The variability in the morphological expression of the anaphor is licensed only if the immediate antecedent is an imposter. If the immediate antecedent is a pronoun referring back to the imposter, then the morphological form of the anaphor is strictly based on the morphological features of the pronoun, not that of the preceding imposter, as in (6).

- (6)
- a. The present authors₁’ children feel that they₁ need to defend their₁ interests.
 - b. The present authors₁’ children feel that we₁ need to defend our₁ interests.
 - c. *The present authors₁’ children feel that they₁ need to defend our₁ interests.
 - d. *The present authors₁’ children feel that we₁ need to defend their₁ interests.
- (Collins and Postal, 2012, 141, (2))

Thus, non-pronominal DPs can give rise to two distinct anaphoric agreement patterns but pronouns cannot.

- (7) *Descriptive generalization of variability in anaphoric agreement:*
Only non-pronominal DPs can give rise to two distinct anaphoric agreement patterns.

Two interrelated questions arise: (i) Under what conditions can ϕ -features on a nominal yield a new set of features, namely, features that match the intended semantic interpretation?, and (ii) What is the structural underpinning of anaphoric agreement and why does its locality domain differ from syntactic agree?

Before we can answer these questions we need to consider another set of nominals, i.e., those in which the morpho-syntactically realized ϕ -features yield more than one interpretation. This group of nominals can be exemplified by Russian nominals such as *vrač* ‘doctor’, i.e., nominals that morphologically appear to be masculine but if the intended referent is female, these nominals can trigger feminine agreement in their local domain (e.g., extended nominal

⁴In a language with different markedness properties, for example, Arabic where feminine is default, the concrete features would play out differently but the general characterization in terms of morpho-syntactic features versus the intended interpretation is expected to remain unchanged.

projection; see, e.g., Corbett 1983 and Pesetsky 2013). Italian nouns of profession, such as *chirurgo* ‘surgeon’ exhibit the same pattern (e.g., Kučerová 2018). If the noun denotes a male (or is unspecified for natural gender), all agreeing elements must be masculine, as in (8). In contrast, if such a noun denotes a female, the predicate agreement is feminine but the agreement within the extended nominal domain can either be feminine or masculine, as in (9).⁵

(8) il chirurg-o è andat-o
 the.M surgeon.M has gone.M
 ‘the (male) surgeon is gone’

(9) a. la chirurgo è andat-a
 the.F surgeon has gone.F
 b. il chirurgo è andat-a
 the.M surgeon has gone-F
 ‘the female surgeon is gone’

Crucially, the switch in the local agreement pattern, as in (9), is subject to markedness. I.e., a morphologically masculine noun can trigger feminine predicate agreement but a morphologically feminine noun cannot trigger a masculine predicate agreement, as in (10). See also Bobaljik and Zocca (2011) for a discussion of cross-linguistic prevalence of markedness in these patterns.

(10) La/ *il brava/ *bravo guarda si e’persa nel bosco.
 the.F.SG/ M.SG good.F.SG/ M.SG guard.F.SG her/him lost.F.SG in the woods
 ‘The guard lost his/her way in the forest.’
 (modeled after Ferrari-Bridgers 2007)

The markedness restriction, however, only holds for a local agreement. The anaphoric agreement can freely be based on the intended gender even if the antecedent is in a morphologically marked form and triggers obligatory marked (feminine) agreement, as in (11) from Czech.

(11) Viděls tu/ *toho vysokou/ *vysokého osobu_i, co
 saw-you that.ACC.F.SG/ M.SG tall.ACC.F.SG/ M.SG person.F.SG what
 stála/ *stál u baru?
 stood.ACC.F.SG/ M.SG by bar
 ‘Did you see that tall person_i that stood by the bar?’
 a. Marie mi ho_i představila.
 Marie to-me him introduced
 ‘Marie introduced him_i to me.’
 b. Marie mi ji_i představila.
 Marie to-me her introduced
 ‘Marie introduced her_i to me.’

⁵If the noun is morphologically marked as feminine, all agreeing elements must be feminine, as in (i). I take these cases aside as they are orthogonal to the main focus of this chapter.

(i) la chirurg-a è andat-a
 the.F surgeon-F has gone.F
 ‘the female surgeon is gone’

The markedness restriction is not limited to the masculine-feminine opposition. As the Czech example in (12) demonstrates, neuter nouns in a three-gender system match the behavior of feminine nouns, i.e., local agree is obligatorily determined by the grammatical features of the noun but anaphoric agreement can be based either on grammatical (here, neuter), or semantic features (masculine, feminine).

- (12) Přišlo tam takové vyžle. Marii se nelíbil/
 came.N.SG there such.N.SG skinny_person.N.SG. Marie.DAT REFL not-liked.M.SG/
 nelíbila/ ?nelíbilo.
 F.SG/ N.SG
 ‘There was a skinny person_i there. Marie didn’t like him_i/ her_i/ them.SG_i.’

Thus with respect to locality of agreement, nouns like *osoba* and *guarda* behave like *děvče* in that agree with them is based on the grammatical gender but anaphoric agreement with them is variable.

The only difference is that while the morpho-syntactic gender on *děvče* never matches the intended semantic interpretation (feminine), the morpho-syntactic gender on *osoba* and *guarda* (feminine) can. Note also that the grammatical gender of ‘girl’ type nouns never matches the intended semantic interpretation (natural gender). The grammatical gender of ‘person’ type nouns can (*osoba* ‘person.F’ can denote a female) but not always (*vyžle* ‘skinny person.N’) which is a direct consequence of the lexical underspecification of the natural gender of the referent for this type of nouns. The interaction of grammatical features and the intended interpretation is summarized in (13).⁶

- (13) *Does agreement match gender-features morphologically expressed on the nominal, or the intended interpretation? (descriptive summary for a 3-way gender system)*

⁶For reasons of space, this chapter entirely leaves out interactions of grammatical versus semantically-interpretable number. Number is also subject to this type of variation, as witnessed by nouns of the committee type in English, and there is a distinction between number based on the intended interpretation (the more frequent case, as in *a pen vs pens*; see, e.g., Kratzer 2009 for an argument that number is primarily semantic) and grammatical number of pluralia tantum (e.g., Corbett 2000). As an anonymous reviewer correctly pointed out, number seems to differ from gender in that it allows a switch to the intended interpretation in a local agree relation, as in (i). However, there is a non-trivial confound: Cases of local semantic agreement I am familiar with involve movement which affects locality. As pointed out by Sauerland and Elbourne (2002), the plural agreement with collective nouns in English requires a wide-scope reading of the nominal. Similarly, Babyonyshev (1997) ties the emergence of semantic agreement with numerals in Russian to derived positions as well. To fully explore the similarities and possible differences between gender and number goes beyond the scope of this chapter.

