Metasyncretism and secondary exponence in L_RFG

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1 Introduction

- *Morpheme*-based realizational models of morphology (a.k.a. *lexical-realizational* morphology; Stump 2001) have often assumed interfaces with derivational models of syntax.
- For example both of the following morphemic, realizational approaches are paired with Minimalist syntax (Chomsky 1995):
  - Distributed Morphology (Halle and Marantz 1993 et seq., among others)
  - Nanosyntax (Starke 2009, Caha 2009 et seq., among others)
- However, there is nothing about morpheme-based realization that is intrinsically derivational.
- *Lexical-Realizational Functional Grammar* (L_RFG; see Asudeh et al. 2023, Asudeh and Siddiqi 2023 and references therein) is a model of morphology that unites morpheme-based realization with the *non-derivational* constraint-based syntactic framework of Lexical-Functional Grammar (LFG; Kaplan and Bresnan 1982, Dalrymple et al. 2019, among others).
- In this talk, we show that this union offers insights into two phenomena that any theory of morphology must account for:
  1. *Metasyncretism* (Williams 1994, among others)
     - L_RFG handles metasyncretism through disjunctive exponence.
  2. *Secondary exponence* (Noyer 1997, among others) a.k.a. *morphological conditioning*
     - L_RFG handles secondary exponence through the addition of constraints to the (relevant) Vocabulary Items, which capture the VIs' conditioning environments.
- We demonstrate the L_RFG approach through an analysis of the nominal declensions of Latin, a complex fusional system that expresses:
  - 5 cases (6 if vocative is counted)
  - 3 genders (masculine, feminine, neuter)
  - 2 numbers
  - (A minimum of) 5 distinct declension classes.
- This is demonstrated for two declension classes in Table 1, where a box with rounded corners indicates metasyncretism and a a box with square corners indicates secondary exponence.

	CLASS 2		CLASS 3	
	SG	PL	SG	PL
NOM	-s	-ī	-s	-$\boxed{\mu}$-s
ACC	-m	-$\boxed{\mu}$-s	-m	-$\boxed{\mu}$-s
GEN	-ī	-rum	-is	-um
DAT	-μ	-$\boxed{\boxed{\text{ī}}}$-s	-ī	-$\boxed{\boxed{\text{ibu}}}$-s
ABL	-μ	-$\boxed{\boxed{\text{ī}}}$-s	-e	-$\boxed{\boxed{\text{ibu}}}$-s

Table 1: Latin cases in 2nd and 3rd declensions (masculine only)

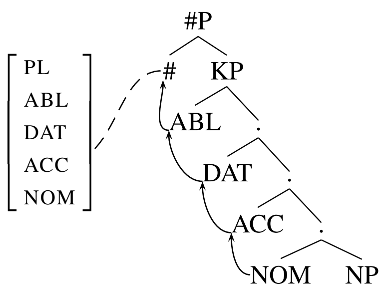
2 Background

2.1 What is metasyncretism?

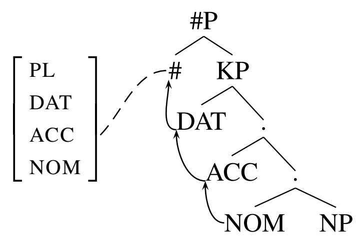
- Metasyncretism is the phenomenon whereby the same syncretism patterns arise in different paradigms.
  - In other words, while the pattern is consistent, the exponent of the pattern can vary across paradigms (Williams 1994, Bobaljik 2002, Harley 2008, Albright and Fuß 2012).
- This is the case with the DAT and ABL plurals shown here:
  - In class 2, DAT and ABL plural have the same exponent (*-ī*); see Table 1.
  - In class 3, DAT and ABL plural again have the same exponent (*-ibu*); see Table 1.
  - Thus, this is metasyncretism, because DAT and ABL plural are syncretic across paradigms, but the exponent is not identical.
  - Recall that metasyncretism is indicated by the rounded boxes in Table 1, ▢.
- Contemporary DM analyses of metasyncretism account for the Latin type via a combination of containment among case features (Caha 2009) and *Impoverishment* (Halle and Marantz 1994).

