ANNA GRABOVAC

MAXIMIZING THE CONCORD DOMAIN: CONCORD AS SPELLOUT IN SLAVIC

MAXIMIZING *the* CONCORD DOMAIN

CONCORD *as* SPELLOUT *in* SLAVIC

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Anna Grabovac: *Maximizing the concord domain: Concord as spellout in Slavic*

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DECLARATION

I, Anna Grabovac, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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ABSTRACT

Nominal concord constitutes the primary focus of this thesis. Although concord bears some resemblance to agreement in the sense that both involve feature sharing, I argue that the two are distinct. Following work by Norris (2014), this thesis takes concord to result from the spellout of features from dominating nodes on available terminals. Extending Norris's analysis, I emphasize the importance of domain maximization in derivations of concord. The system achieves domain maximization by percolating features as high as possible in the syntax and realizing them as low as possible in concord, according to locality. This approach to concord arguably provides a more straightforward analysis than previous analyses that attempt to unify concord and agreement, as these often require unnecessary complications to accommodate concord phenomena.

In addition to providing a simpler account of general concord, this approach offers a novel analysis of Slavic numeral constructions, such as '*those five new students*.' For decades, numeral constructions have posed difficulties for those who have taken up the challenge to investigate them, but there is, as yet, no widely accepted analysis. This thesis compares five concord patterns across Bosnian/Croatian/Serbian, Polish, and Russian and proposes a cohesive account.

While investigating these patterns, the thesis also offers insight into the application of impoverishment and its representation, along with the impact of the numeral's categorial status on the outcome of the derivation. I show that both play a role in domain maximization and language variation. Impoverishment allows for lower extension of the concord domain, whereas the semi-lexicality of the numeral and its associated feature specification can allow higher percolation than usual, which ultimately results in upward extension of the concord domain.

The system developed in this thesis supports the distinction between concord and agreement and provides additional insight into the movement of features within the nominal domain as well as the interaction of processes at the interfaces.

IMPACT STATEMENT

Recent Minimalist literature has shown a renewed interest in the distinction between concord and agreement. Since both involve the sharing of features between elements, many studies have attempted to find a common analysis to unify concord and agreement. However, among other differences, agreement appears to be a one-to-one relationship between nodes, whereas concord is a many-to-one relationship between nodes (Ackema and Neeleman 2020). As a result, it has been impossible to unify concord and agreement and accommodate the wide range of patterns without proposing changes to the standard view of agreement. The system developed in this thesis takes the opposite tack, treating concord and agreement as distinct phenomena. In doing so, the analysis of each phenomenon ultimately becomes simpler.

In addition to supplying a simpler analysis of general concord, the system developed in this thesis provides a new approach to Slavic numeral constructions. These numeral constructions constitute one of the classic problems in Slavic linguistics and have been a subject of interest for decades. Existing theories either rely on outdated technology or are formulated for a specific language. Regarding the latter group especially, the resulting accounts are difficult to extend beyond the language for which they were initially developed. The system advanced in this thesis provides a new, cohesive perspective on these numeral constructions.

The thesis also offers insights into semi-lexicality and the categorial status of the numeral itself. In particular, much of the cross-linguistic variation in the concord patterns displayed by numeral constructions can be attributed to the semi-lexical numeral and its variable feature specification. This is a desirable result—the vast majority of existing analyses agree that numerals constitute a category that is more flexible than standard lexical categories.

The derivations show that another source of variation stems from language-specific impoverishment rules. While impoverishment is a standard tool in Distributed Morphology, this thesis adapts the formulation of impoverishment rules to provide a more generalizable system of constraints. The derivations also uncover further insights about impoverished features—namely, that they can feed agreement.

In addition to contributing to current research surrounding concord and agreement, the system developed in this thesis has implications for the interactions

of features (case, class, gender, and number) both hierarchically and within the extended projection. On a larger scale, the system provides insights into the order of operations of processes at the syntax-morphology interface, contributing to our overall conception of the organization of the grammar.

DECLARATION FORMS

The following pages contain the UCL Research Paper Declaration form, detailing content in the thesis that has already been published or is intended for future publication. The key hypotheses of the system introduced in Chapter 1, as well as simplified versions of the derivations have been presented at various conferences, including AIMM 5, LAGB 2021, CLS 58, and FASL 31. Discussion of the case hierarchy in Chapter 4, particularly with regard to case override and light-headed relative constructions, has been published in Glossa: a journal of general linguistics. The general workings of the case system with respect to numeral constructions was loosely inspired by ideas in my 2019 MA dissertation at UCL, which focused on the behavior of BCS numeral constructions under ellipsis, though none of the content has been directly imported into this thesis.

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Admittedly, I have been dreading the difficulty of the acknowledgements section from the start of the thesis write-up. Since I've put it off until completing the rest, it brings a sense of finality to the PhD, which has overall been a very exciting experience. And more importantly, I don't think it's possible to adequately express my gratitude to everyone who has helped me over the past three years. But here goes an attempt.

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CONTENTS

LIST OF TABLES

ABBREVIATIONS

BCS	Bosnian/Croatian/Serbian	VIR	virile
DM	Distributed Morphology	SG	singular
LBE	left-branch extraction	PC	paucal
1	First person	PL	plural
3	Third person	ANIM	animate
NOM	nominative	AUX	auxiliary
ACC	accusative	DIST	distributive particle
GEN	genitive	MIX	mixed-collective feature
LOC	locative	PRT	partitive
DAT	dative	PST	past tense
INSTR	instrumental	PRES	present tense
ERG	ergative	PFV	perfective
ABS	absolutive	IPFV	imperfective
DEF	default	REFL	reflexive
F	feminine	CVB	converb
M	masculine	I	gender (in Archi)
N	neuter	IV	gender (in Archi)

MAXIMIZING THE CONCORD DOMAIN: CONCORD AS SPELLOUT IN SLAVIC

1

INTRODUCTION

1.1 DEFINING CONCORD

Nominal concord has garnered interest in recent literature because of the challenge it poses for a unified theory of agreement. Put simply, *concord* refers to the kind of agreement phenomena typically found in the nominal domain (Carstens 2000; Norris 2012, 2014; Ackema and Neeleman 2020; a.o.). This amounts to the features shared between a noun any local modifiers. Consider the Bosnian/Croatian/Serbian (BCS) examples in (1). In (1a) and (1b), the noun 'tiger' is specified with nominative, masculine, and either singular or plural features, while the adjective realizes the same features. These examples exhibit concord for case, gender, and number. However, (1c) indicates that the analysis is not always so straightforward. This example displays a mismatch in features between the noun, on the one hand, and the numeral and adjective on the other. Concord in numeral constructions like (1c) constitutes the primary focus of this thesis.

(1) a. *gladan* *tigar*
hungry.NOM.M.SG tiger.NOM.M.SG
'a hungry tiger'

b. *gladn-i* *tigr-ov-i*
hungry-NOM.M.PL tiger-PL-NOM.M
'the hungry tigers'

c. *dv-a* *gladn-a* *tigr-a*
two-N hungry-NOM.N.PL tiger-GEN.M.SG
'two hungry tigers'

At this point, it is necessary to highlight an important distinction. Although concord can be loosely defined as agreement of the modifiers with the head noun, this thesis distinguishes concord from the process of agreement as it is standardly defined in the literature (see also Norris 2012, 2014; Polinsky 2016; Ackema and Neeleman 2020). In phrase-structure versions of generative grammar, *agreement* typically refers to a syntactic relation between two nodes that relies on c-command

(cf. Corbett 1983).[1] Crucially, agreement is a one-to-one mapping of features from one of these nodes to the other. The probe (also termed the 'target') bears uninterpretable features, while the goal (or 'controller') bears interpretable features (Chomsky 2000, 2001). Through an agreement relation, the goal's features value the corresponding features of the probe. This type of relation is common among arguments and predicates, and Chapter 7 provides further discussion in this area.[2]

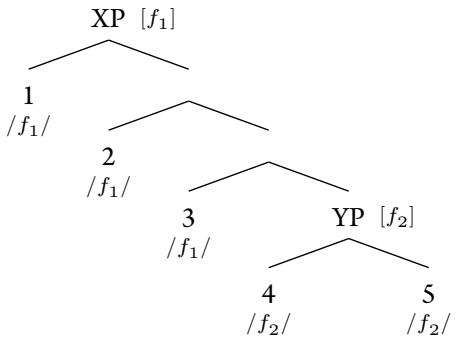
By contrast, concord appears to be expressed via a many-to-one relationship between nodes (Ackema and Neeleman 2020). This is because the individual features involved in concord, such as case, gender, and number on the modifiers in (1), likely begin in different positions throughout the noun phrase. As Ackema and Neeleman (2020) point out, a theory that insists on unifying concord and agreement must abandon at least one of the defining aspects of agreement. On the one hand, we could choose to maintain c-command, but then the one-to-one mapping requirement would have to be dropped since concord involves many goals (the source nodes of individual features such as case, gender, and number) and a single probe (e.g., a modifier). Alternatively, choosing to maintain the one-to-one mapping means that the c-command condition must be abandoned. Features percolate through the noun's extended projection (see Lieber 1989; Anderson 1992; Cole, Hermon, and Sung 1993; Grimshaw 2000), so only the top node contains all of the features involved in concord. This node dominates (and therefore does not c-command) all nodes below it. Thus, by trying to unify concord and agreement, the essence of agreement is lost. This constitutes a major theme of the thesis; while it is possible to model certain concord phenomena in terms of agreement, the resulting system becomes unnecessarily complicated and often compromises the basic principles of agreement. All this is not to say, however, that I am fundamentally opposed to unifying agreement and concord if possible. Such an outcome would be desirable. Nonetheless, this thesis will argue that the generative probe-goal approach to agreement is not suitable for concord. Unification in the other direction—that is, analyzing typical agreement phenomena with the theory developed in this thesis—would have to be explored separately, but I will return to the idea in Chapter 7.

1 Some analyses treat agreement as a two-stage process that involves both syntactic and post-syntactic components (e.g., Chung 1998; Benmamoun, Bhatia, and Polinsky 2009; Arregi and Nevins 2012), which I will adopt in Chapter 7 for subject-verb agreement. Regardless, c-command remains a key premise of agreement, and we will see that this cannot be maintained in concord.

2 In some languages (e.g., Bantu), agreement features appear on both the auxiliary and the verb. Such examples need not be considered counterexamples to the one-to-one nature of agreement. Instead, they should be analyzed as two distinct instances of agreement.

In light of the difficulties posed by a unified analysis, some sources have developed analyses of concord based on domination, whereby the features of dominating nodes are realized on available terminals according to locality (e.g., Norris 2014; Ackema and Neeleman 2020). For example, consider the generic tree in (2), where slashes denote the result of concord. Here, we predict that some feature $[f_1]$ located on XP is realized on terminals 1–3, while $[f_2]$ from YP is realized on 4 and 5 in the lower domain.

(2)



Expanding on this concept of concord as spellout, the system of concord advanced in this thesis emphasizes a theme of domain maximization. In subsequent derivations, we will see that this entails the percolation of features as high as possible in the syntax and the realization of features as low as possible in concord. Some additional tools, such as impoverishment, will be introduced in later sections to extend the effects of this domain maximization.

Overall, this theory of concord aligns with the view that concord and agreement are distinct processes (see Giusti 2008; Norris 2014; Polinsky 2016; Ackema and Neeleman 2020). In the coming chapters, we will gain a better understanding of the individual features involved in concord and their movement throughout the nominal domain, as well as their interactions with each other. As a typological thesis, some discussion is also devoted to identifying certain aspects of the system that may be universal and those that are specific to individual languages. The remainder of this chapter provides a brief background to Russian, BCS, and Polish numeral constructions, which will be used to illustrate the theory. The core assumptions of the system are also outlined before subsequent chapters delve into the derivations of concord.

1.2 SLAVIC NUMERAL CONSTRUCTIONS

1.2.1 *An initial overview*

The theory of concord developed in this thesis is capable of deriving a variety of complex patterns, and the strength of the account will be illustrated through a comparative study of Russian, BCS, and Polish. These three languages provide a sampling of the main branches of the Slavic family—East (Russian), South (BCS), and West (Polish). Numeral constructions, such as those below, are of particular interest. The distribution of features above and below the numeral, as well as the features present on the numeral itself, vary slightly in each of these examples. These small typological differences have plagued linguists for decades in the search for a cohesive analysis.

(3) *Russian*

èt-i	*pjat'*	*vysok-ix*	*žiraf-ov*
this-NOM.PL	five.NOM	tall-GEN.PL	giraffe-GEN.PL

'these five tall giraffes'

(4) *BCS*

ov-ih	*pet*	*visok-ih*	*žiraf-a*
this-GEN.PL	five	tall-GEN.PL	giraffe-GEN.PL

'these five tall giraffes'

(5) *Polish*

t-ych	*pięć*	*wysok-ich*	*żyraf*
this-GEN.PL	five.NOM	tall-GEN.PL	giraffe.GEN.PL

'these five tall giraffes'

Looking at these examples more closely, Russian displays a pattern that I term *aligned heterogeneous*, a slight modification of Babby's (1985) "heterogeneous" and "homogeneous" patterns. The precise syntactic structure of these numeral constructions will be detailed in §1.3, but for now suppose that a boundary exists between the numeral and adjective, creating two domains. Then, example (3) is 'heterogeneous' in the sense that the case features differ between the two domains but 'aligned' since this difference aligns with the domain boundary. In particular, the numeral and demonstrative realize nominative above the boundary, while the

adjective and noun realize genitive below the boundary. Chapter 2 will show that this aligned heterogeneous pattern is also available in Polish and BCS.

Turning to the BCS example in (4), we find the *upward homogeneous* pattern, where genitive is realized both above and below the numeral. The numeral itself surfaces in an indeclinable form, which is often taken as evidence for caselessness (Wechsler and Zlatić 2003; Bošković 2006, 2008; Stjepanović 2012). I will argue that the genitive case originates within the numeral construction and is assigned by the numeral to its complement (Franks 1995; Bošković 2006, 2008). The genitive case features then percolate upward to be realized throughout the construction—hence 'upward' homogeneous. Assuming that the boundary between the numeral and adjective still exists, the pattern is homogeneous in the sense that the same features GEN.(PL) are realized across both domains.

Finally, the Polish example in (5) displays the *interrupted homogeneous* pattern. Like the BCS example, genitive surfaces above and below the numeral. However, the numeral itself does not appear to be caseless. Unlike BCS numerals, Polish numerals are declinable, so I analyze *pięć* here as nominative (see Rappaport 2003; Dziubała-Szrejbrowska 2014; Willim 2015; Klockmann 2017). The complexity in the derivation of this pattern lies in explaining how the genitive case, assigned by the numeral to its complement, surfaces above the numeral in the higher domain while the numeral realizes a different case. Like Russian and BCS, we will see that Polish numeral constructions are consistent with the two-domain analysis.

1.2.2 *Complicating the account: Case, class, and gender*

So far, we have seen that the numeral constructions differ slightly in terms of feature distribution across languages. This has resulted in three distinct patterns, though the picture is even more complex than it seems since none of the languages under consideration is limited to a single concord pattern. In examining these additional complexities, three factors are relevant—case environment, numeral class, and the gender of the quantified noun.