- (i) A northern team is/are certain to be in the final.
 a. is: $\exists > \text{certain}$, $\text{certain} > \exists$
 b. are: $\exists > \text{certain}$, $*\text{certain} > \exists$

(Sauerland and Elbourne, 2002, 288, (14))

The other difference is that number value is in and of itself semantically interpreted but gender only triggers a presupposition. It is not obvious whether the interpretive difference has a syntactic counterpart in the type of features number and gender are in narrow syntax. Note, for example, that for Kratzer (2009) number is not associated with a DP but it arises only at the level of vP. Thus, if there is a number feature in the narrow syntax of a DP it must be a different object that the semantic number Kratzer is interested in.

	type 1 (<i>děvče</i> ‘girl.N’)	unmarked type 2 (<i>chirurgo</i> ‘surgeon.M’)	marked type 2 (<i>osoba</i> ‘person.F’)
agr within DP	features	either	features
subj-pred agr	features	interpretation	features
anaphoric agreement	either	either	either if n, otherwise interpretation

Thus marked type 2 nouns (‘person’) can be unified with type 1 nouns (‘girl’) but unmarked type 2 nouns (‘surgeon’) seem to differ. Yet, I argue we can unify them as well but we will have to take into account a morphological realization of unvalued syntactic features.

Before we proceed with the discussion, a note on existing literature is in order. The fact that values of ϕ -features do not always match their denotation, and that under such conditions, some grammatical processes may be based on the ‘semantically informed’ value of the feature has previously been accounted for by proposing that there is more than one gender feature in the structure: one interpretable, one uninterpretable, with the interpretable feature often being merged higher (e.g., Kramer 2009, 2015; Pesetsky 2013; Smith 2015; Landau 2016; Wurmbrand 2017). Putting aside the non-trivial theoretical consequences of semantic information being part of the narrow-syntax computation,⁷ it is not clear how this line of reasoning could account for the full range of the data discussed in this chapter, especially the locality properties. If a probe unselectively probes for a gender feature, the interpretable feature should always be closer. In turn, we wouldn’t expect to see the distinction between local agree and anaphoric agreement, of the type discussed for *děvče*, (1)–(2). If the probe was selective, then we should never find optionality within anaphoric agreement and we shouldn’t see a split between agree within an extended nominal projection in contrast to subject-predicate agreement, as in (9). If such a split was explainable, let say, by the height of the interpretable feature, we would expect the split to appear everywhere, not only with morphologically unmarked gender, i.e., for instance, (10) should have the same agreement profile as (9), contrary to the facts.

3 Proposal: What is in the label?

The empirical pattern discussed in the previous section raises two questions: (i) Under what conditions can ϕ -features on a nominal yield a new set of features, namely, features that match the intended semantic interpretation?, and (ii) What is the structural underpinning of anaphoric agreement and why does its locality domain differ from syntactic agree? We will start by answering the former question. The proposed answer will then naturally extend to the latter question as well (to be discussed in section 3.3).

The core observation is that the relevant ϕ -feature variation manifests itself only in agreement. I assume that agreement is a morphological realization of a syntactic relation, namely, agree. Since agree targets labels as a representation of a more complex syntactic structure, in order to understand agreement patterns, we must first understand what ϕ -features are in the label.⁸ I will argue that in order to account for the empirical distinction between grammatical

⁷Assuming ‘interpretable’ features in narrow syntax seems to be a remnant of Generative Semantics. Such an assumption is incompatible with the Y-model.

⁸By label I mean a feature set that represents a syntactic structure that for purposes of syntactic operations such as merge or agree behaves as a unit. For example, a label of an extended nominal projection (DP) is a set of features that represent the DP for purposes of external/internal merge etc.

and semantic agreement, we have to explore not only what features form a label but also at what point of the derivation, the label gets established. Concretely, I will propose that grammatical agreement is based on an early stage of labeling, namely, that associated with feature projection in the narrow-syntax module, and that semantic agreement is based on a later stage of labeling, namely, that associated with the label being accessed (minimally searched, using the technical term of Chomsky 2013, 2015) by the syntax-semantics interface (CI).

Let us discuss the proposal in a technical detail. I assume that ϕ -features in narrow syntax are never semantically interpreted. Interpretability of ϕ -features arises only indirectly at the syntax-semantics interface via an association with a semantic index.⁹ As for the feature values, I assume that features can be valued or unvalued, and that agree consists of matching and valuation (Chomsky, 2000; Adger, 2003; Pesetsky and Torrego, 2007). If a ϕ -feature is valued in narrow syntax, it either comes to the derivation valued from the lexicon, or it is valued by agree with an instantiation of a valued feature of the same type. Crucially, I argue that if a ϕ -feature cannot be valued in narrow syntax, it can be valued at the syntax-semantics interface. Such a valuation is highly restricted: I argue that it is restricted by the Maximize Presupposition principle of Heim (1991) as part of phase spell-out & labeling.

The labeling process proposed in Chomsky (2013, 2015) implicitly assumes that labeling is a two-stage process. I explicate the individual stages here. The first stage of labeling is based on syntactic features that are present in the narrow-syntax derivation, i.e., features that get automatically projected to within narrow syntax. That the first stage of labeling is based on the narrow-syntax representation guarantees the primacy of syntax in the overall derivation.¹⁰ Once all syntactic features are checked and projected, the phase is spelled-out and the structure undergoes labeling by the syntax-semantics interface (CI).¹¹ I argue that the primary objective of this stage of labeling is to ensure that the label is legible to the semantics module. I argue that as part of the second stage of labeling, syntactic features in the label can be re-bundled and otherwise adjusted for purposes of externalization, in a manner parallel to feature adjustments identified for the realization of syntactic structures at the syntax-morphology interface (e.g., as in the Distributed Morphology framework of Halle and Marantz 1993). Note that when the phase is syntactically complete, only the complement of the phase head is externalized (spelled-out). The label and the edge of the phase remains accessible to the syntactic computation of the next phase.