- For example, DAT/ABL metasyncretism in plural would work as follows:
  - (1) is a syntactic representation of the ablative plural, which after head movement results in a complex head containing all the case features and plural.
  - (2) is the same for dative plural.
  - The features in the square brackets are the targets for Vocabulary Insertion.

(1)



(2)



- This kind of approach would posit an *Impoverishment Rule* which deletes the feature ABL in the context of PL.
- After this impoverishment rule applies, the targets for insertion in (1) and (2) are identical.

∴ The same Vocabulary Item will be inserted in all instances of DAT PL and ABL PL (as in (1) and (2)).

2.2 What is secondary exponence?

- Secondary exponence is the mechanism that captures the phenomena of *morphological conditioning*, such that contextual allomorphy arises.
  - Secondary exponence in Latin is indicated by the thin, square-corner boxes in Table 1, □.
- The standard DM proposal is that though each feature is only realized once, features can figure in the environment for other realizations.
  - For example, -μ in the ACCUSATIVE PLURAL -μ-*s* in Table 1 is a realization of ACC as a mora (μ), but conditioned by the presence of PL.
- In DM, secondary exponence occurs when a feature is discharged by one VI rule but conditions the realization of other VIs (Noyer 1997).
  - Rules (3a) and (3b) both expone the feature ACC, but (3b) only does so in the context of PL.
  - Therefore, in the context of PL (and only in that context), (3b) is preferred to (3a).
  - However, (3b) does not *discharge* the PL feature (indicated by round brackets). It only discharges the ACC feature (indicated by square brackets).
  - The PL feature is then expressed by (3c).

(3) a. [ACC] $\rightarrow$ *m*
    b. [ACC](PL) $\rightarrow$ μ
    c. [PL] $\rightarrow$ *s*

2.3 What is L_RFG?

- Lexical-Realizational Functional Grammar (L_RFG) is a theoretical framework that couples Lexical-Functional Grammar (LFG) with Distributed Morphology (DM).
  - From DM, L_RFG inherits a morpheme-based, realizational approach to morphosyntax, one which distributes the putative functions of morphology across four domains: hierarchical syntactic structures, syntactic feature structures, phonological representations, and lexical and compositional semantics.
    - L_RFG is thus a version of DM, but one that is "constraints all the way down" (Asudeh et al. 2024), rather than a realizational framework with a derivational underbelly.
  - From LFG, L_RFG inherits a constraint-based syntax split into two modules, one capturing dominance and constituency (c-structure) and the other capturing features and syntactic relations (f-structure).
    - L_RFG is thus also a version of LFG, but one that gives up Strong Lexicalism (Chomsky 1970, Lapointe 1980, Bresnan et al. 2016) and an isolated morphological module that feeds syntax.
- L_RFG was first unveiled at CLA 2020 (Melchin et al. 2020a) and has been developed further since (Melchin et al. 2020b, Everdell et al. 2021, Asudeh and Siddiqi 2022, Asudeh et al. 2023, Asudeh and Siddiqi 2023, Asudeh et al. 2024, Everdell and Melchin 2024, Siddiqi 2024).
  - In that paper, we sketched part of the morphology of a *polysynthetic* language, Ojibwe (Nishnaabemwin/Anishinaabemowin).
  - Here we sketch part of the morphology of an inflectional-fusional language, Latin.

2.3.1 Why should L_RFG look at Latin?

1. Standard fare for word-based/paradigm-based morphology (see, e.g., Matthews 1972, Stump 2001, Spencer 2013, Bonami and Stump 2016, Blevins 2018)
   - Latin has long been an exemplar of paradigmatic morphology, even just in the descriptive/pre-theoretical sense
   - Here are some examples of properties of Latin morphology that seem to support the existence of theoretical objects called *paradigms*:
     - Highly fusional morphology
     - Multiple declension and conjugation classes
     - Intra-paradigmatic syncretism patterns
     - Cross-paradigmatic syncretism patterns
   - Since L_RFG does not have paradigms as theoretical objects, there is an onus on L_RFG to show that it can capture (putative) paradigmatic effects without such objects.
     - This is why this paper looks at syncretism patterns, especially those that cross class paradigms (*metasyncretism*).
2. Myler (2023) is an existing comparison of a Latin declension fragment in Morphology as Syntax (MaS; Collins and Kayne 2023) to a 'counter-fragment' in DM (both fragments devised by Myler himself).
   - This allows us to compare our L_RFG fragment to Myler's explicit MaS fragment and his explicit, alternative DM fragment.[1]

[1] "Alternative" because L_RFG *is* a variety of DM, but a variety with a constraint-based, rather than derivational, syntax.