The examples in (3)–(5) all depict a nominative case environment. For the most part (barring a couple of exceptions to be explored in subsequent chapters), these constructions behave similarly in accusative environments, so I include both nominative and accusative in the 'structural' case category. This contrasts with

the 'lexical' cases: genitive, locative, dative, and instrumental (Babby 1987).[3] In Russian, for example, we see the *downward homogeneous* pattern in lexical case environments. This is exemplified in (6), where the entire construction declines for the externally assigned dative case.

(6) *k èt-im pjat-i vysok-im žiraf-am*
to this-DAT.PL five-DAT tall-DAT.PL giraffe-DAT.PL
'to these five tall giraffes'

This pattern also appears in Polish lexical case examples. By contrast, equivalent BCS examples are simply ungrammatical in dative and instrumental case environments, exemplified with the dative-case-assigning verb *v(j)erovati* in (7). Notice that both the upward homogeneous pattern in (7a) and the downward homogeneous pattern in (7b) are ruled out (see Giusti and Leko 1995; Franks 2002; Stjepanović 2012).

(7) a. **V(j)eruj-u t-ih pet nov-ih proizvod-a.*
trust-3PL that-GEN.PL five new-GEN.PL product-GEN.PL

b. **V(j)eruj-u t-im pet nov-im proizvod-ima.*
trust-3PL that-DAT.PL five new-DAT.PL product-DAT.PL
'They trust those five new products.'

At this point, we have seen four concord patterns, plus the conspicuous lack of the downward homogeneous pattern in BCS. This range expands when we consider numeral class. The examples thus far have included only higher numeral constructions, which contain numerals 'five' and above. In addition to the higher numerals, Slavic distinguishes large numerals, 'thousand,' 'million,' etc., as well as the lower numerals 'two,' 'three,' and 'four.' The numeral 'one' displays adjectival behavior in Russian, BCS, and Polish and thus will not feature in this thesis.[4] In general, the large numerals behave as nouns, so they will only be discussed in subsequent chapters when they can be used to demonstrate an interesting point. By contrast, the lower numerals are a key point of discussion that will feature

3 The cases that I have termed 'lexical' may also be referred to as 'oblique' or 'inherent' cases. Some sources make slight distinctions between these terms (e.g., Woolford 2006), but they are not relevant to the analysis here.

4 Numerals 'eleven' through 'nineteen' pattern with the higher numerals, while those greater than 'twenty' are compounds which pattern with the type of numeral that forms the final word of the compound. In BCS and Russian, compound numerals ending in 'one' also share the adjectival behavior of simplex 'one.' In Polish, however, compounds ending in 'one' behave like the higher numerals.

prominently in subsequent chapters. Occasionally termed 'paucal' (Franks 2002; Rappaport 2002; Despić 2013), the lower numerals are likely the remnant of an old Slavic dual form (Bailyn and Nevins 2008; Šarić 2014).

Russian and Polish lower numeral constructions generally display concord patterns that have already been introduced, but BCS lower numeral constructions display a new pattern depicted in (8).[5] This pattern is termed *non-aligned heterogeneous*. The domains of concord that are distinguishable on the basis of case do not align with the boundary that lies between the numeral and adjective. Furthermore, the case and ϕ-features of the modifiers, NOM.N.PL, do not match those of the noun, GEN.M.SG. This particular feature distribution takes insight from the analyses of Corbett (1983) and Šarić (2014) but is often debated in the literature, and an alternative 'paucal' analysis will be explored more thoroughly in Chapter 5.

(8) *ov-a* *dv-a* *gladn-a* *tigr-a*
this-NOM.N.PL two-N hungry-NOM.N.PL tiger-GEN.M.SG
'these two hungry tigers'

In Polish, the complexities continue to increase. Not only are there observable effects of case context and numeral class, but the gender of the noun also impacts the concord pattern. In this respect, there is a two-way distinction: virile and non-virile (also known as masculine-personal and non-masculine-personal). Virile nouns denote male humans and are specified with the [VIR] gender feature (Przepiórkowski 1999; Miechowicz-Mathiasen 2011; Dziubała-Szrejbrowska 2014; Willim 2015; Klockmann 2017; a.o.). In lexical case environments, the pattern is always downward homogeneous, regardless of gender or numeral class. In structural case environments, however, gender has a perceptible influence. With higher numerals, we have seen that non-virile examples display the interrupted homogeneous pattern, as in (5), but they also allow the aligned heterogeneous pattern like the Russian example in (3). Virile examples display only the interrupted homogeneous pattern in structural case environments. Turning to the lower numerals, non-virile examples exhibit only downward homogeneous concord in structural case environments, whereas virile examples allow this pattern but also have the possibility of the interrupted homogeneous pattern. These alternations, shown in (9) and (10), are analyzed in Chapter 6.

5 We will later see that Russian lower numeral constructions containing a feminine noun also appear to display this patten.

(9) *ci* *dw-aj* *wysoc-y* *chłopc-y*
this.NOM.VIR.PL two-NOM.VIR tall-NOM.VIR.PL boy-NOM.VIR.PL
'these two tall boys'

(10) *t-ych* *dw-óch* *wysok-ich* *chłopc-ów*
this-GEN.PL two-NOM.VIR tall-GEN.PL boy-GEN.VIR.PL
'these two tall boys'

In total, we have seen five distinct patterns: aligned heterogeneous, downward homogeneous, upward homogeneous, interrupted homogeneous, and non-aligned heterogeneous. Some patterns, such as upward homogeneous, interrupted homogeneous, and non-aligned heterogeneous, are primarily associated with a specific language. On the other hand, the aligned heterogeneous and downward homogeneous patterns are common across Russian, BCS, and Polish. We have also seen that the resulting pattern is affected by several factors, including the case environment, numeral class, and gender of the quantified noun. Combined, this range of factors creates difficulty for the development of a cohesive analysis. The system must be simultaneously flexible enough to accommodate the scope of possibilities for each language yet constrained enough to be informative. Given this challenge, many existing analyses of Slavic numeral constructions have been developed with only a particular language or numeral class in focus (e.g., Rappaport 2002 [Russian]; Kim 2009 [collective numerals]; Klockmann 2012, 2017 [Polish]; Šarić 2014 [BCS]).

On the other hand, Franks's (1995) *Parameters of Slavic Morphosyntax* covers the full range of Slavic numeral constructions, including languages not discussed here, but the account hinges on outdated theory involving the distinction between deep structure and surface structure. In short, Franks proposes that the structural or lexical (the latter referred to as 'inherent' by Franks) status of the genitive case assigned by numerals is parameterized cross-linguistically. In Russian, for example, the quantificational genitive is structural. Since lexical case is assigned at deep structure and structural case at surface structure, lexical case 'overrides' the structural genitive, and we obtain the downward homogeneous pattern in lexical case environments but the aligned heterogeneous pattern in structural case environments. By contrast, Franks suggests that the genitive assigned by numerals is lexical in BCS. The logic is the same; since genitive is assigned at deep structure, the upward homogeneous pattern always surfaces. The derivation crashes in dative and instrumental case environments due to a conflict between the lexical cases. As lexical cases, both genitive and the externally assigned case are required to be

realized. Some recent theories have taken insights from Franks and suggest that the timing at which certain cases are licensed varies depending on the case. For example, Lyskawa (2020) develops an account of Polish numeral constructions in which lexical cases are assigned early and structural cases are assigned later. However, I will discuss some complications that arise with this particular analysis in Chapter 6.

Franks's (1995) insights regarding case priority are valuable and have inspired parts of the analysis in this thesis, though without the appeal to the timing of case assignment or parameterization of the genitive. This thesis will show that much of the variation in patterns can in fact be attributed to properties of the numeral itself.

Given the complications with existing analyses of Slavic numeral constructions, this thesis adopts a novel approach to concord that also offers new insights into the numeral constructions. Before proceeding to preview the theoretical assumptions of this thesis, Table 1.1 summarizes the concord patterns that will be addressed with a simplified bracketing notation of the resulting case distribution.[6]

Table 1.1: Overview of concord patterns

Aligned heterogeneous	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ GENITIVE … $]]$
Downward homogeneous	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ EXTERNAL CASE … $]]$
Upward homogeneous	$[_{KP}$ GENITIVE … $[_{KP}$ GENITIVE … $]]$
Non-aligned heterogeneous	$[_{KP}$ IMPOVERISHED CASE … $[_{KP}$ IMPOVERISHED CASE … $N_{GEN}]]$
Interrupted homogeneous	$[_{KP}$ GENITIVE … $Num_{DEF}[_{KP}$ GENITIVE … $]]$

6 As a general representation of the concord patterns, Table 1.1 includes IMPOVERISHED CASE to characterize the non-aligned heterogeneous pattern. This simply refers to case that is derived as a result of impoverishment. Similarly, DEF ('default') is used on the numeral to generally represent the interrupted homogeneous pattern. In Polish, the only language in this thesis where the interrupted homogeneous pattern appears, nominative is considered the default case (Klockmann 2017), so the Polish glosses will show NOM on the numeral.

1.3 THEORETICAL ASSUMPTIONS

1.3.1 *Universal 20 and the syntax of numeral constructions*

This section provides an overview of the central hypotheses involved in the concord system. First, I discuss the syntax of numeral constructions and motivate the aforementioned 'boundary' between the numeral and adjective. In §1.2, all of the examples followed the same word order: demonstrative-numeral-adjective-noun. This is one of the base orders of Greenberg's (1963) Universal 20, a generalization on the ordering of elements in the nominal domain that states: "When any or all of the items (demonstrative, numeral, and descriptive adjective) precede the noun, they are always found in that order. If they follow, the order is either the same or its exact opposite" (87). In subsequent typological work, Cinque (2005) found that there is slightly more to the pattern, with fourteen attested and ten unattested orders. One such unattested order is numeral-demonstrative-adjective-noun.[7] However, the higher and lower numeral constructions below all indicate that this a grammatical possibility, albeit with a partitive reading. Note that while a lower demonstrative typically gives rise to a partitive reading, the concord pattern does not change.[8]

(11) *Russian*

a. *pjat'* *èt-ix* *vysok-ix* *žiraf-ov*
five.NOM this-GEN.PL tall-GEN.PL giraffe-GEN.F.PL
'five of these tall giraffes'

b. *dva* *èt-ix* *golodn-yx* *tigr-a*
two.NOM.M this-GEN.PL hungry-GEN.PL tiger-GEN.M.SG
'two of these hungry tigers'

(12) *BCS*

a. *pet* *ov-ih* *visok-ih* *žiraf-a*
five this-GEN.PL tall-GEN.PL giraffe-GEN.F.PL
'five of these tall giraffes'

7 Recent work by Martin et al. (2020) shows that Num-Dem-A-N may not be completely unattested. Nonetheless, it is typologically quite rare and is not a neutral order for Russian, BCS, and Polish, as it typically gives rise to a partitive reading (Mel'čuk 1980; Bašić 2004; Miechowicz-Mathiasen 2011; Pesetsky 2013; Čulinović 2017). This supports the analysis in (14).

8 Some speakers allow a lower demonstrative but do not get a partitive reading, instead interpreting the demonstrative higher. Regardless of the reading, the lower demonstrative does not change the concord pattern.

b. *dv-a* *ov-a* *gladn-a* *tigr-a*
two-N this-NOM.N.PL hungry-NOM.N.PL tiger-GEN.M.SG
'two of these hungry tigers'

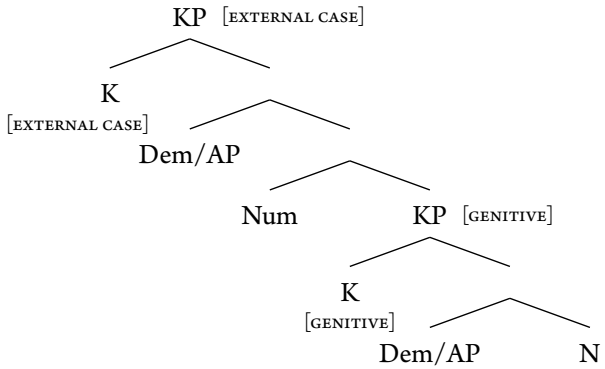
(13) *Polish*

a. *pięć* *t-ych* *wysok-ich* *żyraf*
five.NOM this-GEN.PL tall-GEN.PL giraffe.GEN.F.PL
'five of these tall giraffes'

b. *dw-óch* *t-ych* *wysok-ich* *chłopc-ów*
two-NOM.VIR that-GEN.PL tall-GEN.PL boy-GEN.VIR.PL
'two of those tall boys'

In light of these examples, I suggest that numeral constructions are composed of two extended projections (i.e., two syntactic domains) (Grabovac 2021).[9] This amounts to the structure in (14), where the extended nominal projections are KPs (case phrases) (see Bittner and Hale 1996).

(14)



The lower KP is genitive, given the common observation that Slavic numerals impose genitive case on their complements (Franks 1995; Rappaport 2002; Bošković 2006; Klockmann 2017; Ionin and Matushansky 2018; a.o.). Since genitive case assignment is a common property of nouns, the numeral's tendency to assign genitive lends additional support to the roughly binominal structure in (14) (for a similar structure, see Caha 2019 and references therein). The higher KP reflects the external case context, given examples such as (3) in which two cases are distinguishable.[10] In fact, using the basic notion of concord as spellout, the case distribution

9 In work on Estonian, Norris (2014) uses the ungrammaticality of this low demonstrative to argue that numeral constructions are composed of only one domain.

10 The structure in (14) predicts the possibility of numeral constructions containing both higher and lower demonstratives. Generally this type of construction is considered odd, though some speakers

of the aligned heterogeneous pattern is already derivable. The features of the higher KP spell out on the numeral and higher modifier according to locality, while the features of the lower, genitive KP spell out on the lower modifier and noun.

I take the structure in (14) to be consistent across the various concord patterns. Some analyses propose that the numeral can function as either a head or a specifier to account for the variation in concord patterns (e.g., Bailyn 2004; Pereltsvaig 2006; Danon 2012; Norris 2014). However, as Klockmann (2017) points out, this treatment can result in a look-ahead issue, depending on the precise formulation of the theory. If structure is built from the bottom up, look-ahead arises since the case environment determines the numeral's function, but the numeral should be syntactically merged before the case environment is known.[11] While various mechanisms can be added to deal with look-ahead, the success of the derivations in subsequent chapters will show that it is simpler to maintain consistency in the structure of these examples. Moreover, the distribution of demonstratives across all of the concord patterns covered in this thesis supports the existence of two syntactic domains.

1.3.2 *Additional hypotheses*

The concord system can be made more precise with five additional hypotheses (see Grabovac 2021): (i) Obligatory head-head agreement occurs between N and K. (ii) Potential head-head agreement occurs between Num and K. (iii) Case is hierarchically decomposed. (iv) Case assignment and case concord are complementary. Finally, (v) impoverishment rules are restricted to the heads and the dominating nodes to which features percolate. These are each elaborated below.