The consequence of the two-stage labeling process is that if there are ϕ -features in the label, they can be projected to the label within narrow syntax, or they could be result of labeling by the syntax-semantics interface. Namely, if there is a valued gender feature in the narrow-syntax derivation of a DP, this valued feature must project to the label. If a probe probes for

⁹The ϕ -feature-like interpretive effects can arise also via the lexical denotation of a root. For example, a root for a noun like ‘woman’ denotes a female via its lexical semantics. Note that this semantic denotation of natural gender is by definition assertive. I will argue that the interpretive effect associated with ϕ -features is presuppositional.

¹⁰The core assumption here is that syntax builds structures, interfaces interpret these structures.

¹¹Chomsky (2013, 2015) does not explicitly acknowledge the necessity of the two stages but if the labeling process is to reflect narrow-syntax features and if CI plays a role in the labeling process, there must be two processes taking place in two stages of the derivation. As pointed out by an anonymous reviewer, two stages of labeling are explicitly proposed in Bošković (2016). In this work, labeling interacts with movement, i.e., there is a labeling stage prior movement and a labeling stage after movement of certain syntactic objects. Bošković’s approach is rather different from the approach of labeling proposed in this chapter as his two stages of labeling reflect narrow-syntax processes, not an interaction of narrow syntax and the CI interface. This being said, it is quite possible that there is a deeper connection between the two approaches as movement out of a phase interacts with spell-out. To fully explore this connection goes beyond the scope of this chapter.

a gender feature, it must get valued by this syntactically projected feature. However, if there is no valued gender feature in the narrow-syntax derivation of a DP, I argue that under certain circumstances the syntax-semantics interface can fill in a semantically appropriate value. The next two subsections discuss the proposed derivations in a detail.

3.1 Labeling in syntax

Let us start with examining the agreement pattern attested in Italian and exemplified in (8)–(9), repeated below.

(14) il chirurg-o è andat-o
 the.M surgeon.M has gone.M
 ‘the (male) surgeon is gone’

(15) a. la chirurgo è andat-a
 the.F surgeon has gone.F
 b. il chirurgo è andat-a
 the.M surgeon has gone-F
 ‘the female surgeon is gone’

I assume that historically all nouns in a language like Italian or Czech, i.e., languages with a grammatical gender system, were associated with a gender from the lexicon.¹² However, there is a limited lexical domain in which nouns lost their gender specification, i.e., nouns of professions that were traditionally performed by males but are currently increasingly performed by females. In turn, some nouns that used to be grammatically specified for masculine gender have changed their grammatical representation in order to reflect this sociological shift and have become structurally genderless.¹³ Thus, we can directly investigate two types of nominals: nouns *with* a valued gender feature from the lexicon, and nouns *without* a valued gender feature from the lexicon.

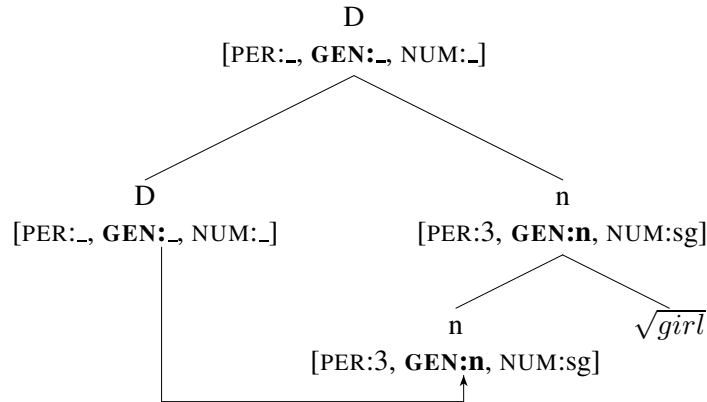
For concreteness, let us assume that D is merged as a bundle of unvalued ϕ -features.¹⁴ The unvalued feature on D gets valued by matching feature on n. The features on n are valued from the lexicon (to match idiosyncratic indices of the root representation; Acquaviva 2014). In turn the valued gender feature projects to the label of the DP. A derivation of a noun with gender valued from the lexicon – here ‘girl’ with the gender feature valued as neuter – is given in (17).

(16) *Derivation of a noun with gender from the lexicon (děvče ‘girl.N’):*
 a. *Base generation & agree:*

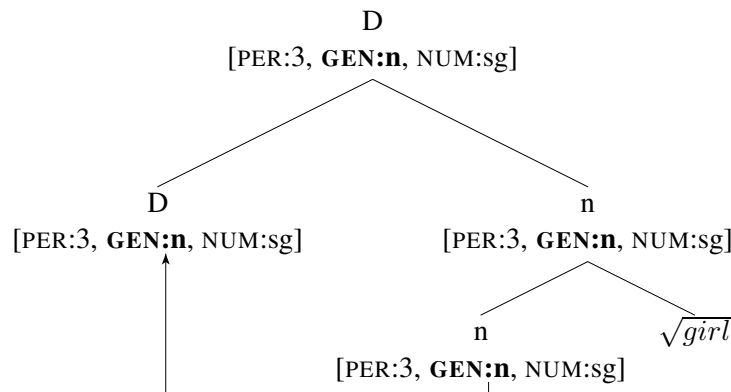
¹²See Acquaviva (2014) for a formal model of such a system and arguments why in a language like Italian gender is an intrinsic part of the root lexical representation. Cf. Borer (2014) for an argument that roots do not have to combine with categorial heads as long as they project a nominal feature like gender.

¹³See Kučerová 2018 for structural tests demonstrating that Italian names of professions we investigate here are based on category-neutral roots, unlike their gendered counterparts.

¹⁴This is rather simplistic as e.g., Ritter (1995) and Béjar and Rezac (2003) argue that person is merged as a valued person on D. Similarly, there’s a number of sophisticated arguments for a Number P etc. The current simplification is inconsequential as the focus is on features that project to the label in narrow syntax, i.e., the only relevant factor is that their value is introduced within the narrow-syntax computation.



b. *Valuation & syntactic labeling:*

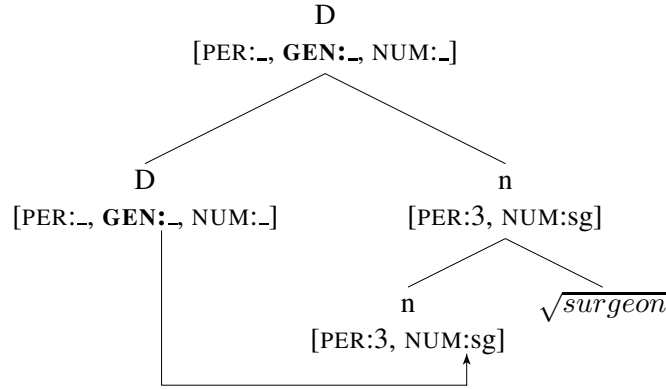


A consequence of this derivation is that agreement with such a DP is strictly based on the grammatical gender feature from the lexicon. In the case of the noun ‘girl.GIRL’ this means that all instances of agreement based on agree (e.g., subject-predicate agreement) will be in neuter. Observe that the derivation would proceed in the same way for any common noun with a gender specified from the lexicon.