3 Analysis

3.1 Metasyncretism

- In L_RFG, metasyncretism of the Latin type arises from:

1. Case containment
2. Direct disjunction in the exponents of vocabulary items

3.1.1 Case containment

- L_RFG captures case containment through the cascading of *macros* (a.k.a. *templates* in the LFG literature; see, e.g., Dalrymple et al. 2004 and Asudeh et al. 2013); we'll call this a *macro cascade*.
  - This is the same method used for capturing person hierarchies in Ojibwe, as in Table 2.
    - For example, HEARER entails PARTICIPANT, because the @HEARER macro calls the @PARTICIPANT macro.

Macro	*Description*	*Explanation*
INCLUSIVE(f)	(f PERS SPEAK) = + (f PERS HEAR) = + @PARTICIPANT(f)	1st person inclusive
SPEAKER(f)	(f PERS SPEAK) = + @PARTICIPANT(f)	1st person
HEARER(f)	(f PERS HEAR) = + @PARTICIPANT(f)	2nd person
PARTICIPANT(f)	(f PERS PART) = + @PROXIMATE(f)	1 and/or 2
PROXIMATE(f)	(f PERS PROX) = + @ANIMATE(f)	3 and above
ANIMATE(f)	(f PERS ANIM) = + @ENTITY(f)	$3'$ and above
ENTITY(f)	(f PERS ENTITY) = +	All persons (0 and above)

Table 2: Prominence hierarchy macros (Melchin et al. 2020a,b)

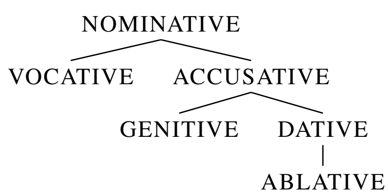
- Similarly, we can capture case containment in Latin through a macro cascade:

Macro	*Description*	*Explanation*
NOM(f)	(f NOMINATIVE)	Nominative case
ACC(f)	(f ACCUSATIVE) $= +$ @NOM	Accusative case
VOC(f)	(f VOCATIVE) $= +$ @NOM	Vocative case
GEN(f)	(f GENITIVE) $= +$ @ACC	Genitive case
DAT(f)	(f DATIVE) $= +$ @ACC	Dative case
ABL(f)	(f ABLATIVE) $= +$ @DAT	Ablative case

Table 3: Latin case containment

- This captures the following case hierarchy:

(4)



- For example, if there is no relevant VI for ablative, then the (relevant) dative VI will appear in both dative and ablative environments.
  - This leads to *syncretism* between dative and ablative.
- We also use the same method for gender:

Macro	*Description*	*Explanation*
MASC(f)	(f GENDER) $= +$	Masculine gender
FEM(f)	(f FEMININE) $= +$ @MASC	Feminine gender
		Neuter gender

Table 4: Latin gender hierarchy

- Note that ‘neuter gender’ is the exponent of the absence of gender features.

3.1.2 Disjunction in exponence

- The second ingredient in the $\mathrm{L_R}$FG account of Latin metasyncretism is direct disjunction in the exponents of vocabulary items.
  - A disjunctive rule of exponence is one in which a single listed exponendum in the Vocabulary maps to more than one possible exponent (although only one can be selected on any given occasion).
  - For example, the metasyncretism of *-ī* and *-ibu* is realized via the vocabulary item in (5).

(5)
$$\left\langle \begin{array}{l} [\mathrm{K}],\ @\textsc{dat} \\ \quad (\uparrow \textsc{plural}) =_c + \end{array} \right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\text{ī}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}{=}1 \lor \textsc{x}{=}2 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix} \lor \begin{bmatrix} \textsc{phonrep} & /\text{ibu}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}{=}3 \lor \textsc{x}{=}4 \lor \\ & \textsc{x}{=}5 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix}$$

  - · As shown in (5), *-ī* and *-ibu* <u>must</u> have the same distribution (modulo class), because they are exponents of a single VI.