The first hypothesis of obligatory agreement between the noun and K is somewhat obvious but nonetheless important to highlight. N always agrees with the lower, local K and receives genitive case features as a result.[12] This is a straightforward one-to-one mapping between nodes and is therefore a simple assumption to make.[13]

allow it with a focus intonation. While the examples containing concurrent demonstratives are rare, each type of numeral discussed in this thesis allows higher and lower demonstratives individually with no change to the concord pattern associated with the numeral.

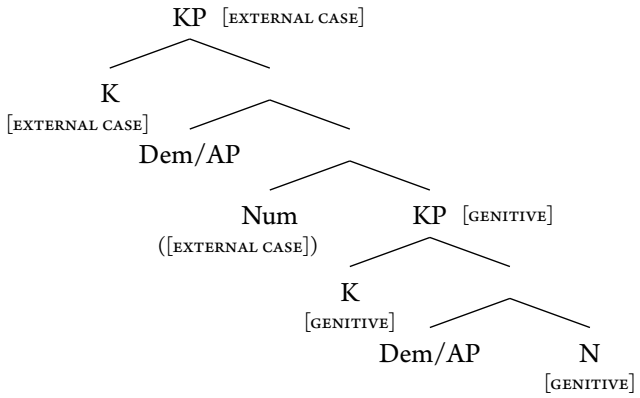
11 Different theories of syntax have other implications for where look-ahead arises. Not all theories assume bottom-up structure building (see e.g., den Dikken 2018).

12 While it is often the case that heads agree with phrases, nothing about the defintion of agreement precludes head-head agreement (see den Dikken 2019 for discussion).

13 The intuition that N realizes case features through agreement follows the analysis put forth by Ackema and Neeleman (2020), who argue that features present on heads are there either inherently or as a result of agreement.

The second hypothesis concerns the agreement potential of the numeral with the higher K, represented in the revised structure of (15) (Grabovac 2021). Subsequent chapters will show that whether the numeral agrees is a language-specific property. This variation in agreement potential can be attributed to the numeral's semi-lexical status, to be explored further in subsequent chapters (see Vos 1999; Corver and van Riemsdijk 2001; Klockmann 2012, 2017). It has long been observed that the lexical category of numerals appears to be rather fluid, falling somewhere on a continuum between adjective and noun (see Corbett 1978; Franks 1994; Ionin and Matushansky 2018). This observation largely stems from the fact that many numeral classes display both homogeneous and heterogeneous concord patterns. Given its semi-lexicality, I suggest that the numeral's feature specification can vary, and it does not always agree for case as would a regular noun.

(15)



Regarding the makeup of the case system, I assume a hierarchical decomposition along the lines of Caha (2009), as shown in (16). Independent motivation for this decomposition comes from the patterns of case syncretism that are found across Russian, BCS, and Polish. The hierarchical relations among cases are also necessary to capture the patterns of case priority observed in numeral constructions, which will become apparent in subsequent chapters. However, I emphasize that while this thesis borrows insight from Caha's case system, his nanosyntactic framework is not necessary for the analysis here. The only requirement is a basic understanding of subset-superset relations; a case C_1 can 'override' another case C_2 (in the syntax) if and only if all features of C_2 are contained in C_1 (Grabovac 2022).

(16) *Case features*

Nominative:	{NOM}
Accusative:	{NOM, ACC}
Genitive:	{NOM, ACC, GEN}
Locative:	{NOM, ACC, GEN, LOC}
Dative:	{NOM, ACC, GEN, LOC, DAT}
Instrumental:	{NOM, ACC, GEN, LOC, DAT, INSTR}

The fourth hypothesis concerns the complementarity of case assignment and case concord. This means that when a numeral assigns (genitive) case, it cannot also realize case features in concord. However, this does not necessarily prevent the numeral from realizing case, as it may participate in head-head agreement, following hypothesis (ii). The condition implies that the spellout rules of concord cannot accept an element which has a case feature it needs to assign, a property that is encoded in the numeral. While the hypothesis is somewhat stipulative, it is possible to draw a parallel with verbs, which are often held to assign case to their complements but do not themselves realize case. Similarly in Slavic, the numerals that assign case cannot show concord for case.

Finally, we come to the hypothesis concerning impoverishment. Impoverishment is a post-syntactic operation that deletes a feature prior to spellout (Bonet 1991; Harley and Noyer 1999; Arregi and Nevins 2007, 2012; a.o.). Restricting these deletions to nodes that contain the feature that is targeted for deletion is an intuitive constraint that follows naturally from the notion of concord as spellout. Given the setup of the concord system, the relevant nodes include heads (Num, N, K) and the dominating nodes to which their features have percolated during the syntactic stage of the derivation. Crucially, modifiers are not included in this group as possible loci of impoverishment because they realize features in concord.[14] This constrains the overall application of impoverishment in the system. The next section takes a closer look at how impoverishment will be employed and its important function in this work.

14 It has been widely observed that the plural forms of modifiers in BCS, Polish, and Russian do not distinguish gender (at least in certain case contexts). Other metasyncretisms such as this one can be found crosslinguistically, and impoverishment is often a component of the analysis (Williams 1994; Bobaljik 2002; Harley 2008). Even though the concord system disallows impoverishment on individual modifiers, nothing would prevent the formulation of a gender-impoverishment rule that applies to dominating nodes, subsequently affecting the features realized by modifiers. Alternatively, it is not unreasonable to assume a filter that prevents certain feature co-occurrences in a given morphological paradigm (Nevins 2007).

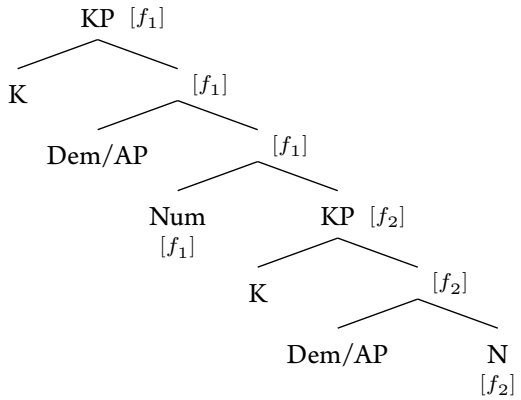
1.4 MORE ON IMPOVERISHMENT

1.4.1 *Impoverishment as a method of domain extension*

In the derivations that follow this chapter, I will show that impoverishment plays a critical role in the extension of the concord domain. At the beginning of the chapter, I highlighted a theme of domain maximization; features percolate as high as possible in the syntax and are realized as low as possible in concord. Now that we have seen a preview of the system and overarching hypotheses, it is possible to more precisely explain how this maximization works. I adopt a broadly Minimalist, Distributed Morphology (DM) architecture (Halle and Marantz 1993), whereby syntactic operations occur first, followed by morphological operations and spellout.

On the syntactic side, features percolate upward until they encounter competing features from a head, which ultimately take precedence. Because of the two-domain configuration of numeral constructions, features that originate in the lower domain percolate upward until encountering the numeral. At this point, they may continue to percolate through the higher domain if the numeral is not specified with corresponding features, or they may cease to percolate above the lower domain if the numeral bears the relevant features (following the concept of 'relativized heads' discussed in Sciullo and Williams 1987). This is depicted in the tree below, where N is specified with arbitrary feature $[f_2]$ and Num with $[f_1]$ (for simplicity, I disregard the case specification of each KP). The noun's feature percolates up to the lower KP boundary, at which point the numeral's feature takes precedence and percolates through the higher domain.

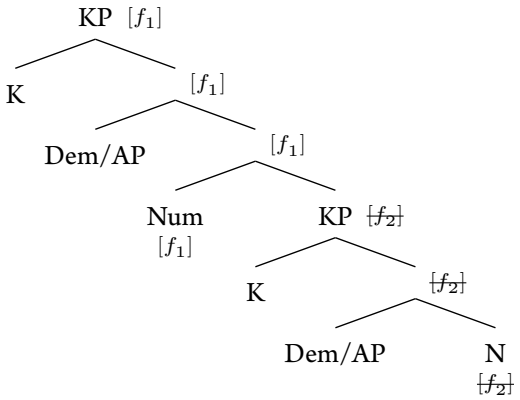
(17)



As a post-syntactic process, impoverishment can be used to extend the final concord domain. For a basic idea of how this extension works, consider the tree in (18).

Instead of proceeding directly to spellout, suppose we have the impoverishment rule in (19), which deletes the $[f_2]$ features in the lower domain.[15]

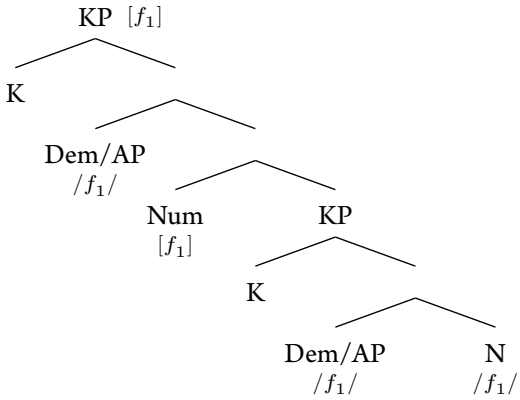
(18)



(19) $[f_2] \rightarrow \emptyset / [f_1]$

The absence of $[f_2]$ forces $[f_1]$ to be realized throughout the construction as the most local feature, assuming that concord spells out the closest set of dominating features. This produces an extended domain of concord for $[f_1]$ as shown in (20). The features resulting from concord are denoted by slashes.

(20)



Typically, impoverishment rules are formulated as in (19) with a specific context or feature that triggers deletion. Because it can be difficult or even impossible to generalize certain impoverishment rules due to their specificity and idiosyncrasy,

15 The rule in (19) roughly translates to 'delete $[f_2]$ in the context of $[f_1]$.' Typically, this kind of rule would take effect when $[f_2]$ and $[f_1]$ occur on the same node rather than in a domination relation, but the format of impoverishment rules will soon be revised in the following section, so I am not concerned about its precise formulation here.

impoverishment has occasionally been criticized in favor of alternative approaches (e.g., Stump 2001; Brown and Hippisley 2012). To address some of these concerns, the next section elaborates on a modified version of impoverishment that separates targeted features from their contexts of deletion in order to make the rules more generalizable.

1.4.2 *Deconstructing impoverishment*

We have seen that impoverishment rules typically consist of two parts: a particular context that drives deletion and a specific feature that is targeted for deletion. The version adopted here separates these two components into a feature co-occurrence restriction such as (21) (see Gazdar et al. 1985; Fisher 1991; Müller 2013), and a primitive deletion rule of the form in (22). It is also assumed that feature deletion is an economic operation triggered only to repair violated feature co-occurrence restrictions (Noyer 1992/1997; Calabrese 1995). As we will see throughout the derivations, this simplification is possible because each language consistently rejects certain feature co occurrences—particularly case with another marked feature.

(21) $[f_1]$ cannot co-occur with $[f_2]$

(22) $[f] \rightarrow \emptyset$

A single feature co-occurrence restriction mentions at least two conflicting features; when a feature co-occurrence restriction is violated, one of these features is deleted to resolve the conflict. The feature that is deleted is determined by a hierarchy. Whenever two features are in conflict, the feature located lower in the hierarchy is deleted (see Noyer 1992/1997). The benefit of this modified approach is that a single feature co-occurrence restriction can provide a context for at least two deletions—the resolution depends upon a language's feature hierarchy. As such, it is more generalizable than typical impoverishment rules. In fact, we will see that some feature co-occurrence restrictions are shared between Russian, BCS, and Polish.

In addition to feature co-occurrence restrictions, each language contains a feature hierarchy that combines case, gender, number, and other marked features such as 'paucal' [PC]. Cross-linguistically, the individual feature types of case, gender, and number appear in a fixed order in the overall hierarchy. For example, the case hierarchy predicted by the decomposition of features in (16) is NOM< ACC< GEN< LOC< DAT< INSTR, which we will see holds for all three of the languages under

consideration. However, the way that the feature types (case, gender, number, etc.) are ordered with respect to each other may vary slightly across languages. This provides one source of language variation, along with any language-specific feature co-occurrence restrictions.

To map the direction this thesis will take, the feature hierarchies for Russian, BCS, and Polish are included below. These hierarchies can also be found in Appendices A, B, and C, along with an overview of concord patterns and complete list of feature co-occurrence restrictions for each language. The hierarchies for Russian and BCS contain both simplex features and complex feature combinations, while in the Polish hierarchy, it is only necessary (for the purposes of this thesis) to make reference to case features.[16] The feature combinations, which are always ranked at the top of the hierarchy, represent additional language-specific preferences. Note that these are partial hierarchies which include only the features specifically mentioned in each language's set of feature co-occurrence restrictions. It is assumed that the features not mentioned are ordered with respect to the corresponding features of their type, but more research would be required to precisely determine the complete hierarchies.

(23) *Russian feature hierarchy*

[ACC, ANIM]

[F, PC]

[LOC]

[GEN]

[PC]

[PL]

[ACC]

[NOM]

16 The BCS hierarchy contains both [PC] and [MIX], which will be analyzed in the derivations as numeral-class features. Since the two never occur in the same derivation, it is not possible to determine their rank with respect to each other. This should not be understood as a feature combination, such as [ACC, ANIM] and [F, PC] in the Russian hierarchy.

(24) *BCS feature hierarchy*

[PC] ; [MIX]

[PL]

[F]

[M]

[GEN]

[ACC]

[NOM]

(25) *Polish feature hierarchy*

[LOC]

[GEN]

1.5 ORGANIZATION OF REMAINING CHAPTERS

The remainder of the thesis is primarily organized according to the five concord patterns outlined in this introduction. Figure 1.1 schematizes how these concord patterns generally follow from the key hypotheses introduced in § 1.3.

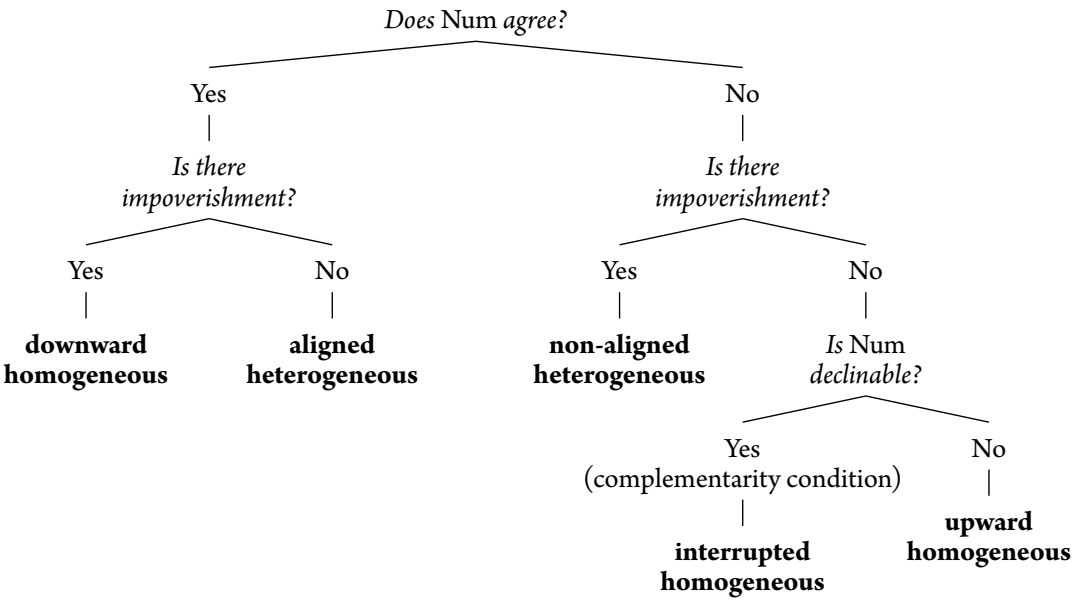


Figure 1.1: Predicted Effects of Hypotheses

Chapter 2 begins with the aligned heterogeneous pattern, which can be found within Russian, BCS, and Polish. As one of the most typologically common patterns, not to mention the simplest to derive, this pattern serves as a good starting point to reinforce the basics of the concord system. Chapter 3 continues with downward homogeneous concord, another fairly prevalent pattern. This chapter also expands upon the use of impoverishment in the system, emphasizing its function as a tool for domain maximization.