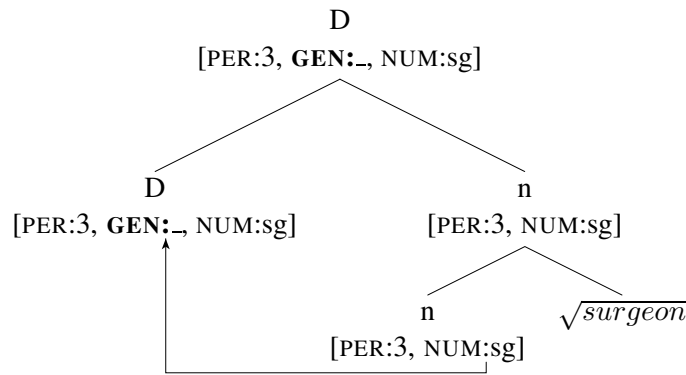
The narrow-syntax derivation of a noun without a valued gender from the lexicon is minimally different. As we can see in (17), if a noun like *chirurgo* ‘surgeon’ enters the derivation, D still probes for the gender feature on n. But since there is no valued gender on n, the feature on D remains unvalued and this unvalued feature projects to the label in narrow syntax.

(17) *Derivation of a noun without gender from the lexicon (chirurgo ‘surgeon’):*

a. *Base generation & agree:*



b. *Valuation & syntactic labeling:*



Once we adopt a dissociation of matching and valuation, the derivation converges even if the gender feature projected in syntax is unvalued. In turn, if such a DP is spelled-out, morphology realizes the unvalued gender feature as a morphological default. For Italian, the default realization is masculine. We thus obtain a masculine DP realization, such as that in (21-b). The question is how we can model the fact that the same DP can be realized with a “semantically informed” value, as in (21-a).

3.2 Labeling in the syntax-semantics interface

I follow Cooper (1983); Heim (2008) and others in that a gender feature is presuppositional. This means that its semantic denotation can be captured as an admissibility condition on the ‘referent’. Technically, the semantic denotation of the masculine and feminine gender is defined as an identity function, i.e., the function takes the value of a semantic index under a certain assignment and returns the value of this index under the same assignment only if the gender presupposition is satisfied. If the returned value is not of the appropriate gender, the function will remain undefined and the structure will not be interpretable. For concreteness, the formulas in (18) are defined for individuals but the gender presupposition mechanism is more general, as the same facts obtain of indefinites and quantifiers.¹⁵

- (18) a. $\llbracket [\text{GEN}:f_i] \rrbracket^{w,g} = \lambda x_e. g(i)$ is female in w : x
 b. $\llbracket [\text{GEN}:m_i] \rrbracket^{w,g} = \lambda x_e. g(i)$ is a person in w : x

Note that the subscript i in the denotation of a gender feature is to indicate that the ad-

¹⁵Thanks to an anonymous reviewer who pointed out the importance of a more general formulation.

missibility restriction arises only in the context of a semantic index. Thus, the interpretation function interprets an assignment index (i) associated with the gender, not the actual gender feature. This insight is crucial for the current proposal. I argue that labeling by the syntax-semantics interface associates narrow-syntax features from the label (the result of the narrow-syntax labeling) with a semantic index. The semantic module (LF) interprets this index, and morphology, and in turn, agreement, reflects ϕ -features associated with the semantic index.

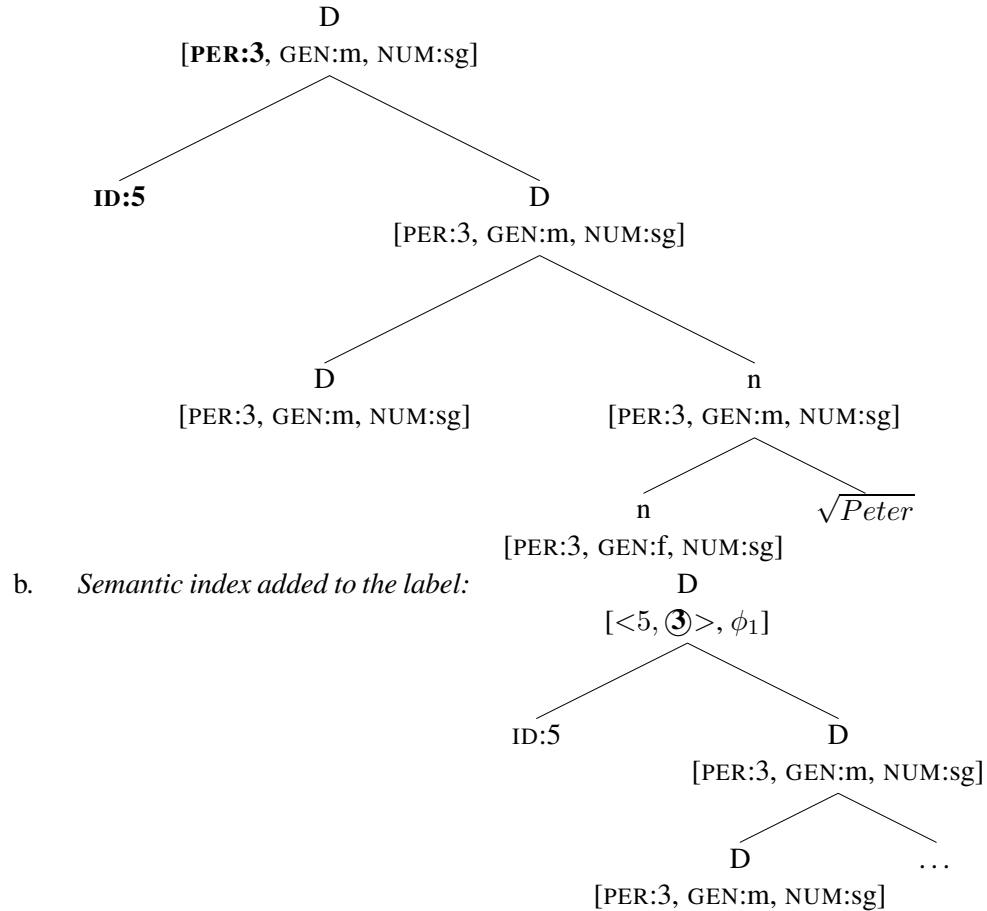
In order to unpack this claim we first need to consider the structure of a semantic index and have a concrete model of how such an index becomes part of the derivation. Following Heim and Kratzer (1998) I assume that an index in and of itself does not carry a meaning. Its meaning is associated with a denotation only via an assignment function at LF. Thus, a semantic index is an object that can be part of the derivation prior semantics proper. Technically, a semantic index is a complex structure which includes a numerical pointer and a reference to person, possibly to other ϕ -features (Heim, 2008; Minor, 2011; Sudo, 2012). For instance, $\langle 5, \textcircled{3} \rangle$ is an ordered pair that maps a numerical identifier 5 to third person (i.e., [-participant]) at LF. An assignment function then maps this index, for example, to individual named Peter. Note that the output of the assignment function does not have to be an individual, for example, if the index is a variable bound by a quantifier.