- Like Impoverishment, disjunction is potentially powerful, but $\mathrm{L_R}$FG uses it conservatively, restricting it to only the exponence side of its vocabulary items.

- Moreover, the $\mathrm{L_R}$FG analysis encodes the relationship between metasyncretism and simple syncretism directly.
  - The application of the syncretism across multiple classes is expressed in the same rule that would otherwise express a simple syncretism.
    - · Note that in the Vocabulary fragment below (§A.4) there is no VI that expones ABLATIVE PLURAL.
    - · Note also that (5) contains all five classes.
  - ∴ The VI in (5) will be used in both dative and ablative plural in all five classes.
    - · However, in classes 1 and 2 it will have the form *-ī*, while in classes 3–5 it will have the form *-ibu*.
    - ∴ Latin dative-ablative plural metasyncretism arises from a single VI being utilized in ten environments.

3.2 Secondary exponence

- Recall that in DM, the issue in secondary exponence is that the licensing features
  1. Are not located in the target node; and
  2. Are not discharged by insertion (the exponence function)

- This contrasts with the situation in $\mathrm{L_R}$FG.
  - The left-hand sides (exponenda) in vocabulary items contain two kinds of feature specifications (as in standard LFG):
    1. *Defining equations* (annotated with plain =) define what features are in the f-structure by stating attributes and their values.

       (6) $(\uparrow \textsc{feature}) = +$ defines an f-structure $\begin{bmatrix} \textsc{feature} & + \end{bmatrix}$

       - · Defining equations the vocabulary items are the f-structural exponenda in $\mathrm{L_R}$FG.

2. *Constraining equations* (annotated with $=_c$) state what attributes and/or values the f-structure that is defined by the defining equations must or must not contain.
   (a) $(\uparrow \text{FEATURE}) =_c +$ does *not* define an f-structure, but rather constrains the defined f-structure to contain this feature.
   · Similarly, existential constraints and negated existential constraints operate on the defined f-structure and do not add information of their own:
   (b) $(\uparrow \text{FEATURE})$ constrains the f-structure to contain the feature FEATURE, but with any value.
   (c) $\neg(\uparrow \text{FEATURE})$ constrains the f-structure to *not* contain the feature FEATURE.
   · Existential constraints are the *conditioning environment* of a vocabulary item.
   · Negated existential constraints are the *restricted environment* of a vocabulary item.

- For example, consider VI (31) from below.
  - This morpheme *-m* is prohibited from appearing in f-structures that contain GENDER.
  - The lack of GENDER is how NEUTER is defined.
  - Therefore, NEUTER morphology is explicitly those vocabulary items which express f-structures that don't contain gender.

(31) $\left\langle \text{[K], @NOM} \atop \langle\!\langle \neg(\uparrow \text{GENDER}) \rangle\!\rangle \right\rangle \xrightarrow{\nu} \begin{bmatrix} \text{PHONREP} & /\text{m}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}2 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$

  - Note that we have used an arbitrary double-angle notation ⟪ ⟫ to highlight constraining equations (including existential and negative existentials).
    · In other words, we use ⟪ ⟫ to indicate a constraint on the (independently) defined f-structure.

- VI (31) is an example of *restricting* exponence using a negative existential constraint.

- Now let's look at an example of *conditioning* exponence using a positive existential constraint. As we see in (30), the morpheme *-s* is conditioned by f-structures that contain the GENDER feature.

(30) $\left\langle \text{[K], @NOM} \atop \langle\!\langle (\uparrow \text{GENDER}) \rangle\!\rangle \right\rangle \xrightarrow{\nu} \begin{bmatrix} \text{PHONREP} & /\text{s}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}2 \lor \text{X}{=}3 \lor \text{X}{=}4 \lor \text{X}{=}5 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$

- It will therefore only appear in MASCULINE or FEMININE environments.

- Note that this is functionally equivalent to DM's use of secondary exponence here, where *-s* would be a secondary exponent of the GENDER feature.