Chapters 4 and 5 cover patterns found primarily in BCS—upward homogeneous with the higher numerals and non-aligned heterogeneous with the lower numerals. Here, we are able to explore in more depth the semi-lexical nature of the numeral and the influence of the numeral's feature specification on the outcome of the derivation. These chapters also highlight interesting properties of BCS prepositions with numeral-construction complements and address some reported speaker variation with regard to the lower numeral constructions. Chapter 6 analyzes the Polish-specific interrupted homogeneous pattern, which is found with both higher and lower numerals. I discuss the integration of this pattern with the full range of patterns allowed by Polish.

Finally, Chapter 7 concludes the thesis with a reflection on the predictions made by the system and possible directions for future research. Topics include further discussion of the universal aspects of the concord system, as well as predictions beyond the five patterns covered by Russian, BCS, and Polish. The chapter also reflects on the specific types of features and their representation. Additionally, I discuss how the proposed concord system may be relevant to understanding the subject-verb agreement patterns displayed with numeral constructions.

2

ALIGNED HETEROGENEOUS CONCORD

2.1 INTRODUCTION

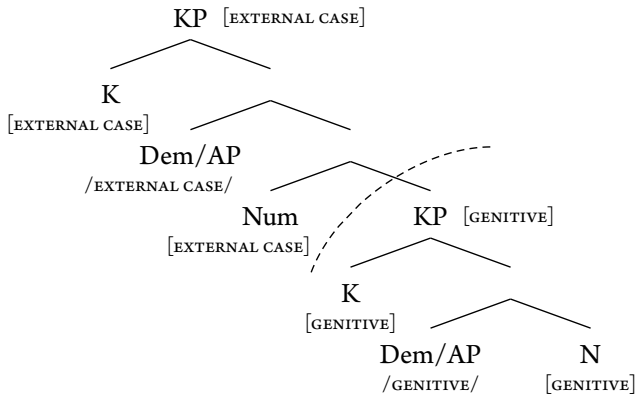
This chapter demonstrates how the aligned heterogeneous pattern, which can be found in Russian, Polish, and BCS, easily follows from the concord-as-spellout approach. Recall that this pattern is characterized by two domains of concord, distinguishable on the basis of case, that align with the underlying syntactic domain boundary. In addition to the simplicity of its derivation, this pattern provides a logical starting point for our discussion of concord because of its prevalence in the literature. Russian numeral constructions in particular have long been a topic of interest, but it was in Babby's (1985) analysis that the terms "heterogeneous" and "homogeneous" agreement were first introduced to describe the Russian patterns. Since then, this classification of the concord patterns found in numeral constructions has inspired analyses of similar patterns in other languages, though the range of patterns within Slavic alone has proved challenging for a unified account.

Examples of the aligned heterogeneous pattern can be found across Russian, Polish, and BCS, and for the most part, the pattern can be derived solely from the spellout of dominating nodes. However, we will uncover some slight differences in terms of feature distribution within the pattern across the three languages. For example, I will argue that the modifiers in aligned heterogeneous Russian lower numeral constructions realize [PL], while the noun surfaces in a singular form. In Polish, we will see that the higher domain consistently realizes accusative rather than the externally assigned case. This chapter demonstrates the ease with which these differences can be accommodated given the central hypotheses of the concord system.

We will also see that the slight differences in the derivation of the aligned heterogeneous pattern are often due to the agreement potential and feature specification of the numeral, following the second hypothesis introduced in Chapter 1 (see also Figure 1.1). These two factors affect how high features originating in the lower domain are able to percolate. For some examples, impoverishment is also applied to derive the correct feature distribution. In general, though, the basic structure in (26) is applicable. The content of dominating nodes (the two KPs) spells out

on local terminals. The higher domain realizes the external case, along with any ϕ-features that have percolated through the construction, while the lower domain realizes genitive and any available ϕ-features.

(26)



2.2 RUSSIAN

In Russian, the aligned heterogeneous pattern is observed with both higher (5+) and lower (2–4) numeral constructions. The '1000+ numerals' (to borrow Klockmann's (2017) terminology) also display the aligned heterogeneous pattern, but this section argues that these large numerals behave as regular nouns rather than higher numerals (Wade 2020).

2.2.1 *Higher numerals*

Russian higher numeral constructions display the aligned heterogeneous pattern in structural case environments (Babby 1985, 1987; Rappaport 2002; Pesetsky 2013; a.o.), exemplified in (27) with a nominative context.

(27)

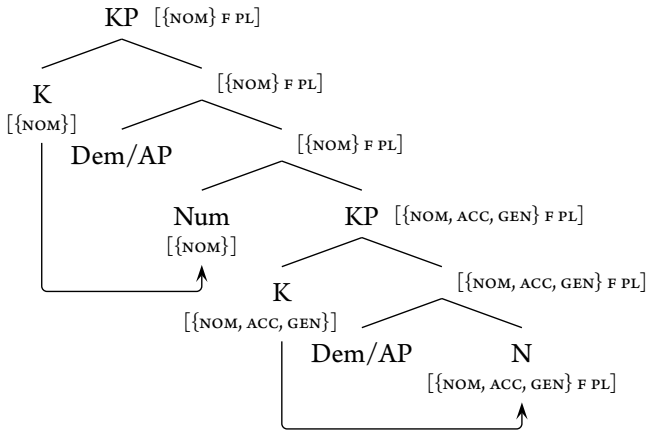
èt-i	*pjat'*	*vysok-ix*	*žiraf-ov*
this-NOM.PL	five.NOM	tall-GEN.PL	giraffe-GEN.F.PL

'these five tall giraffes'

The higher domain consisting of the numeral and demonstrative realizes NOM.PL. The adjective and noun realize GEN.PL in the lower domain. Although the noun is inherently feminine, gender is not distinguishable in the plural forms of modifiers (Wade 2020), so it is not included in the gloss.

This example can be analyzed with two structures, depicted in (28) and (29). Beginning in the syntax with (28), the numeral assigns genitive case to the lower domain and agrees with the higher K, the latter symbolized with an arrow. With regard to case agreement, two points are worth noting. First, I assume that Russian numerals always agree for case and that a numeral's participation in agreement determines its morphological form. As we will see in later derivations, the agreement status of the numeral can be ascertained based on the numeral's declinability, as well as the height of genitive percolation in the construction. For example, BCS higher numerals are indeclinable, and they consistently display the upward homogeneous pattern where genitive is realized above the numeral. Based on these observations, I assume that the BCS numerals never agree for case. Similarly, we will see that Polish numerals do not agree in structural case contexts. The Polish numerals are declinable, but the realization of genitive in the higher domain of the interrupted homogeneous pattern is taken as evidence for their lack of participation in agreement.

(28)



The second point regarding agreement is that, for the time being, I treat agreement as a syntactic process. Note, however, that I will have reason to revise this in Chapter 7 with the discussion of subject-verb agreement. There I will argue that agreement is a two-stage process which is completed as early as possible, though certain constraints may require it to be completed post-syntactically. Returning to (28), we can see that the numeral has received the nominative case feature. Likewise, the noun agrees with the lower K and is specified for genitive. The noun is also specified with gender and number features (though the latter may be interpreted higher in the structure). Following Kramer's (2016) literature review, I assume that

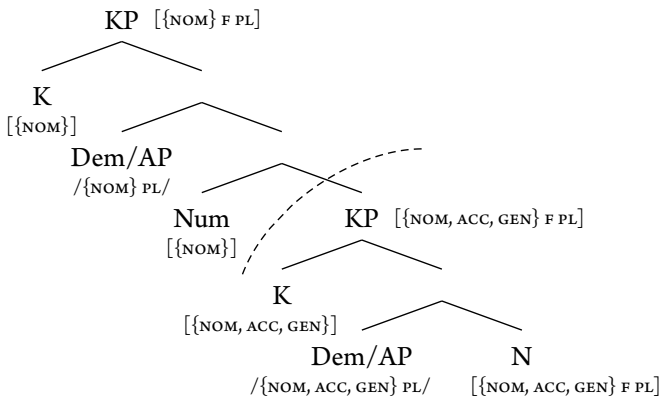
gender features are most likely located on the nominal head.[17] However, number features could alternatively be encoded through a number phrase, which is typically taken to be located above NP (Ritter 1992)—just above the lower modifier in the structures used here. Such an analysis is compatible with the current system. In (28), for example, [PL] would simply percolate from higher up in the structure rather than from N.

Regarding syntactic feature percolation, I follow Norris (2014) in assuming that ϕ-features percolate upward until reaching another projecting head, at which point the features of the new head take precedence (see also Di Sciullo and Williams's (1987) concept of 'relativized heads'). In (28), the ϕ-features of the noun are able to fully percolate and ultimately reach the higher KP since the numeral has no ϕ-features of its own to contribute. In other derivations, we will see that this concept also extends to case; when the numeral does not participate in agreement, genitive percolation can enter the higher domain. Russian numerals do participate in agreement, however, so while case percolates from K to KP in each domain, the genitive features of the lower domain are unable to percolate into the higher domain. I assume that agreeing numerals have case agreement slots, which necessarily block percolation of case from the lower domain even before case is valued on the numeral. One further note about case percolation is necessary. Norris (2014) adopts downward percolation of case. By contrast, this analysis assumes that all feature percolation must be upward following Neeleman and van de Koot (2002). They show that downward percolation in the syntax violates Chomsky's (1995) Inclusiveness, which requires the properties of a node to be recoverable from dominated structure.

The next structure represents the post-syntactic mapping and spellout stage of the derivation. In (29), the feature content of intermediate nodes in each domain has been disregarded since their content is redundant to that of the dominating nodes, which provide the features for spellout. This step is merely a matter of presentational convenience that may or may not be present in the actual derivation. The features of dominating nodes are realized locally on available terminals, denoted by slashes. All features present on the modifiers are therefore a direct result of the spellout of a dominating node (compare Norris 2014; Ackema and Neeleman 2020). This produces two domains of concord—NOM.PL in the higher domain and GEN.PL in the lower. The dotted line signifies the break in concord domains, which exactly corresponds to the break in syntactic domains.

17 Merchant (2014) argues that gender is located above NP but below the number projection. This analysis of gender is also compatible with the current system. As mentioned above regarding number, gender would simply percolate from higher in the structure.

(29)



The derivation would proceed exactly the same in accusative case environments. It is also possible that the derivation is the same in genitive contexts since genitive case is realized in both domains, though Chapter 3 will further reflect on this possibility.

2.2.2 *The status of 1000+*

The 1000+ numerals also display the aligned heterogeneous pattern, but in contrast to the higher numerals, they appear to function as regular nouns.[18] This is because they follow nominal declension paradigms and consistently display the aligned heterogeneous pattern across both structural and lexical case environments (Wade 2020).[19]

(30) *tysjača* *žiraf-ov*
thousand.NOM.F.SG giraffe-GEN.F.PL
'a thousand giraffes'

18 When one of the 1000+ numerals is further specified with a smaller cardinal numeral, such as *tri tysjači* 'three thousand or *pjat' tysjač* 'five thousand,' the 1000+ numeral declines according to the type of cardinal. A lower cardinal triggers genitive singular on the large numeral, while a higher cardinal triggers genitive plural. The large numeral appears to behave like a regular noun, suggesting that the syntactic structure of 'three thousand' should be similar to that of 'three giraffes,' (Ionin and Matushansky 2006, 2018). Unlike nouns, however, a modifier cannot intervene between the cardinal and the 1000+ numeral. This impossibility of the modifier is unlikely to be due to the syntax. These constructions may involve a mismatch between the syntactic and phonological components, whereby two syntactic heads are phonologically realized as a single complex numeral. An alternative explanation based on the semantics of these examples is also plausible.

19 There is an interesting exception to this consistency. Wade (2020, 186–7) points out that *tysjača* 'thousand' has two forms in the instrumental. *Tysjačej* is used in the aligned heterogeneous pattern when the quantifier functions as a noun of quantity. *Tysjačju* is used as a numeral in the downward homogeneous pattern. The latter parallels higher numeral constructions, which suggests that *tysjača* can alternate between functioning as a noun and numeral. §2.3.2 explores a similar but more widespread phenomenon in Polish.

(31) *tysjač-e* *žiraf-ov*
thousand-DAT.F.SG giraffe-GEN.F.PL
'to a thousand giraffes'

The derivation would proceed in the same way outlined above, so I do not repeat it here.

However, based on the concord patterns observed in lexical case environments, it is necessary to assume that the derivation of concord is sensitive to the numeral's degree of (semi)lexicality. The 1000+ numerals consistently display the aligned heterogeneous pattern across structural and lexical case environments, while higher numeral constructions display the downward homogeneous in lexical case environments. Chapter 3 will show that the downward homogeneous pattern of the higher numeral constructions is derived with the help of case-feature impoverishment, but the relevant deletions must be prevented from applying in 1000+ derivations. These different outcomes cannot simply be attributed to the numeral's potential for case agreement since we will see that higher numerals always agree for case in Russian, and as nouns, the 1000+ numerals must too. Such differences lend support to analyzing the higher (and lower) numerals as semi-lexical (Corver and van Riemsdijk 2001; Klockmann 2017), distinct from fully lexical, regular nouns. To capture this variation in pattern and the fact that feature co-occurrence restrictions apply to some classes but not others, it must be that the feature co-occurrence restrictions can directly refer to specific numeral classes. Nevertheless, since this thesis primarily focuses on the semi-lexical numerals, I will not complicate the feature co-occurrence restrictions by adding additional features.

2.2.3 *Lower numerals*

Russian lower numeral constructions also display the aligned heterogeneous pattern in structural case environments. The derivation is similar to the higher numeral examples but requires a simple application of impoverishment to derive the correct feature distribution. In example (32), notice that the form of the noun is singular, while the modifiers realize plural.