I argue that a semantic index becomes part of the DP label during labeling by the syntax-semantics interface. Concretely, an index is built as part of the minimal search by CI for the purposes of labeling. For concreteness, I assume that the numerical identifier is base-generated as an external argument of D (Williams, 1981; Higginbotham, 1985; Grimshaw, 1990; Winter, 2000; Borer, 2005).¹⁶ First, the features of the phase label, in our case, ϕ -features project into the label in the narrow-syntax part of the labeling process. These features immediately become available to the CI-labeling process. I follow Kučerová (2018) in that the syntactic feature central to the process is person. The reasoning is that person feature is a designated feature that associates a DP with a semantic index as a representation of a DP for the purposes of a semantic interpretation. During the minimal search by CI, the system searches the edge of the phase, i.e., the phase head and its specifier(s) and identifies all features relevant to person, here the numerical identifier in the specifier of the DP. As part of labeling by CI, a person feature projected from syntax gets bundled with a numerical identifier. This new feature bundle effectively becomes a semantic index. The derivation in (19) exemplifies how such a new bundle is formed for a noun like Peter.¹⁷

- (19) *Baseline case (Peter):*
 a. *Numerical identifier and syntactic labeling:*

¹⁶There is a long linguistics tradition of associating D with an individual-denoting function (Williams, 1981; Higginbotham, 1985; Grimshaw, 1990; Wiltschko, 1998; Winter, 2000; Borer, 2005; Longobardi, 2008; Landau, 2010). Note we need a more general process because of non-individual denoting nominals but we can still build on this structural insight.

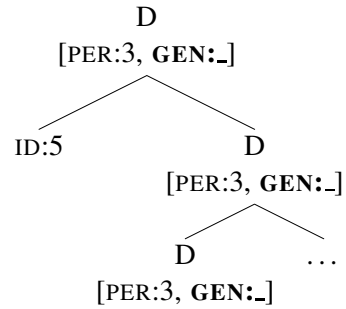
¹⁷For concreteness, I treat the proper name as structurally identical to a common noun. Note also that the name is selected for its stereo-typical gender association.



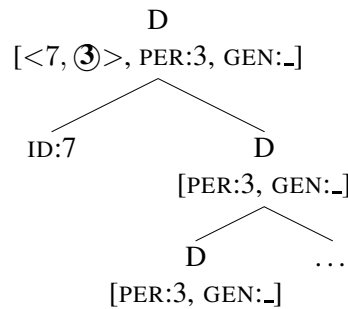
With this baseline derivation in place, we can turn to nominals that come to the derivation without a valued gender. Following Sudo (2012) who proposes that a semantic index contains indices of presupposed ϕ -features I argue that an unvalued gender feature in the label of a DP can get enriched by gender indices associated with their semantic index. This enrichment arises modulo Maximize Presupposition (Heim, 1991), i.e., a requirement that if a presupposition is satisfied in the given context and if there is a structure that satisfies this presupposition then such a structure must be chosen over a structure that does not satisfy this presupposition. I.e., the enrichment of the unvalued gender feature can yield a morphological realization of the presuppositional gender feature within the semantic index. I.e., if there is no valued gender feature in the label, then the morphology module realizes the gender value of the presuppositional indices. In turn, the morphological output satisfies the Maximize Presupposition requirement. An example of a derivation with enrichment of the semantic index modulo Maximize Presupposition is given in (20). Here the root noun is the Italian noun *chirurgo* ‘surgeon’; the derivation is for a context in which the noun denotes a female.

(20) *Nominal without a valued gender feature (surgeon ‘chirurg’)*

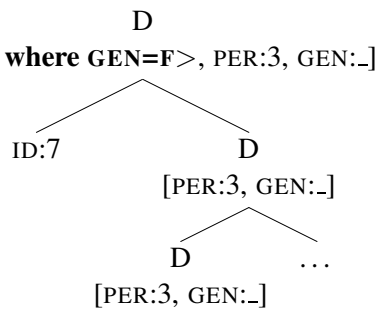
a. *Numerical index & syntactic labeling (simplified):*



b. *Semantic index added to the label:*



c. *Index enriched by gender (where 7 → Mary):*



Once the DP is labeled both by features projected from narrow syntax and by the syntax-semantics interface, the morphological spell-out of the DP can be based on two different sources of information. Either the morphological realization is based on the syntactic feature in the label, that is, the unvalued feature, or it can be based on the presuppositional gender associated with the semantic index. If the morphological realization is based on the unvalued feature, the output will be based on morphological default and the extended nominal projection of the DP will be masculine, as in (14).

The other option is that the morphology module will realize the presuppositional gender associated with the semantic index in the label (modulo Maximize Presupposition). In this case, the gender of the extended nominal projection will get realized as feminine, as in (15). Note that since the gender feature in the label forms a chain with other instances of unvalued gender feature within the DP, the morphological realization of the chain uniformly uses either the unvalued gender feature, or it spreads the presuppositional gender across the whole chain.

The question that immediately arises is how morphology could access a CI-label without violating the Y-model. Note that only the complement of a phase head is sent to spell-out. That is, the edge of phase α remains accessible to a further derivation after the complement of this phase head has been sent to the morphology interface. The edge of phase α gets sent to morphology only after the complement of the next phase head gets spelled-out. At this point, the label of α has been fully labeled by CI and the morphology module can use the enriched semantic information.