- However, because this is a constraint on a local f-structure:

1. The phenomenon is captured entirely locally, whereas secondary exponence in DM is not inherently local.
2. There is no claim of *multiple exponence* here with respect to GENDER.
   ∴ Feature discharge is not an issue, because GENDER is not exponed twice but rather just conditions the allomorph.

4 Metasyncretism and secondary exponence in action

- Let's look at Table 5.[2]

	Class									
	1		2		3		4		5	
	SG	PL	SG	PL	SG	PL	SG	PL	SG	PL
DAT	aqu-*a*-*j*	aqu-*ī*-*s*	dōn-*o*-*µ*	dōn-*ī*-*s*	rēg-*ī*	rēg-*ibu*-*s*	frūct-*u*-*ī*	frūct-*ibu*-*s*	r-*ē*-*ī*	r-*ē*-*ibu*-*s*
	aquae	*aquīs*	*dōnō*	*dōnīs*	*rēgī*	*rēgibus*	*frūctuī*	*frūctibus*	*reī*	*rēbus*
ABL	aqu-*a*-*µ*	aqu-*ī*-*s*	dōn-*o*-*µ*	dōn-*ī*-*s*	rēg-*e*	rēg-*ibu*-*s*	frūct-*u*-*µ*	frūct-*ibu*-*s*	r-*ē*-*µ*	r-*ē*-*ibu*-*s*
	aquā	*aquīs*	*dōnō*	*dōnīs*	*rēge*	*rēgibus*	*frūctū*	*frūctibus*	*rē*	*rēbus*

Table 5: Latin DATIVE and ABLATIVE (Crowder 2024)

- There is a contrast between DATIVE and ABLATIVE in the singular that is always lost in the plural.
- The PLURAL-conditioned case marker does not span the PLURAL feature, which is realized independently as *-s*.
- The phenomena that need to be captured here are:
  1. The consistent CASE metasyncretism conditioned by PLURAL
  2. The secondary exponence of the PLURAL feature on the case marker

- Example (21), from Appendix A below, shows the regular plural marker that appears in all PLURAL environments.

(21) $$\langle\ [\#],\ @\textsc{pl}\ \rangle \xrightarrow{\nu} \begin{bmatrix} \text{PHONREP} & /\text{s}/ \\ \text{DEP} & \text{LT} \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \end{bmatrix} \end{bmatrix}$$

- Examples (41), also from §A below, is where our analysis of secondary exponence and metasyncretism is demonstrated.

(41) $$\left\langle\ [\text{K}],\ \begin{matrix} @\textsc{dat} \\ \langle\!\langle(\uparrow \text{PLURAL})\rangle\!\rangle \end{matrix}\ \right\rangle \xrightarrow{\nu} \begin{bmatrix} \text{PHONREP} & /\bar{\text{ı}}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}1 \vee \text{X}{=}2 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix} \vee \begin{bmatrix} \text{PHONREP} & /\text{ibu}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}3 \vee \text{X}{=}4 \vee \text{X}{=}5 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$$

Secondary exponence: The VI is conditioned by the feature PLURAL, so it will appear in PLURAL environments, but does not expone PLURAL.

Metasyncretism: The right-hand side of the VI is disjunctive—giving one form in first and second declension and another form in the other declensions.

- This VI will appear in both DATIVE and ABLATIVE, because
  - DATIVE is a subset of ABLATIVE (the latter has one more feature)
  - There is no competing ABL suffix in the fragment (the only VI specified with ABLATIVE is restricted from PLURAL environments; see (43) below).

[2] Case endings are shown in blue/underlined, number marking in red/double-underlined, and the noun stem and the theme vowel are given in plain black. When the theme vowel is not segmented separately, it has been deleted by the regular phonology.

5 Conclusion

What does L_RFG bring to DM?

1. An f-structure which can constrain vocabulary structure. This gives us something that looks like *secondary exponence*, without any of the down sides.
2. Disjunctive exponents, which gives us *metasyncretism* as a function of just one vocabulary item, therefore not requiring Impoverishment.