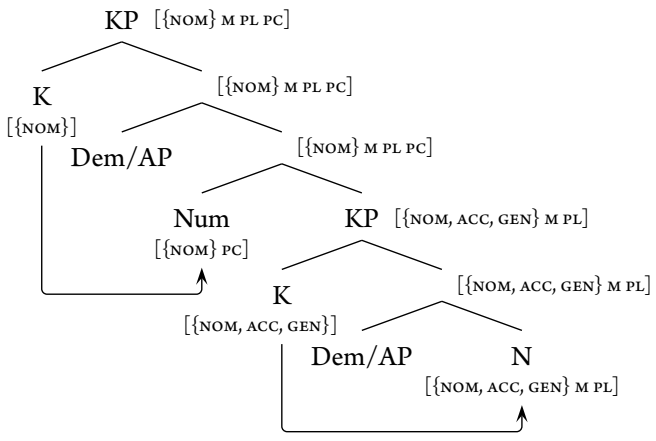
(32) *èt-i* *dv-a* *golodn-yx* *tigr-a*
this-NOM.PL two-NOM.M hungry-GEN.PL tiger-GEN.M.SG
'these two hungry tigers'

This feature mismatch is sometimes taken as evidence that the elements of the numeral construction instead realize a 'paucal' form. Paucal is instantiated in dif-

ferent ways according to various sources. Some contend that paucal is a number feature on par with singular and plural. In this paucal number analysis, there are two competing views regarding the feature distribution—either the modifiers and noun all realize nominative paucal features (Rakhlin 2003; Bailyn and Nevins 2008), or they realize genitive paucal (Asinari 2019). Still other analyses treat paucal as a case (Franks 1995; Rappaport 2002; Ionin and Matushansky 2018). This thesis adopts neither the number nor the case view. Instead, I choose to address the feature mismatch and treat paucal as a marked feature [PC] that is inherently specified on lower numerals, comparable to a class feature. This particular treatment of paucal stems from the fact that certain concord patterns are limited to specifc subsets of numerals; since there is a need to identify these subsets, I use features to distinguish them.[20] The markedness of [PC] triggers impoverishment, which allows us to derive the observed feature mismatch. In part, this analysis takes insight from Corbett (2000, 2010), who argues that paucal should not be considered a true number feature in Slavic because it lacks semantic import and cannot be used without the presence of the numeral. Chapter 5 on BCS lower numeral constructions will discuss more about the challenges for a paucal case analysis, so for now I simply disregard it as an option in the Russian derivation.

In the first stage of the derivation, the numeral assigns genitive to the lower domain, and both the numeral and noun agree for case in their respective domains. Case and ϕ-features percolate. The numeral's participation in agreement blocks genitive from percolating through the higher domain, but the masculine and plural features of the noun are allowed to continue, along with the paucal feature of the numeral since it is neither a number nor a gender feature. Thus far, the paucal feature is the only change from the higher numeral derivation.

(33)

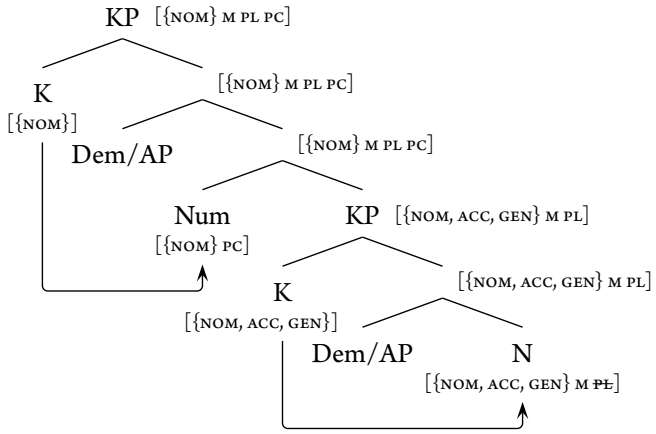


20 We will see a similar situation with mixed collectives in BCS.

In the post-syntactic mapping, impoverishment occurs when relevant feature co-occurrence restrictions are violated. I assume that Russian has the feature co-occurrence restriction in (34), which blocks [PL] on a noun dominated by [PC]. Given the lower ranking of [PL] with respect to [PC] in Russian's feature hierarchy (Appendix A), [PL] is deleted to derive singular (see Harley and Ritter 2002; Baerman, Brown, and Corbett 2005; Nevins 2011b; Ackema and Neeleman 2018). This aligns with the view that more marked features drive impoverishment (Nevins 2011a; Arregi and Nevins 2012). In light of this derivation it is also important to clarify certain assumptions about the representation of [SG]. In particular, I assume that [SG] results from the projection of a number node that is unspecified for number. This is consistent with the fact that [PL] impoverishment derives [SG], but [SG] on 1000+ numerals in the previous section can block percolation.

(34) [PL] cannot occur on N dominated by [PC]

(35)

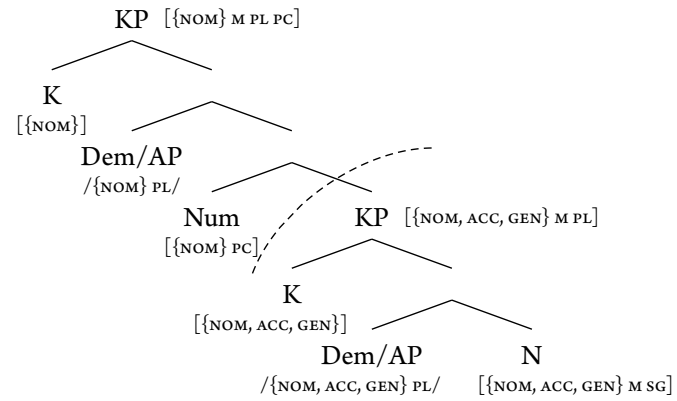


With regard to the effects of (34), a brief discussion of locality is in order. Given the way in which the concord system is organized, feature co-occurrence restrictions and the resulting impoverishment can refer to content on dominating nodes. This is possible since features percolate through the structure. However, we have seen that the system is sensitive to locality, both in percolation and in realization. Impoverishment is no exception. Although [PC], which triggers impoverishment, is located in a separate projection from the noun specified with [PL], I argue that locality can be maintained. The numeral's semi-lexicality creates a transparent boundary between the syntactic domains that allows [PC] to be interpreted as local to N (see Vos ()1999) for a discussion of semi-lexicality and transparency).

In the final stage of the derivation, the features of each KP spell out on available terminals according to locality. This results in NOM.PL throughout the higher domain; in the lower domain, we find GEN.PL on the modifier and a GEN.M.SG

form of the noun. In (36), the paucal feature is not represented on any of the modifiers or the noun, though this is technically allowed by the system. [PC] has no observable effect other than impoverishment of the noun's [PL] feature in the current derivation. However, a handful of Russian nouns display slight changes in pronunciation between the genitive singular form and the form observed in a lower numeral construction. The latter form is marked by a stress shift onto the final vowel, which could easily be captured by including [PC] in a spellout rule to adjust pronunciation.[21]

(36)



This aligned heterogeneous derivation applies only to masculine and neuter lower numeral constructions. Feminine lower numeral constructions in Russian appear to demonstrate a version of the homogeneous pattern due to a GEN.SG/NOM.PL syncretism, so these constructions will be addressed in Chapter 3. Furthermore, this derivation would proceed similarly in accusative case environments, but only with inanimate nouns. Russian displays animacy effects with lower numeral constructions that result in the downward homogeneous pattern in accusative case environments (Asinari 2019). These constructions are also addressed in Chapter 3.

2.3 POLISH

In Polish, the aligned heterogeneous pattern is found with both higher and 1000+ numerals. However, both numeral classes can alternate between aligned heterogeneous and other patterns in structural case environments, which makes the Polish concord system slightly more intricate than that of Russian. The complexities of Polish are explored more deeply in Chapter 6, but this section offers an initial preview.

21 Roughly, [V#] ⟷ [V́#] / N dominated by [PC].

2.3.1 *Higher numerals with non-virile nouns*

The overview of numeral constructions in Chapter 1 highlighted an effect of gender on the outcome of the Polish derivations. With higher numeral constructions in structural case environments, many speakers accept both the interrupted homogeneous and the aligned heterogeneous pattern with non-virile examples.[22] I attribute this pattern alternation to the feature specification of the numeral. Chapter 6 will return to Polish with consideration for the full range of patterns and their interactions with each other. For the moment, I will only address the aligned heterogeneous pattern in (37), which is derived under the assumption that one form of Polish higher numerals is pre-specified with accusative case.[23] Notice that the gloss of this example highlights the NOM/ACC.PL syncretism that is found on the demonstrative and numeral. This syncretism is common across Slavic but will play an especially important role in the Polish derivations.

(37)

te	*pięć*	*wysok-ich*	*żyraf*
this.NOM/ACC.PL	five.NOM/ACC	tall-GEN.PL	giraffe.GEN.F.PL

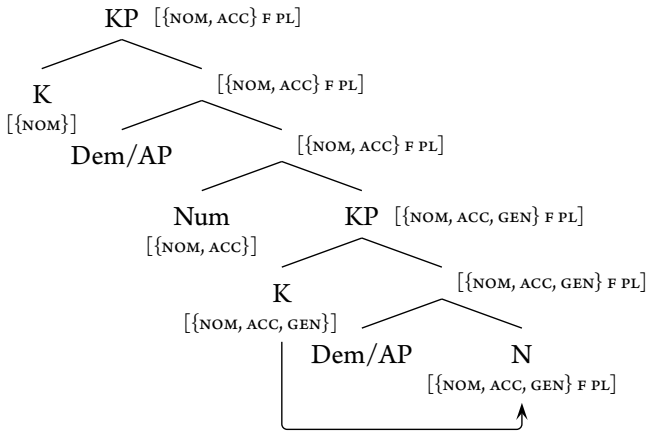
'these five tall giraffes'

The derivation proceeds as follows. In contrast to Russian, I assume that Polish numerals do not agree for case in structural case environments. As mentioned in §2.2.1, the numerals' lack of participation in agreement can be determined based on the interrupted homogeneous pattern in which genitive case is realized above the numeral. In the derivation of the aligned heterogeneous pattern, the numeral is pre-specified with {NOM, ACC}, which percolates through the higher domain and blocks percolation of genitive from the lower domain, as shown in (38).

22 The pattern alternation is allowed by many speakers, but there are some who only accept the interrupted homogeneous pattern. This variation will be addressed in Chapter 6.

23 I assume that the possibility of case pre-specification is limited to the numeral, so we would not expect to find a noun pre-specified for case.

(38)



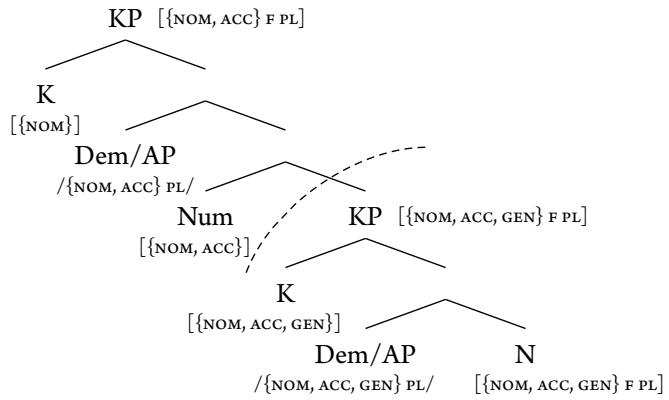
Case override on KP is possible because of simple subset-superset relations; as discussed in Chapter 1, the set of accusative features {NOM, ACC} contains the {NOM} feature of nominative. The ϕ-features percolate across both domains as usual. In the Russian derivations, it was argued that nominative case on the numeral blocked percolation of the lower genitive features, and likewise in this derivation with accusative on the numeral. However, we see that accusative can override nominative on KP. In addressing this override potential, we can refer to the principles of extended projection (Grimshaw 1991, 2000, 2005). Features percolate through the extended projection as a matter of course, but the break in extended projections is where relativized heads take effect. The inability of genitive to override the case of the numeral and percolate into the higher domain occurs because at the relevant time, features are moving between extended projections. Any feature specification on the numeral, as the head of an extended projection, blocks percolation of equivalent features from the lower domain. By contrast, in the Polish pattern, the accusative features only encounter the functional head K rather than the head of the extended projection, so override is possible.

In spellout, the higher domain ultimately realizes ACC.PL features, while the lower domain realizes GEN.PL, as shown in (39). This realization of accusative rather than nominative in the higher domain aligns with the predictions of the so-called 'Accusative Hypothesis,' which harnesses the prevalence of NOM/ACC syncretism in Polish and contends that the higher numerals (and higher domain) are accusative (Franks 1995, 2002; Przepiórkowski 1999; Miechowicz-Mathiasen 2011, 2012; a.o.). In part, this hypothesis has been adopted by many to account for the rather unexpected default agreement that occurs on the verb with a higher-numeral subject.[24] Verbs in Polish agree with nominative subjects, so the fact that

24 In addition to default agreement, those who adopt the Accusative Hypothesis also emphasize case syncretism in the non-virile and virile paradigms. As discussed above, non-virile higher numerals

these constructions occur with default agreement has been taken as evidence that nominative is not realized in the higher domain of the numeral construction. This will be explored more deeply in Chapter 7 with the discussion of subject-verb agreement.

(39)



2.3.2 *1000+ numerals*

The complicated behavior of Polish 1000+ numerals raises some interesting points for discussion. Based on the work of Klockmann (2017), we can identify three patterns with these numerals. (40) exemplifies the aligned heterogeneous pattern, which is familiar from the preceding discussion in this chapter. (41) depicts what I term the interrupted homogeneous pattern, when genitive is realized above and below the numeral, but the numeral itself surfaces in a default nominative form. We will return to this pattern in Chapter 6. Finally, (42) contains what Klockmann refers to as the 'default' pattern.

and modifiers display a NOM/ACC syncretism. On the other hand, their virile counterparts display an ACC/GEN syncretism. The fact that accusative is the common denominator in these paradigms is taken as additional evidence that the higher numeral constructions are accusative in structural case contexts (see Przepiórkowski, To appear). By contrast, I only assume that the aligned heterogeneous pattern with non-virile examples is accusative; we will see that the syncretism and subject-verb agreement facts make it difficult to determine whether virile examples are accusative or genitive. Moreover, the aligned heterogeneous pattern above is derived using a numeral that is inherently accusative. This analysis avoids a common critique of Accusative Hypothesis analyses, which typically posit that the nominative form is simply absent from the numeral's paradigm (see Dziubała-Szrejbrowska 2014; Klockmann 2017). Chapter 6 will discuss the matter further.

(40) adapted from Miechowicz-Mathiasen 2011 (6, ex. (6b))
Ten *tysiąc* *list-ów* *przyszed-ł*
this.NOM.M.SG thousand.NOM.M.SG letter-GEN.M.PL come-PST.3M.SG
do *Piotr-a.*
to Peter-GEN
'This thousand letters came to Peter.'

(41) adapted from Przepiórkowski 1999 (195–6, ex. (5.335))
T-ych *tysiąc* *osób* *już* *przysz-ło.*
this.GEN.PL thousand.NOM person-GEN.F.PL already come-PST.N.SG
'The thousand people already came.'

(42) adapted from Klockmann 2017 (123, ex. (67))
Te *tysiąc* *złot-ych* *już* *zosta-ło*
this.NOM.PL thousand.NOM zloty-GEN.M.PL already was-N.SG
wydan-e.
spent-NOM.PL
'These thousand zlotys have already been spent.'