Crucially, the previous discussion refers to enrichment and morphological realization instead of valuation of the syntactic gender value in the label. The reason is that the optionality of the gender realization within the DP contrasts with the subject-agreement facts. While the gender within the extended nominal projection can either be masculine or feminine, the gender on the agreeing predicate is feminine, irrespective of the gender on D. I argue that there is a fundamental asymmetry between the valuation within the DP and external agree. The label per se does not probe for the unvalued features. The chain formation is triggered by D and it is complete before the label is semantically enriched. Probing the label by an unvalued gender feature on a probe, e.g., a predicate, is rather different in that at the point agree is established, the semantically enriched feature bundle (the semantic index with its presuppositional indices) has already been formed. In turn, the unvalued gender feature of the probe gets valued via the enriched information. That is to say, if a feature participating in agree can get valued, it must get valued. If there is a valued syntactic feature in the label, agree must get valued by this feature because of the primacy of syntax. Only if there is no syntactically valued feature in the label, the predicate can get valued by the gender associated with the semantic index (modulo Maximize Presupposition). More precisely, if there is a such enriched feature bundle, agree must be based on this enriched value. In turn, the predicate agrees in feminine irrespective of the morphological spell-out of the DP, (21).¹⁸

- (21) a. la chirurgo è andat-a
 the.F surgeon has gone.F *last resort valuation for spell-out of DP & agree*
- b. il chirurgo è andat-a
 the.M surgeon has gone-F *last resort valuation only for agree*
- ‘the female surgeon is gone’

One consequence of the obligatory agree-based realization of the presupposed feature is that the Maximize Presupposition principle is satisfied even if the gender feature is not morphologically realized on the DP itself. Hence we obtain optionality in the marking of the DP.¹⁹

With the system set up as is, we must make sure that the system does not overgenerate.²⁰ To see that the system indeed does not overgenerate we need to consider again nouns with a gender valued from the lexicon, such as Czech *děvče* ‘girl.N’ or *osoba* ‘person.F’. As we have seen, the label of these nouns contains valued gender feature projected from narrow syntax (neuter for ‘girl’, feminine for ‘person’) and a semantic index enriched by a presuppositional gender (feminine if the intended referent is a female, masculine if it is a male). The fully labeled structures are given in (22) for ‘girl’, assuming a feminine referent, and for ‘person’ in (23), assuming a masculine referent.

- (22) *Syntactic and CI labeling for ‘girl’, where $7 \rightarrow \text{Mary}$:*

¹⁸If there was no presuppositional gender associated with the semantic index, the feature on the goal would remain unvalued and would get realized as morphological default. Patterns of this sort are attested, for example, in Czech in agreement with numerals that lack ϕ -features in their label.

¹⁹I assume some competition between ‘faithfulness’ of morphological structures to the value of syntactic features versus ‘faithfulness’ of morphological realizations to the intended semantic interpretation, here governed by Maximize Presupposition, is at play.

²⁰Overgeneration is not necessarily a problem within the narrow-syntax module as it can get amended by some form of an interface ‘filter’. However, since the enrichment happens already at the interface level, there is no later point in the derivation when the undesired derivations could be filtered out.

phase head.²² Under Kratzer’s proposal a pronoun is merged as a minimal pronoun and ‘inherits’ its features from the local phase head. I follow Kratzer with a minor modification: I argue that binding is licensed at LF but its syntactic underpinning is established in narrow syntax.²³ For concreteness, I model a minimal pronoun as an unvalued semantic index and a bundle of unvalued ϕ -features. The value of the semantic index is assigned via a local phase head. I argue that the valuation of unvalued ϕ -features is parallel to the realization of unvalued gender feature proposed in the previous section. Namely, the unvalued features can get morphologically realized in two different ways. The first option is that the morphology module realizes the presuppositional features associated with the semantic index (module Maximize Presupposition). The other option is that morphology copies morpho-syntactic features of the antecedent, i.e., of the label that shares its semantic index. This process of sharing morphological realization over a syntactically established chain corresponds to the notion of Feature Transmission proposed in Heim (2008) and Kratzer (2009). Let us see how the proposed derivation plays out for nouns of our interest, i.e., nouns with a syntactically valued gender feature and with a distinct presuppositional gender feature, such as the Czech noun *děvče* ‘girl.N’. The relevant example is in (2), repeated below as (24).

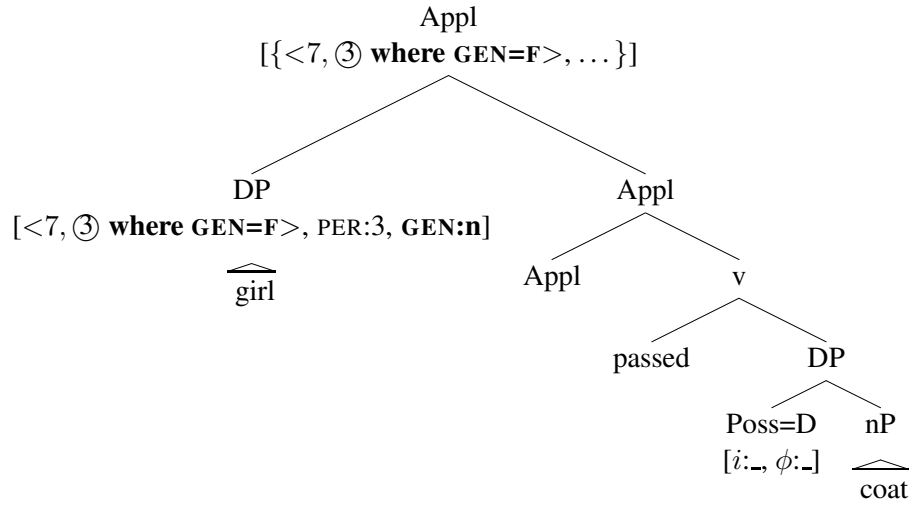
- (24) Petr podal děvčeti jeho/ její kabát.
 Petr passed to-girl.N.SG its. N.SG / her. F.SG coat
 ‘Petr gave the girl_i her_i coat.’