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A The Latin declension system: A fragment

A.1 Macros

A.1.1 Root individuation

(7) ROOT(X) := (↑ PRED) = 'X'

A.1.2 Feature selection/association

(8) NUM! := @PL

(9) GEND! := { @MASC | @FEM }

(10) CASE! := { @NOM | @ACC | @GEN | @DAT | @ABL }

A.1.3 Feature containment

(11)

Number	**Hierarchy**
PL := (↑ PLURAL) = +	PLURAL

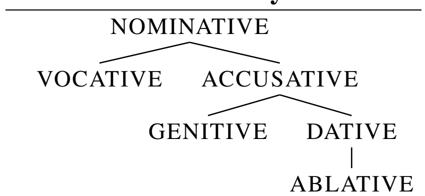
(12)

Gender	**Hierarchy**
MASC := (↑ GENDER) = +	GENDER
FEM := @MASC	|
(↑ FEMININE) = +	FEMININE

(13) **Case**

NOM := (↑ NOMINATIVE) = +
ACC := @NOM
(↑ ACCUSATIVE) = +
VOC := @NOM
(↑ VOCATIVE) = +
GEN := @ACC
(↑ GENITIVE) = +
DAT := @ACC
(↑ DATIVE) = +
ABL := @DAT
(↑ ABLATIVE) = +

Hierarchy



A.2 Phrase structure

A.2.1 Metarules[3]

(14) $n_xP \xrightarrow{9}$ $\sqrt{\ }$ ↑ = ↓ @ROOT(__) $n_{x \in \{a,b,c,d,e,f,g,v,w\}}$ ↑ = ↓ @LIST(x) (@GEND!)

[3]The numerical annotation on arrows in metarules stands for the number of distinct instantiations of the of the x c-structure variable, i.e. 9 possible instantiations in rule (14) and 7 in rule (15).

(15) $\theta P \xrightarrow{7} \underset{\uparrow = \downarrow}{n_x P} \quad \underset{\uparrow = \downarrow}{\theta_{x \in \{a,b,c,d,e,f,g\}}}$

A.2.2 Rules

(16) $KP \rightarrow \underset{\uparrow = \downarrow}{\theta P} \quad \begin{matrix} K \\ \uparrow = \downarrow \\ @\text{CASE}! \end{matrix}$

(17) $\#P \rightarrow \underset{\uparrow = \downarrow}{KP} \quad \left(\begin{matrix} \# \\ \uparrow = \downarrow \\ @\text{NUM}! \end{matrix} \right)$

(18) $\theta P \rightarrow \underset{\uparrow = \downarrow}{n_x P} \quad \underset{\uparrow = \downarrow}{\theta_a}$

(19) $\theta P \rightarrow \underset{\uparrow = \downarrow}{n_x P} \quad \underset{\uparrow = \downarrow}{\theta_b}$

A.3 Lists

(20)
$$\text{LIST}(X) := \begin{matrix} X = a \Rightarrow (\uparrow \text{PRED FN}) \in C_1 \\ X = b \Rightarrow (\uparrow \text{PRED FN}) \in C_2 \\ X = c \Rightarrow (\uparrow \text{PRED FN}) \in C_3 \\ X = d \Rightarrow (\uparrow \text{PRED FN}) \in C_{3m} \\ X = e \Rightarrow (\uparrow \text{PRED FN}) \in C_{3i} \\ X = f \Rightarrow (\uparrow \text{PRED FN}) \in C_4 \\ X = g \Rightarrow (\uparrow \text{PRED FN}) \in C_5 \\ X = v \Rightarrow (\uparrow \text{PRED FN}) \in M_1 \\ X = w \Rightarrow (\uparrow \text{PRED FN}) \in M_2 \\ \vdots \end{matrix} \quad \& \quad \begin{matrix} C_1 = \{ \text{water}, \ldots \} \\ C_2 = \{ \text{gift}, \ldots \} \\ C_3 = \{ \text{royal}, \ldots \} \\ \\ \vdots \\ \\ \\ M_1 = \{ \text{royal}, \ldots \} \\ M_2 = \{ \text{royal}, \ldots \} \\ \vdots \end{matrix}$$