However, I argue that this range can be simplified to two patterns. Simplification is possible because the numeral alternates between nominal and numeral status. When 1000+ is fully nominal, the aligned heterogeneous pattern is a given. As a higher numeral, 1000+ displays the same patterns as higher numeral constructions, alternating between aligned heterogeneous and interrupted homogeneous. Klockmann's default pattern is thus actually a second instantiation of the aligned heterogeneous pattern that obtains when 1000+ behaves as a higher numeral.

Data from Miechowicz-Mathiasen (2011) indicate that 1000+ numerals can alternate between the categories of noun and numeral (see also Przepiórkowski 2008). This is based on the case realization following the distributive particle *po*, which assigns locative to nominal complements but accusative to numerals. The examples in (43) show that *tysiąc* 'thousand' allows both.

(43) adapted from Miechowicz-Mathiasen 2011 (17–18, ex. (25)–(26))

a. *Piotr* *dał* *im* *po* *jabłk-u.*
Peter.NOM gave.3M.SG them.DAT DIST apple-LOC
'Peter gave them an apple each.'

b. *Piotr* *dał* *im* *po* *pięć* *jabł-ek.*
Peter.NOM gave.3M.SG them.DAT DIST five-ACC apple-GEN.PL
'Peter gave them five apples each.'

c. *Ojciec* *dał* *nam* *po* **tysiąc*
Father.NOM gave.3M.SG us.DAT DIST *thousand.ACC
/tysiąc-u.
/thousand-LOC
'Father gave us a thousand each.'

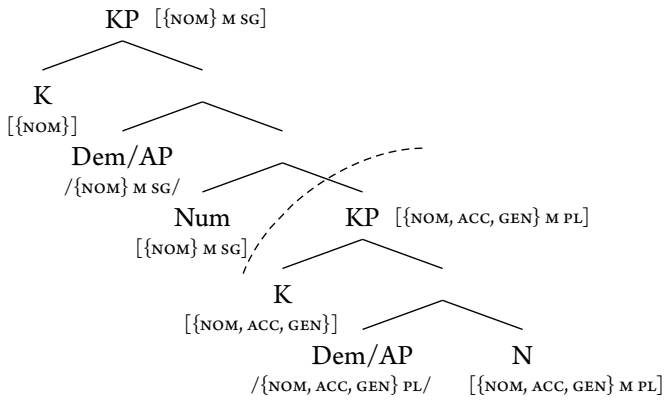
d. *Ojciec* *dał* *nam* *po* *tysiąc*
Father.NOM gave.3M.SG us.DAT DIST thousand.ACC
/tysiąc-u *złot-ych.*
/thousand-LOC zloty-GEN.PL
'Father gave us a thousand zlotys each.'

Let us first examine the nominal form of 1000+. In (40), repeated below as (44), *tysiąc* is specified with masculine singular features because its declension parallels that of a regular non-virile noun (Swan 2002).

(44) adapted from Miechowicz-Mathiasen 2011 (6, ex. (6b))
Ten *tysiąc* *list-ów* *przyszed-ł*
this.NOM.M.SG thousand.NOM.M.SG letter-GEN.M.PL come-PST.3M.SG
do *Piotr-a.*
to Peter-GEN
'This thousand letters came to Peter.'

The derivation is then quite straightforward. 1000+ enters the derivation with ϕ-features, and as a regular noun, obligatorily agrees for case with the higher K. The genitive features and ϕ-features of the quantified noun are restricted to the lower domain, while the features of 1000+ take precedence in the higher domain. In spellout, the higher domain realizes NOM.M.SG, while the lower domain realizes GEN.PL.

(45)



We now turn to 1000+ as a higher numeral, focusing specifically on the aligned heterogeneous pattern (the interrupted homogeneous pattern of (41) will be addressed in Chapter 6). In (42), repeated in (46) with syncretism included in the gloss, the distribution of features in the numeral construction appears identical to the nominal example in (40), but a closer look reveals that the agreement features on the verb differ. While (40) displays regular agreement, (46) displays default agreement, which is typical of Polish higher numeral constructions.

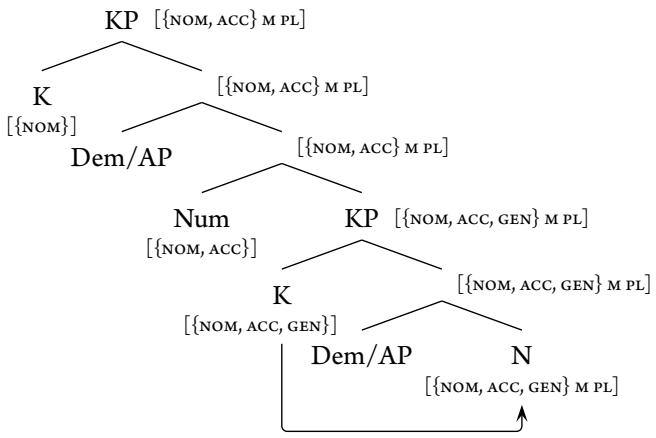
(46) adapted from Klockmann 2017 (123, ex. (67))

Te	*tysiąc*	*złot-ych*	*już*
This.NOM/ACC.PL	thousand.NOM/ACC	zloty-GEN.M.PL	already

zosta-ło *wydan-e.*
was-N.SG spent-NOM.PL
'These thousand zlotys have already been spent.'

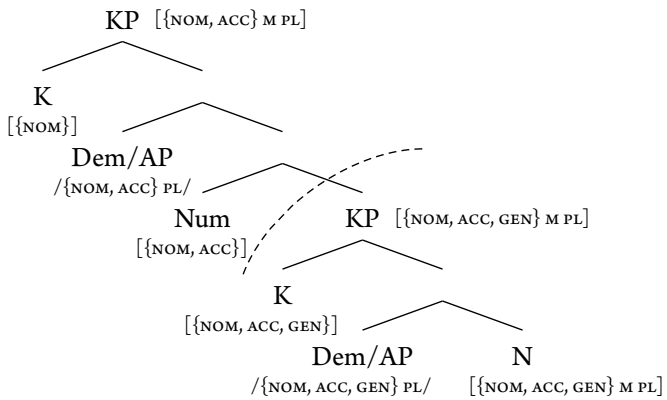
This derivation is easily captured if we assume that the numeral here is indeed a higher numeral pre-specified with accusative case. The derivation then proceeds in exactly the same way as we saw in §2.3.1. The tree in (47) depicts feature percolation in the syntax.

(47)



In concord, ACC.PL is realized in the higher domain and GEN.PL in the lower domain, as depicted in (48).

(48)



2.4 BCS

For the most part, BCS higher and lower numeral constructions display unique patterns that will be covered in subsequent chapters. However, the aligned heterogeneous pattern can be found in 1000+ and collective numeral constructions. The 1000+ numerals offer no new insights, so this section focuses on two types of collective numeral constructions: masculine and mixed collectives (per the terminology of Šarić 2014).[25]

2.4.1 *Masculine collectives*

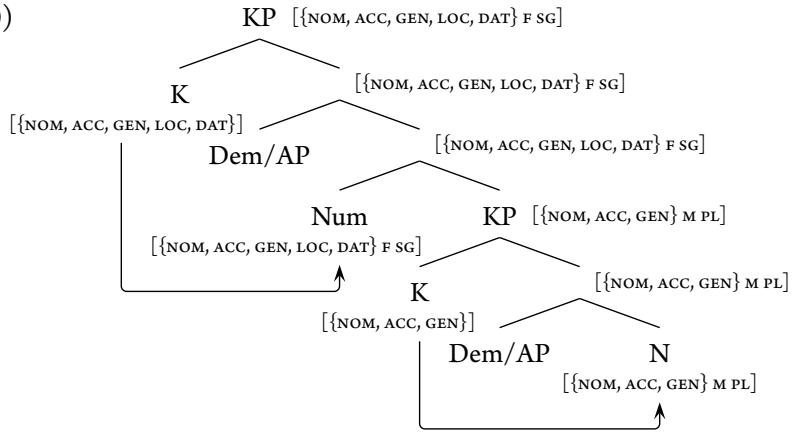
The masculine collective, a form available for numerals 'two' through 'ninety-nine' apart from those ending in 'one,' is used to quantify the members of an animate group and is typically reserved for male human referents (Hammond 2005; Thomas 2011; Šarić 2014). Because of their use in group contexts, the masculine collectives often give rise to a partitive reading (Šarić 2014). Ironically, the masculine collective numerals themselves decline like feminine singular nouns and are accordingly specified here with their own gender and number features (Kim 2009). Example (49) shows the collective construction in a dative environment. Here, two domains of concord are distinguishable: the demonstrative and collective realize dative case, while the lower modifier and noun realize genitive.

25 In the category of collectives, BCS also has 'collective numeral adjectives' (Šarić 2014). As suggested by their name, collective numeral adjectives appear to be purely adjectival, so they are not discussed here. For further discussion of BCS collective numerals, see also Hammond (2005), Kim (2009), Thomas (2011), Lučić (2015).

(49) *pomoći* *t-oj* *dvoj-ici* *neustrašiv-ih*
help.INF that-DAT.F.SG two-COLL.DAT.F.SG fearless-GEN.PL
general-a
general-GEN.M.PL
'to help those two (of the) fearless generals'

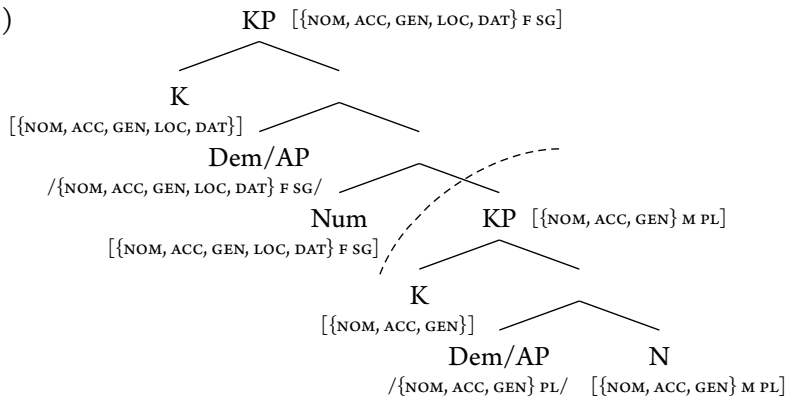
As before, the first stage of the derivation, depicted in (50), consists of case agreement and feature percolation. Beginning with agreement, both the numeral and the noun enter into head-head agreement with the local K. In terms of feature percolation, N is specified with [M] and [PL] features, which percolate through each node up to the lower KP. At this point, they are blocked from percolating further, as the [F] and [SG] features of the collective take precedence in the higher domain. Likewise, the genitive features assigned to the lower domain are blocked from percolating into the higher domain given the collective's participation in agreement.

(50)



Continuing to the next stage of the derivation, the structure in (51) depicts the post-syntactic mapping of (50) and the result of concord. Subject to locality, the features on each KP spell out on available terminals. In the tree below, the higher domain realizes DAT.F.SG. The lower domain realizes GEN.PL, as BCS plural modifiers do not distinguish gender in the lexical cases (Alexander 2006). The derivation is thus quite straightforward and resembles some of the earlier Russian and Polish examples.

(51)



2.4.2 *Mixed collectives*

The mixed collectives are used with animate nouns of mixed or unknown gender, such as *ljudi* 'people', and collective nouns, such as *d(j)eca* 'children' (Hammond 2005; Kim 2009; Lučić 2015). Though the mixed collectives historically declined (and occasionally still do with certain readings), there is a tendency toward the use of a frozen nominative/accusative syncretic form, as shown in (52) (see Lučić 2015).

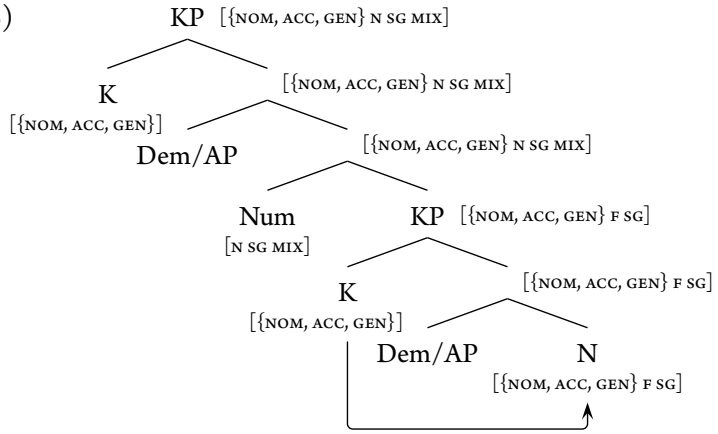
(52) *S(j)eti-la* *se* *t-o* *dv-oje*
Remember-PST.F.SG REFL that-NOM/ACC.N.SG two-COLL.NOM/ACC.N.SG
dobr-e *d(j)ec-e.*
good-GEN.F.SG children-GEN.F.SG
'She remembered those two good children.'

The example above shows the collective construction as the object of the genitive-case-assigning verb *s(j)etiti se*. The NOM/ACC form of the collective is acceptable across nominative, accusative, and genitive case contexts, as well as after prepositions of any case (Giusti and Leko 1995; Lučić 2015). As with the masculine collectives, the mixed collective in (52) displays the aligned heterogeneous pattern with two distinct domains of concord: the higher domain realizes NOM/ACC neuter singular, while the lower domain realizes genitive (see Hammond 2005; Kim 2009; Šarić 2014).[26] However, because the higher domain reflects the frozen form rather than the externally assigned genitive case, this derivation is

26 Various sources gloss the noun *d(j)eca* differently. Some use neuter plural (e.g., Hammond 2005), while others use feminine singular because of its declension pattern (e.g., Kim 2009). This does not affect the analysis, as all agree that the case is genitive in the environment of a mixed collective.

slightly more involved than the previous one.[27] As with the previous derivations, (53) begins with case agreement and feature percolation in the syntax.

(53)



In contrast to the nominal masculine collectives, I assume that mixed collectives do not agree for case. While this assumption is necessary to obtain the desired outcome of the derivation, it is not altogether surprising. Chapters 4 and 5 will show that BCS numerals are often feature deficient. The lack of case on the mixed collective allows the genitive sets of the lower domain to percolate beyond the domain boundary, ultimately reaching the higher KP. The ϕ-features of the noun percolate upward to the lower extended projection boundary, but the features of the collective take precedence in the higher domain. The collective is further specified with a [MIX] class feature denoting mixed collectives, which ultimately triggers impoverishment.[28]

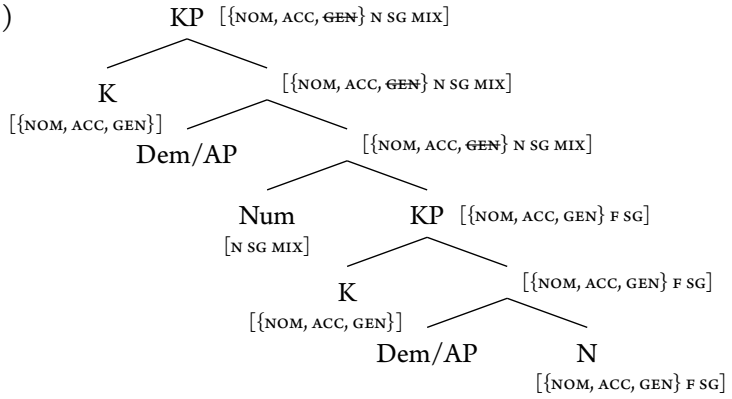
The structure in (53) is then mapped to the post-syntactic structure in (55). In contrast to the derivation of a masculine collective, impoverishment of the genitive is necessary to derive the desired case features. In this particular derivation, (54) triggers the deletion of the genitive set everywhere it shares a node with the [MIX] feature—the entire higher domain. As previous derivations have shown, this deletion is determined by the lower ranking of [GEN] with respect to [MIX] in the BCS hierarchy (Appendix C).