As this example demonstrates, a noun like *děvče* obligatorily triggers neuter agreement, the reason being that there is a valued gender feature in the label of the DP (neuter). The very same noun can, however, locally bind a pronoun that shares its syntactically valued gender feature (neuter; *jeho* ‘its’) or a pronoun which is based on its presuppositional gender feature (feminine; *její* ‘her’). The derivation in (25) exemplifies how the duality of morphological realization of the bound pronoun arises. As we can see in (25-a), the local phase head that mediates the binding relationship between the antecedent (‘girl’) and the bound pronoun within the direct object first gathers the semantic index from the label of the DP in its specifier. This semantic index is enriched by a presuppositional gender feature (feminine). In the next step, the semantic index is shared with the possessive pronoun, (25-b). Once the morphology realizes the pronoun, there are two possible routes the morphology output can take. If the morphology module realizes the morpho-syntactic features of the label of the antecedent across the complete chain that shares the semantic index, the pronoun gets realized as neuter, (25-b). The morphological realization can be local as well. Then the pronoun gets morphologically realized based on the presuppositional indices associated with its semantic index, i.e., feminine, (25-b).

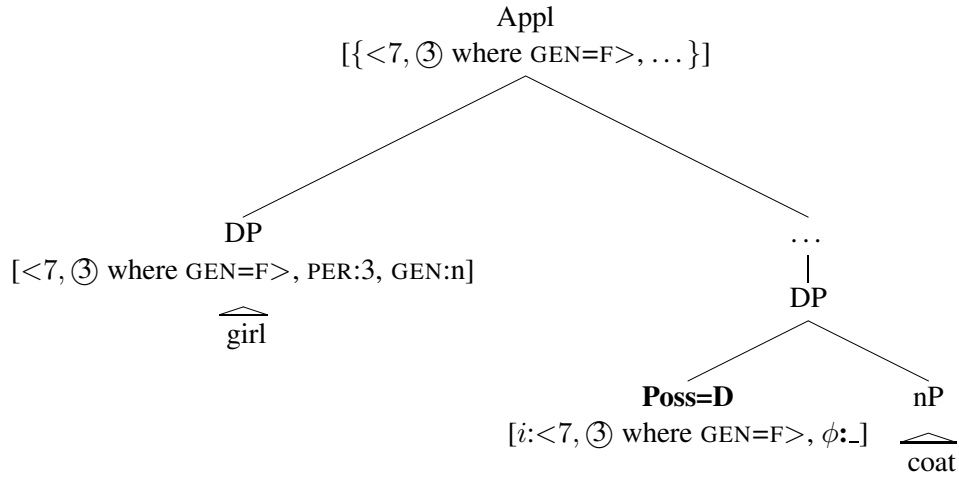
- (25) a. *Semantic indices on the phase head (Appl):*

²²The idea that phase heads (v, C, D) gather features of arguments in their local domain, such as semantic indices, person features, ϕ -features etc., and that this phase head representation mediates syntactic relations has been independently argued for by a number of scholars, e.g., Adger and Ramchand (2005); Ritter and Wiltschko (2014); Zubizarreta and Pancheva (2017); Pancheva and Zubizarreta (2017). The central idea of this family of work is that a phase head collects these features for semantic anchoring purposes.

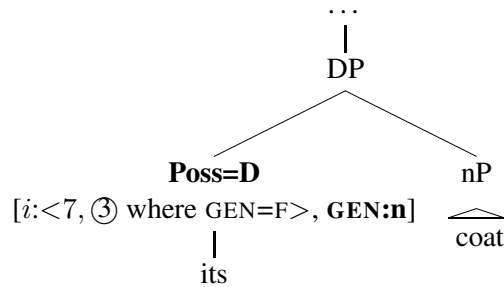
²³According to Kratzer (2009) binding takes place at LF. See also Charnavel and Sportiche (2016) that binding is established within a phase.



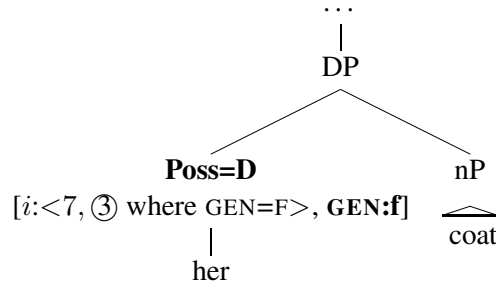
b. *Unvalued index of the minimal pronoun valued via the phase head:*



c'. *φ-features of the possessive pronoun valued by Feature Transmission:*



c''. *φ-features of the possessive pronoun valued directly from the index (modulo Maximize Presupposition):*



To summarize, the argument put forward here is that anaphoric agreement is always mediated by a phase head. Since the feature representation of the phase head refers to the semantic index of the antecedent, the bound pronoun can inherit either the syntactic ϕ -features of its antecedent, or its features can get valued by presuppositional features associated with the semantic index. Thus even if we cannot see the presupposed features on the index in the overt realization of the DP or its syntactically agreeing elements, the features become morphologically realized in anaphoric relations.

The separation between agree based directly on the features present in the label of the probe, with syntactically projected features having precedence, and anaphoric agreement being mediated by a semantic index on a local phase head has consequences for locality of these two structural relations. While agree must use a valued syntactic feature for valuation, anaphoric agreement can be based on presuppositional features of the shared semantic index even if the antecedent has a valued gender feature in the label. Consequently, local agree is restricted to syntactically projected features in the label, locality properties of anaphoric agreement are restricted by their relevant phase heads and locality properties of the head's feature valuation. Next section explores locality interactions mediated by phase heads.

3.4 Pronouns as antecedents

We have seen that the morphological form of a locally bound pronoun can either be based on morphological copying of features present in the chain mediated by a phase head, or it can be locally derived from the agreeing semantic index itself. Now we turn to morphological realizations of pronouns that are established across a sentential boundary, i.e., via a C head. There are two cases to consider: the cross-sentential agreement type, exemplified in (1), and the binding by imposters type, exemplified by (6), repeated below as (26) and (27), respectively.

- (26) To/ *ta pracovitě/ *pracovitá děvče šlo/ *šla na
 that.N.SG/ *F.SG industrious.N.SG/ *F.SG girl.N.SG went.N.SG/ *F.SG on
 jahody. Hned jich mělo/ měla plný košík.
 strawberries immediately of_them had.N.SG/ F.SG full basket
 'The industrious girl went strawberry-picking. She quickly filled a basket.'

- (27) a. The present authors₁' children feel that **they**₁ need to defend **their**₁ interests.
 b. The present authors₁' children feel that **we**₁ need to defend **our**₁ interests.
 c. *The present authors₁' children feel that **they**₁ need to defend **our**₁ interests.
 d. *The present authors₁' children feel that **we**₁ need to defend **their**₁ interests.