A.4 Vocabulary items

A.4.1 Number

(21)
$$\langle [\#], @\text{PL} \rangle \xrightarrow{\nu} \begin{bmatrix} \text{PHONREP} & /\text{s}/ \\ \text{DEP} & \text{LT} \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \end{bmatrix} \end{bmatrix}$$

A.4.2 Nominalizers/gender

(22)
$$\langle [n_v], @\text{FEM} \rangle \xrightarrow{\nu} \begin{bmatrix} \text{PHONREP} & /\text{in}/ \\ \text{DEP} & \text{LT} \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \end{bmatrix} \end{bmatrix}$$

(23) $$\langle\, [\mathrm{n}_w],\ \varnothing\, \rangle \overset{\nu}{\rightarrow} \begin{bmatrix} \text{PHONREP} & /\mathrm{n}/ \\ \text{DEP} & \text{LT} \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \end{bmatrix} \end{bmatrix}$$

A.4.3 Class[4]

(24) $$\langle\, [\theta_a],\ \varnothing\, \rangle \overset{\nu}{\rightarrow} \begin{bmatrix} \text{PHONREP} & /\mathrm{a}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}1 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$$

(25) $$\langle\, [\theta_b],\ \varnothing\, \rangle \overset{\nu}{\rightarrow} \begin{bmatrix} \text{PHONREP} & /\mathrm{o}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}2 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$$

(26) $$\langle\, [\theta_d],\ \langle\!\langle(\uparrow \text{PL})\rangle\!\rangle\, \rangle \overset{\nu}{\rightarrow} \begin{bmatrix} \text{PHONREP} & /\mathrm{i}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}3 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$$

(27) $$\langle\, [\theta_e],\ \varnothing\, \rangle \overset{\nu}{\rightarrow} \begin{bmatrix} \text{PHONREP} & /\mathrm{i}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}3 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$$

(28) $$\langle\, [\theta_f],\ \varnothing\, \rangle \overset{\nu}{\rightarrow} \begin{bmatrix} \text{PHONREP} & \mu \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}4 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$$

(29) $$\langle\, [\theta_g],\ \varnothing\, \rangle \overset{\nu}{\rightarrow} \begin{bmatrix} \text{PHONREP} & /\bar{\mathrm{\imath}}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}5 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$$

A.4.4 Case

(30) $$\left\langle\, [\text{K}],\ \begin{matrix} @\text{NOM} \\ \langle\!\langle(\uparrow \text{GENDER})\rangle\!\rangle \end{matrix}\, \right\rangle \overset{\nu}{\rightarrow} \begin{bmatrix} \text{PHONREP} & /\mathrm{s}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}2 \lor \text{X}{=}3 \lor \text{X}{=}4 \lor \text{X}{=}5 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$$

(31) $$\left\langle\, [\text{K}],\ \begin{matrix} @\text{NOM} \\ \langle\!\langle\neg(\uparrow \text{GENDER})\rangle\!\rangle \end{matrix}\, \right\rangle \overset{\nu}{\rightarrow} \begin{bmatrix} \text{PHONREP} & /\mathrm{m}/ \\ \text{DEP} & \text{LT} \\ \text{CLASS} & \text{X}{=}2 \\ \text{HOST} & \begin{bmatrix} \text{IDENT} & + \\ \text{CLASS} & \text{X} \end{bmatrix} \end{bmatrix}$$

[4]Note that θ_c is missing because it is zero-marked and therefore always spanned.

(32) $$\left\langle \begin{array}{l} [\mathrm{K}],\ @\textsc{nom} \\ \langle\!\langle \neg(\uparrow \textsc{gender})\rangle\!\rangle \\ \langle\!\langle \neg(\uparrow \textsc{plural})\rangle\!\rangle \end{array} \right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & \mu \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}=4 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix}$$

(33) $$\left\langle \begin{array}{l} [\mathrm{K},\#],\ @\textsc{nom} \\ @\textsc{pl} \\ \langle\!\langle \neg(\uparrow \textsc{accusative})\rangle\!\rangle \end{array} \right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\mathrm{j}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}=1 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix} \vee \begin{bmatrix} \textsc{phonrep} & /\bar{\mathrm{\i}}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}=2 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix}$$