27 Lučić (2015) (and two consultants) indicates that some speakers differentiate between lower and higher mixed collectives. For these speakers, the higher mixed collectives display the same upward homogeneous pattern as BCS higher numerals, suggesting that they simply lack the [MIX] feature which differentiates mixed collectives from cardinals. However, the same analysis cannot be extended to the lower mixed collectives as they maintain the aligned heterogeneous pattern, while the lower numerals display non-aligned heterogeneous agreement.

28 Rather than using [MIX] to trigger case impoverishment in the higher domain, one could posit an alternative analysis that parallels Polish, where the collective is pre-specified with {NOM, ACC} (or simply {NOM}). Since the mixed collectives are more commonly regarded as a distinct class in BCS, unlike the Polish accusative-specified higher numerals, I have opted for the [MIX] analysis.

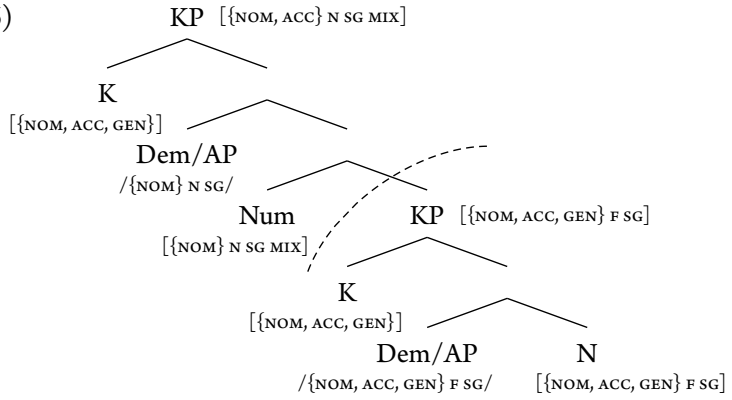
(54) [GEN] cannot occur on the same node as [MIX]

(55)



In the next stage of the derivation, the features of dominating nodes are realized according to locality, as shown in (56). Two distinct domains of concord are apparent, as the higher domain realizes accusative case features, while the lower domain preserves the genitive.[29] Given the complementarity of case assignment and case concord introduced in Chapter 1, the numeral must surface in a default form, which is nominative in BCS (see e.g., Šarić 2014).

(56)



The derivation would proceed the same way in both nominative and accusative environments, since the internally assigned genitive can override both nominative

29 Mixed collectives typically occur with a neuter singular verb (Kim 2009; Šarić 2014; Lučić 2015), which is considered default in BCS. The discussion of agreement in Chapter 7 hypothesizes that the features of KP are relevant to agreement. Moreover, agreement in BCS is conditioned by nominative case. Therefore, the fact that ACC.N.SG results on KP is consistent with default agreement. However, it may also be possible to argue that agreement is successful with mixed collectives. Adding another feature co-occurrence restriction to trigger deletion of [ACC] on the same node as [MIX] would result in NOM.N.SG on KP—the outcome of successful agreement would still be a neuter singular verb. In the main text, I choose to pursue the simplest derivation with the least impoverishment.

and accusative on the higher KP. While a mixed collective can occur as the complement of a preposition that assigns dative or instrumental case, its NOM/ACC form is problematic when used as the complement of a verb that requires dative or instrumental—such constructions are generally considered ungrammatical (Giusti and Leko 1995; Lučić 2015). Similar instances of ungrammaticality are observed with BCS higher numeral constructions. These are explored in depth in Chapter 4, where we will see that the third hypothesis on the hierarchical decomposition of case plays a key role.

Citing Tafra (2005), Lučić (2015) further breaks down the mixed collectives according to their uses. One use is with a collective noun, as in (52). The second occurs without an accompanying noun, where the numeral denotes an abstract entity, and the third denotes a group of people and can be used without an accompanying noun. According to Lučić, the three uses display slightly different concord patterns because the declinability of the numeral seems to shift depending on the referent. However, it is not clear why the referent affects the declinability of the numeral. The precise distribution of the mixed collectives therefore seems somewhat uncertain, possibly due to their evolving usage. Many sources, including my own consultants, do not differentiate between the three uses and simply resort to the aligned heterogeneous pattern of (52). Similar attitudes are also reflected by my Russian and Polish consultants regarding their usage of collective numerals (see also Yanko 2003; Lyskawa 2020), which is why this thesis largely restricts its focus to the cardinals. Nonetheless, collectives could be an interesting subject for future research.

2.5 REFLECTIONS ON AN AGREEMENT-BASED ANALYSIS

This chapter has demonstrated the relative ease with which the concord-as-spellout approach captures the aligned heterogeneous pattern common in Slavic numeral constructions. The merits of this type of approach are twofold. Not only does it provide a simple account of concord in general by treating it as distinct from agreement (and as a result, avoids compromising the essence of agreement), but it also provides a straightforward account of the numeral constructions. In fact, many of the examples discussed follow directly from the spellout of dominating nodes on available local terminals. The few that do not require only the application of a single impoverishment rule or a simple assumption about the numeral's inherent properties.

To reinforce the simplicity of the concord-as-spellout approach, let us consider how a purely agreement-based alternative would work with a Russian higher numeral construction, one of the simplest examples encountered in this chapter.

(57) *èt-i* *pjat'* *vysok-ix* *žiraf-ov*
this-NOM.PL five.NOM tall-GEN.PL giraffe-GEN.F.PL
'these five tall giraffes'

The current concord-as-spellout approach assumes that both the numeral and noun agree for case, so I will assume that this extends to the agreement approach. In terms of ϕ-features, it is possible that the noun is either pre-specified with these features or else receives them through agreement with number and gender heads (see §2.2.1). For the adjective to receive case and ϕ-features, it could either agree with the noun after the noun's features have been valued or individually agree with the case, gender, and number heads. Pursuing the first option, we would have to introduce an ordering of agreement relations so that the adjective agrees with the noun only after the noun's features have been valued. This means that the noun must always have all of the features that the adjective requires. However, that the noun has the required features is not always obvious, and Chapter 5 will return to this discussion in light of the non-aligned heterogeneous pattern of BCS.[30]

The second option introduces potential complications regarding the status of the adjective as a probe, the directionality of agreement, and the number of agreement relations that would be required. Let us first consider the status of the adjective as a probe. While this is not an uncommon assumption, probes are typically heads rather than modifiers. Abney (1987) analyzes adjectives as heads, but this has largely been eschewed in current work. Regarding the directionality of agreement, case and number projections are likely located above the adjective, but it has been argued that gender occurs below, either on or just above the noun (Merchant 2014; Kramer 2016). Therefore, the adjective would have to probe downward for gender but upward for case and number. The literature continues to debate the directionality of agreement (see e.g., Carstens 2016; Ackema and Neeleman 2018), but regardless, accounting for the adjective's bidirectional feature valuation seems over-complicated compared to the concord approach. Moreover, it does

30 Rather than assuming an order of valuation, one could adopt the feature-sharing version of Agree (Frampton and Gutmann 2006; Pesetsky and Torrego 2007; Danon 2012), which does not require the goal to contain valued instances of the features required by the probe. In this type of approach, the adjective could enter into an agreement relation with the noun even before the noun's features have been valued. Through feature-sharing, values for case and number are supplied later. However, issues still arise since we will see that the noun's features do not always correspond to those of the modifiers.

not appear to be possible to stipulate that a head consistently probes upward for case and number but downward for gender when we consider the features of the demonstrative.

The demonstrative in the higher domain would likely probe downward for ϕ-features, presumably into the lower domain since we have seen that the numeral is not typically specified with many features. At this point, however, we cannot hypothesize that the demonstrative simply agrees with the noun, since the two elements realize different case values. The noun must agree with the lower K, and the demonstrative with the higher K. It may be possible to assume roll-up movement of the numeral whereby the required features collect as the numeral moves up the structure (see Klockmann 2017). A one-to-one mapping can then be established with the demonstrative. Nevertheless, this kind of approach to agreement seems to be making the essentially the same assumptions as the concord analysis in which features are collected on KP and then spelled out at once on terminal nodes. Moreover, this additional movement is unusual for theories of agreement. Therefore, while it is not impossible to derive the aligned heterogeneous distribution of features through agreement, the analysis hinges on atypical probes and either multiple agreement relations that occur in different directions or added movement. This is clearly more complicated than the concord approach, which naturally derives the aligned heterogeneous pattern.

3

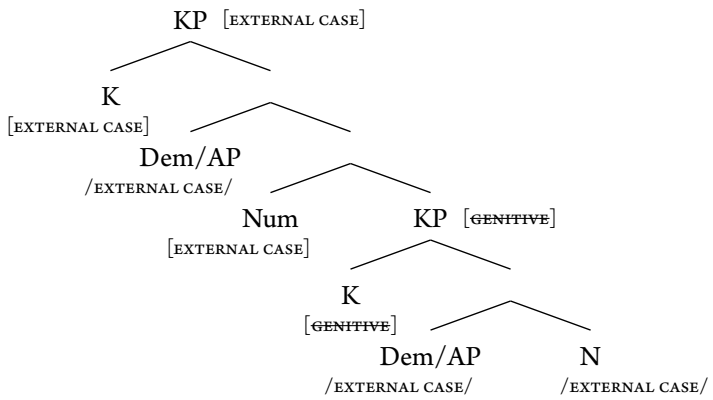
DOWNWARD HOMOGENEOUS CONCORD

3.1 INTRODUCTION

The downward homogeneous pattern is characterized by a single domain of concord that reflects the externally assigned case. The pattern is typical in lexical case environments, and we will see that this is consistent across Russian and Polish numeral constructions. Occasionally, downward homogeneous concord also seems to appear in structural case environments. This chapter will show that Polish lower numeral constructions are compatible with a true downward homogeneous analysis in structural case contexts, while Russian lower numeral constructions may not be. The derivations demonstrate that the downward homogeneous pattern only obtains in Russian structural case environments because of syncretism, and by following the simplest course for the derivation, we instead derive a heterogeneous pattern.

Impoverishment, the fifth key hypothesis introduced in Chapter 1, plays a crucial role in deriving the downward homogeneous pattern (see Figure 1.1), and this chapter emphasizes the use of impoverishment as a possible method of domain extension. Impoverishment is required because I assume that the numeral consistently assigns genitive case to its complement, so deletion of these features is required to clear the lower domain for realization of the external case features, as shown in (58). We will see that impoverishment of case features prior to concord has a global effect within the lower domain, and relevant rules can trigger deletion on heads such as K, as well as the dominating nodes to which features have percolated.

(58)



Some theories disagree with the consistency of genitive assignment across structural and lexical case environments (e.g., Rappaport 2002; Rakhlin 2003), while others contend that if a class of numerals assigns genitive, it does so consistently (e.g., Franks 1995, 2002; Miechowicz-Mathiasen 2011; Ionin and Matushansky 2018). This thesis follows the latter group of analyses to avoid the complication of explaining why genitive cannot be assigned in certain environments. Moreover, the distribution of demonstratives above and below the numeral holds in lexical case environments with no effect on the concord pattern, providing further support for two syntactic domains.

3.2 RUSSIAN

In Russian, the downward homogeneous pattern can be found with both higher and lower numeral constructions in lexical case environments. It has also been observed that lower numeral constructions containing animate or feminine nouns appear to display the pattern in structural case environments (see Brattico 2011; Pesetsky 2013; Asinari 2019), but we will see that this is due to effects of syncretism. Prior to analyzing syncretism, the underlying patterns appear to be heterogeneous.

3.2.1 *Higher numerals*

Let us begin by examining Russian higher numerals in lexical case contexts. As shown in (59), the entire construction reflects the same features, in this case DAT.PL.

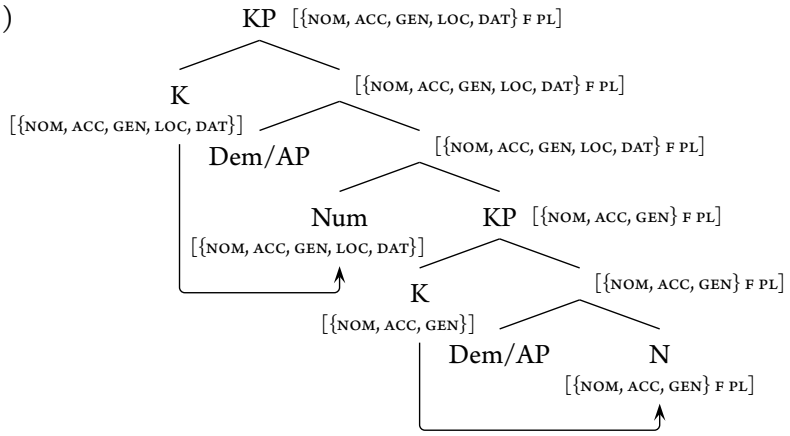
(59) *k* *èt-im* *pjat-i* *vysok-im* *žiraf-am*
to this-DAT.PL five-DAT tall-DAT.PL giraffe-DAT.F.PL
'to these five tall giraffes'

In contrast to the aligned heterogeneous example in Chapter 2, we now have to account for a domain mismatch: two syntactic domains but only one concord domain. This is supported by (60) in which the demonstrative appears below the numeral while the concord pattern remains consistent with (59).

(60) *k* *pjat-i* *èt-im* *vysok-im* *žiraf-am*
to five-DAT this-DAT.PL tall-DAT.PL giraffe-DAT.F.PL
'to five of these tall giraffes'

The mismatch between the syntactic and concord domains is easily addressed with impoverishment. The structure in (61) depicts the start of the derivation with the noun and numeral participating in agreement, followed by feature percolation. As we saw in the previous chapter, the numeral's participation in case agreement blocks percolation of the genitive features from the lower domain. By contrast, the ϕ-features of the noun are able to percolate through the higher domain since the numeral has no competing features.