(Collins and Postal, 2012, 141, (2))

I argue that the agreement pattern in (26) is mediated by a covert pronominal element (*pro*), as

in (28). In turn, the data in both cases are parallel in that both the bound pronoun in the imposter case and the predicate in the ‘girl’ case must be based on the morphological realization of the antecedent (the overt pronominal subject in the English case or *pro* in the Czech case).²⁴

- (28) To děvče ...
 that.N.SG girl.N.SG
 ‘The girl...’
- a. *pro* Hned jich mělo plný košík.
 pro.N.SG immediately of_them had.N.SG full basket
- b. *pro* Hned jich měla plný košík.
 pro.F.SG immediately of_them had.F.SG full basket
 ‘She quickly filled a basket.’

The question is why a full DP can give rise to two pronominal binding patterns but if the antecedent is a pronoun, the local relationship is obligatorily based on the morphological features of the pronoun. I argue that the pattern follows from the proposal put forward for anaphoric agreement within a clause. In the first step of the derivation for the imposter case, the bound pronoun and the pronominal subject get coindexed via their local phase head (*v*). At this point of the derivation, the coindexation is not valued by a semantic index yet, as the index must come from the previous linguistic discourse. Similarly for the *pro* case: *pro* gets merged as a minimal pronoun in the specifier of *v*P and it shares its index with *v*. The predicate probes for *pro* and in turn agree establishes a matching link with the unvalued ϕ -features of the covert pronoun. The actual valuation of the shared semantic index awaits until *v* inherits a semantic index from the C head, with the semantic index being associated with the linguistically present antecedent (either in the matrix clause or in the previous clause). Once the semantic index is established, the value is shared via the established chain. The morphology module then realizes the complete chain, either using morphological features present on the antecedent (by Feature Transmission; neuter singular for the Czech case, (28-a); third plural for the imposter case, (27-a)), or presuppositional gender features associated with the shared semantic index (feminine singular for the Czech case, (28-b); first plural for the imposter case, (27-b)). The result is that the morphological realization must be uniform within the clause, irrespective of whether the relevant relationship is based on agree (the Czech case) or on anaphoric agreement (the imposter case). The mixed patterns are ungrammatical.

3.5 More on heads with an unvalued semantic index

The logic of the argument is that whenever there is a phase head that collects semantic indices, a syntactic agree with such a phase head can ignore grammatical gender and can be based on semantic gender derived from the indices. We can test this prediction by investigating other configurations in which a local agree is mediated by a phase head that collects semantic indices of its local DPs. I argue that conjoined DPs provide a testing ground for this prediction.

Following Munn (1993), Bošković (2009), Bhatt and Walkow (2013), I assume that DP conjunction forms semantic plurality. Since a formation of semantic plurality is a process that requires access to the semantic component, more precisely to semantic indices, the label of a ConjP must contain a reference to semantic indices of the individual conjuncts. The English

²⁴We could use overt pronouns instead of *pro* but the utterances would be downgraded because of information-structure requirements on overt pronouns. See footnote 2.

examples in (29) demonstrate the basic insight. Whether or not the predicate agreement with the conjoined DP will be plural depends on whether the two nominals are associated with two distinct indices. Thus when the predicate probes for the label of the conjunction, the label must contain a set of two distinct indices in order for the unvalued number feature on the probe to be valued as plural.

- (29) a. his best friend_i and editor_j **is** by his bedside $i = j$
 b. his best friend_i and editor_j **are** by his bedside $i \neq j$

We can use this insight and extend it to our discussion of nominals with a syntactically valued gender feature but with a distinct presuppositional gender feature associated with their semantic index. Recall that if a noun comes to the derivation with a valued gender from the lexicon and if the grammatical gender does not match its natural gender, a predicate must agree with the grammatical gender, as in (10), repeated below as (30). The reason is that syntactic agreement must respect the valued syntactic feature projected to the label (here, feminine).

- (30) La/ *il brava/ *bravo guarda si e'persa nel bosco.
 the.F.SG/ M.SG good.F.SG M.SG guard.F.SG her/him lost.F.SG in the woods
 'The guard lost his/her way in the forest.'
(modeled after Ferrari-Bridgers 2007)

Interestingly, if such a noun is embedded in a conjoined DP, the label of the conjoined DP does not contain syntactic gender features projected from narrow syntax. Instead, the label contains the semantic index. Since the semantic index is enriched by a presuppositional gender feature, the presuppositional gender feature becomes available for local agreement. As we can see in (31), if the noun *guardia*.F.SG 'guard' refers to a female, the predicate agreement treats the noun as feminine (the combined agreement of the female-denoting 'guard' and the feminine noun 'sister'), (31-a). If, however, the noun denotes a male, the combined agreement is masculine, as in (31-b).²⁵

- (31) a. La guardia e sua sorella sono andate al cinema sta sera
 the guard.F and self sister have gone.F.PL to-the movies this evening
 'The guard and her sister went to the movies tonight.'
 b. La guardia e sua sorella son andati al cinema sta sera
 the guard.F and self sister have gone.M.PL to-the movies this evening
 'The guard and his sister went to the movies tonight.'
[adapted from Ferrari-Bridgers (2007, 151, (4))]

4 Conclusions

This chapter has argued for a model of grammatical and semantic agreement that removes all semantic information from narrow syntax. Instead, ϕ -features become interpretable only indirectly via association of syntactic person feature with a semantic index. I proposed a system in which labeling proceeds in two stages. First, features are projected from the narrow-syntax derivation. Then the features become subject to labeling by the syntax-semantics interface.

²⁵Bošković (2009) argues that last-conjunct agreement in Serbo-Croatian is possible with grammatical gender but not semantic gender. I leave these facts aside because the syntactic analysis of first and last conjunct agreement is rather complex.

The second stage of labeling can rebundle the features present in the syntactically projected label. I have argued that the association of the person feature with a semantic index takes place during the labeling the syntax-semantics component. The chapter explores the interaction of the syntactically projected features and the CI-labeled features in two interrelated domains: in the domain of local syntactic agree and in anaphoric agreement where the feature sharing process is mediated by phase heads. In turn, the proposal furthers our understanding of locality restrictions on grammatical versus semantic agreement and provides a principled account of otherwise puzzling locality differences. The proposal further contributes to our understanding of the representation of labels and the division of labor among modules of the grammar. Under the proposed model syntax is a fully autonomous module, with no recourse to semantic information. Instead, interpretability of features arises only at the syntax-semantics interface.

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