(34) $$\left\langle \begin{array}{l} [\mathrm{K}],\ @\textsc{nom} \\ \langle\!\langle (\uparrow \textsc{plural})\rangle\!\rangle \end{array} \right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & \mu \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}=3 \vee \textsc{x}=4 \vee \textsc{x}=5 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix}$$

(35) $$\left\langle \begin{array}{l} [\mathrm{K},\#],\ @\textsc{nom} \\ @\textsc{pl} \\ \langle\!\langle \neg(\uparrow \textsc{gender})\rangle\!\rangle \end{array} \right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\mathrm{a}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}=2 \vee \textsc{x}=3 \vee \textsc{x}=4 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix}$$

(36) $$\left\langle \begin{array}{l} [\mathrm{K}],\ @\textsc{acc} \\ \langle\!\langle (\uparrow \textsc{gender})\rangle\!\rangle \end{array} \right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\mathrm{m}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \begin{array}{l} \textsc{x}=1 \vee \textsc{x}=2 \vee \\ \textsc{x}=3 \vee \textsc{x}=4 \vee \\ \textsc{x}=5 \end{array} \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix}$$

(37) $$\left\langle \begin{array}{l} [\mathrm{K}],\ @\textsc{acc} \\ \langle\!\langle (\uparrow \textsc{plural})\rangle\!\rangle \\ \langle\!\langle \neg(\uparrow \textsc{gender})\rangle\!\rangle \end{array} \right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & \mu \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}=1 \vee \textsc{x}=2 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix}$$

(38) $$\langle\ [\mathrm{K}],\ @\textsc{gen}\ \rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\mathrm{j}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}=1 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix} \vee \begin{bmatrix} \textsc{phonrep} & /\bar{\mathrm{\i}}/ \\ \textsc{dep} & \textsc{lt} \\ \textsc{class} & \textsc{x}=5 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \textsc{x} \end{bmatrix} \end{bmatrix}$$

(39) $$\langle\, [\mathrm{K}], @\textsc{gen} \,\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\bar{\imath}/ \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}2 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix} \vee \begin{bmatrix} \textsc{phonrep} & /\mathrm{is}/ \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}3 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix} \vee \begin{bmatrix} \textsc{phonrep} & \mu\cdot/\mathrm{s}/ \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}4 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix}$$

(40) $$\left\langle\, [\mathrm{K},\#], \begin{matrix} @\textsc{gen} \\ @\textsc{pl} \end{matrix} \,\right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\mathrm{rum}/ \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}1 \vee \mathrm{X}{=}2 \vee \mathrm{X}{=}5 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix} \vee \begin{bmatrix} \textsc{phonrep} & /\mathrm{um}/ \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}3 \vee \mathrm{X}{=}4 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix}$$

(41) $$\left\langle\, [\mathrm{K}], \begin{matrix} @\textsc{dat} \\ \langle\!\langle(\uparrow \textsc{plural})\rangle\!\rangle \end{matrix} \,\right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\bar{\imath}/ \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}1 \vee \mathrm{X}{=}2 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix} \vee \begin{bmatrix} \textsc{phonrep} & /\mathrm{ibu}/ \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}3 \vee \mathrm{X}{=}4 \vee \mathrm{X}{=}5 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix}$$

(42) $$\langle\, [\mathrm{K}], @\textsc{dat} \,\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & /\bar{\imath}/ \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}3 \vee \mathrm{X}{=}4 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix}$$

(43) $$\left\langle\, [\mathrm{K}], \begin{matrix} @\textsc{abl} \\ \langle\!\langle\neg(\uparrow \textsc{plural})\rangle\!\rangle \end{matrix} \,\right\rangle \xrightarrow{\nu} \begin{bmatrix} \textsc{phonrep} & \mu \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}1 \vee \mathrm{X}{=}4 \vee \mathrm{X}{=}5 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix} \vee \begin{bmatrix} \textsc{phonrep} & /\mathrm{e}/ \\ \textsc{dep} & \mathrm{LT} \\ \textsc{class} & \mathrm{X}{=}3 \\ \textsc{host} & \begin{bmatrix} \textsc{ident} & + \\ \textsc{class} & \mathrm{X} \end{bmatrix} \end{bmatrix}$$