(61)

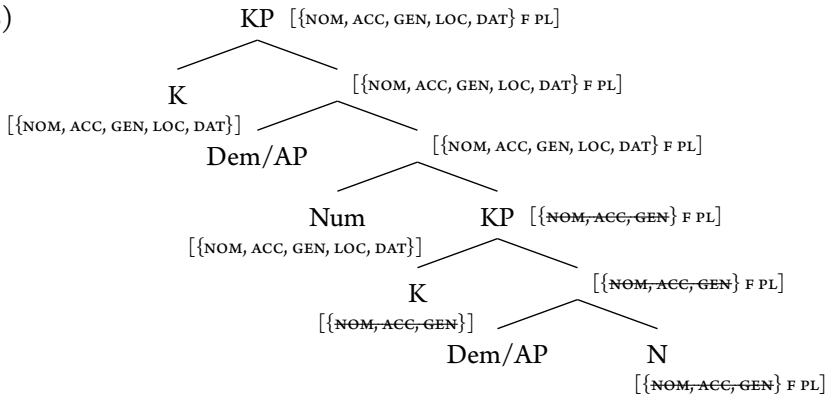


Impoverishment is applied in the post-syntactic stage of the derivation. Just as the features of dominating nodes are realized in spellout, I hypothesize that impoverishment can also involve the features of dominating nodes, as briefly discussed in Chapter 2. Since feature percolation occurs before impoverishment, the nodes along spine of the construction all contain at least a subset of the same features. By taking advantage of the domination relations among nodes, a single feature co-occurrence restriction can trigger global deletion. In this derivation, impoverishment applies to resolve violations of the feature co-occurrence restriction in

(62).[31] Since [LOC] is a high-ranking feature in the case hierarchy, violations of the feature co-occurrence restriction are resolved through deletion of the lower-ranked [NOM], [ACC], and [GEN] features located in the lower domain of the construction. [32] As we saw in Chapter 2, impoverishment respects locality. Even though [LOC] is only present in the higher domain while impoverishment applies in the lower domain, the semi-lexicality of the numeral supports a transparent boundary between the two domains. Therefore, it is possible to obtain cross-domain effects of impoverishment while maintaining locality.

(62) [NOM], [ACC], [GEN] cannot occur on nodes dominated by [LOC]

(63)



Given the layout of the case system, one might wonder how impoverishment is restricted to the lower domain since the relevant case features are also present in the higher domain. In response to this, I assume that there is a constraint on the well-formedness of cases with respect to their decomposition in Chapter 1. The constraint allows only the outermost feature of a given case set to be deleted (see also Ackema and Neeleman's (2018) Russian Doll Principle and Zompì's (2019) Graduality constraint). This means that the [NOM], [ACC], and [GEN] features cannot be deleted on the higher K or KP nodes in (63) since doing so would reduce those case sets to {LOC, DAT}, an incomplete set of case features.

Considering the containment relations among cases, the feature co-occurrence restriction in (62) is applicable across locative, dative, and instrumental case environments to derive the downward homogeneous pattern, although an additional

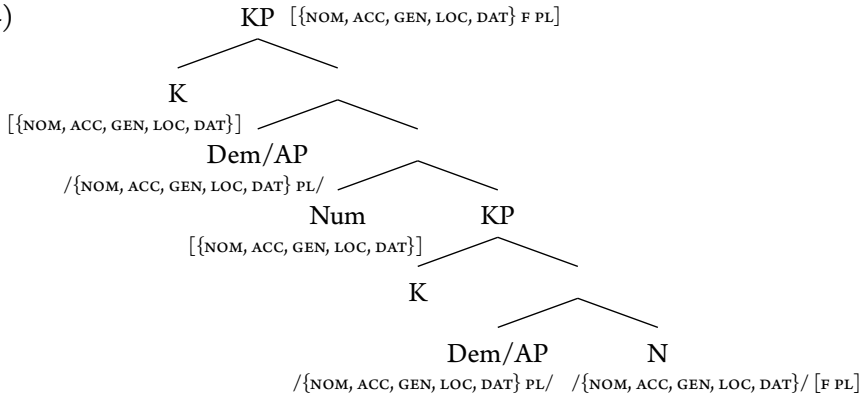
31 As discussed in the previous chapter, this feature co-occurrence restriction would have to make reference to specific numeral classes so that it would not apply to examples containing a 1000+ numeral or a noun with a genitive complement. For the purposes of this thesis, I will avoid making the feature co-occurrence restrictions more complex than necessary.

32 (62) could alternatively be written as three individual feature co-occurrence restrictions but has been condensed for a simpler representation.

note about locative examples is necessary. Since I have been treating domination as a reflexive relation (see e.g., Cushing 1978; Norris 2014), (62) would be violated on the topmost KP in locative contexts. However, deleting [LOC] on this node would go against the feature hierarchy, since [LOC] outranks [NOM], [ACC], and [GEN]. On the other hand, deletion of [NOM], [ACC], and [GEN] is also banned since this would result in an ill-formed set of case features. Thus, I suggest that the system tolerates violation of a feature co-occurrence restriction when there is no licit resolution. In locative examples, KP retains the set of locative features, which is then realized throughout the construction in concord. Regarding genitive case environments, it is unclear whether impoverishment is required to derive the downward homogeneous pattern since genitive is present in both domains. While it would be possible to add another impoverishment rule to derive the pattern, the output is the same regardless, so I will avoid complicating the derivation.[33]

During spellout, the lower domain is then free to realize the features on the higher KP as the most local set of case features. In (64), DAT.PL is realized throughout the construction in an extended domain of concord. Note that in this derivation, case features on the noun are the result of concord rather than agreement.

(64)



The completion of this derivation raises the question of why impoverishment is necessary at all given the decomposition of case. More specifically, why doesn't the set of dative features in the higher domain override the set of genitive in the lower domain during concord? After all, the Polish derivations in Chapter 2 showed that during feature percolation, case override is based on containment. From an empirical standpoint, if the downward homogeneous pattern were to result from simple case override, we would incorrectly predict the availability of the downward

33 The use of impoverishment to derive the downward homogeneous pattern in a genitive context may also be ruled out on the basis of economy.

homogeneous pattern in BCS, discussed in Chapters 4 and 5. The availability of the downward homogeneous pattern in a given language therefore appears to be linked to language-specific feature co-occurrence restrictions. In more concrete terms, the impossibility of case override in concord could be tied to a difference in locality between post-syntactic concord and syntactic percolation. The derivations thus far have shown that percolation moves in accordance with relativized heads, which take effect at the extended projection boundary with the head of an extended projection. When the numeral agrees for case, or is pre-specified as in Polish, percolation of the lower genitive features is necessarily blocked. This blocking occurs regardless of the ability of genitive to override the higher-domain case that results on the numeral because the numeral functions as a relativized head. When the numeral does not agree or has no pre-specification, the set of genitive features is able to percolate beyond the domain boundary and can attempt to override K's case features since K does not function as a relativized head (i.e., is not the head of the extended projection). As subsequent derivations will show, the downward realization of features in concord is only sensitive to the presence of features, rather than the headedness of the nodes involved. Concord simply spells out the closest set of dominating features.[34]

3.2.2 *Lower numerals*

Russian lower numeral constructions also display the downward homogeneous pattern in lexical case environments, which we will see is derived very similarly to the higher numeral examples. This section also addresses the status of what has been deemed the downward homogeneous pattern in certain structural case examples. We will see that in following the simplest course for the derivation, the resulting pattern is not underlyingly homogeneous.

3.2.2.1 *Lexical case environments*

Example (65) shows a lower numeral construction in a dative environment. The low demonstrative in (66) provides additional evidence of two syntactic domains. As before, the entire construction realizes DAT.PL, but the derivation slightly differs from that of a higher numeral construction because of the paucal feature introduced by lower numerals.

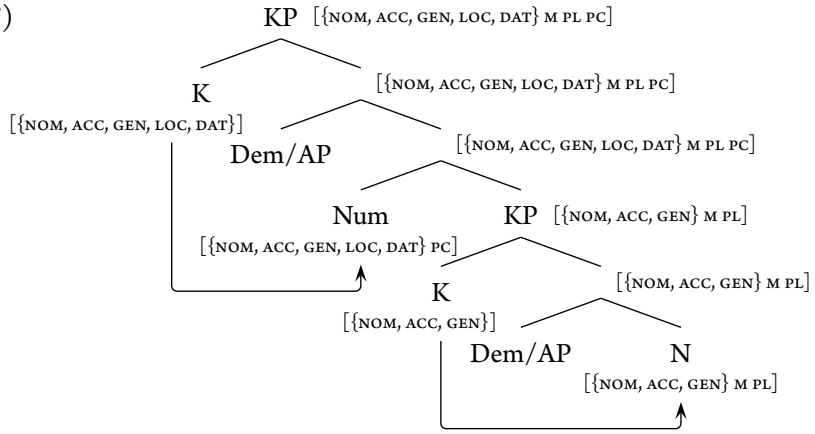
34 On a related note, another difference between percolation and concord is apparent in the possible loci for each process. We have seen that features never percolate from modifiers, but modifiers can realize features in concord.

(65) *k* *èt-im* *dv-um* *golodn-ym* *tigr-am*
to this-DAT.PL two-DAT hungry-DAT.PL tiger-DAT.M.PL
'to these two hungry tigers'

(66) *k* *dv-um* *èt-im* *golodn-ym* *tigr-am*
to two-DAT this-DAT.PL hungry-DAT.PL tiger-DAT.M.PL
'to two of these hungry tigers'

The derivation begins as usual. The numeral and noun both participate in case agreement, and the ϕ-features of the noun percolate through the higher domain, this time along with [PC] from the numeral.

(67)



In the post-syntactic mapping, impoverishment applies where relevant. Given the case environment of this example, the feature co-occurrence restriction in (62) is again applicable, and the genitive features of the lower domain are deleted, as shown in (70). However, recall from Chapter 2 the feature co-occurrence restriction that results in the deletion of [PL], repeated in (68). This was necessary for the aligned heterogeneous derivation in which the noun occurred in a singular form, while the rest of the construction realized plural. Now, though, we observe [PL] throughout the construction, as indicated by (65), so (68) must be prevented from applying. This is achieved with the feature co-occurrence restriction in (69), which results in [PC] deletion in lexical case environments due to the lower ranking of [PC] with respect to [GEN]. Assuming that a node dominates itself, [PC] is deleted globally, including on KP.[35] The effects of this feature co-occurrence restriction require that it be ordered *before* the feature co-occurrence restriction in (68) to

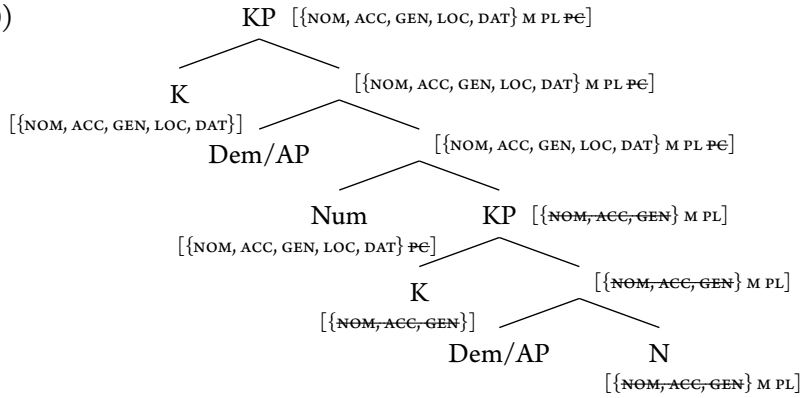
35 As mentioned in the previous chapter, I assume that the semi-lexicality of the numeral creates a boundary between the two extended projections that is more transparent than usual (see Vos 1999). Therefore, the cross-domain effects of impoverishment in this derivation are not predicted to obtain with a regular noun or 1000+ numeral.

eliminate any possible violations that would result in [PL] deletion. §3.2.3 provides further discussion about the required ordering of Russian feature co-occurrence restrictions following the full set of Russian derivations (see also Appendix A for the Russian feature co-occurrence restrictions and feature hierarchy).

(68) [PL] cannot occur on N dominated by [PC]

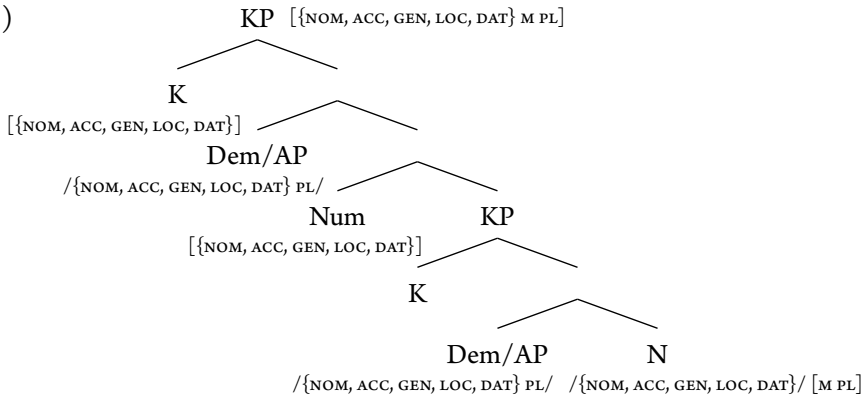
(69) [PC] cannot occur on nodes dominated by [GEN]

(70)



The result of impoverishment is the realization of DAT.PL throughout the entire construction, as shown in (71). Again, impoverishment has been used to extend the concord domain of the external case.

(71)



3.2.2.2 *Animate accusative: Homogeneous or heterogeneous?*

Russian animate nouns quantified by a lower numeral appear to exhibit homogeneous concord in accusative environments (Brattico 2011). Crucial to this derivation is the observation that animate accusative is syncretic with genitive in the plural (Rakhlin 2003), as demonstrated in (72).

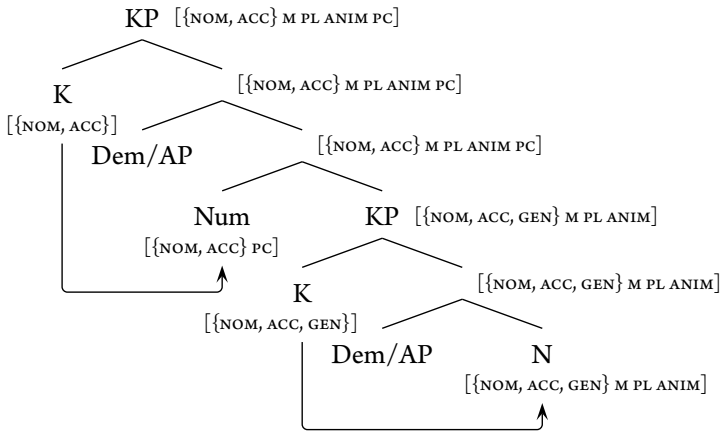
(72) a. *Ja vižu èt-ix dv-ux golodn-yx*
I see this-ACC.PL.ANIM two-ACC.ANIM hungry-ACC.PL.ANIM
tigr-ov.
tiger-ACC.M.PL.ANIM
'I see these two hungry tigers.'

b. *dlja èt-ix dv-ux golodn-yx tigr-ov*
for this-GEN.PL two-GEN hungry-GEN.PL tiger-GEN.M.PL
'for these two hungry tigers'

The key difference between the animate accusative environment and either an animate nominative environment or an inanimate structural case environment is that the quantified noun realizes plural, rather than singular. The derivation will show that the preservation of the plural feature can be obtained through impoverishment of the paucal feature.

In (73), the animate, masculine, and plural features of the noun percolate upward through the higher domain.[36] In terms of case, the noun and numeral each participate in agreement. The genitive of the lower domain fails to percolate upward because of the numeral's case.

(73)



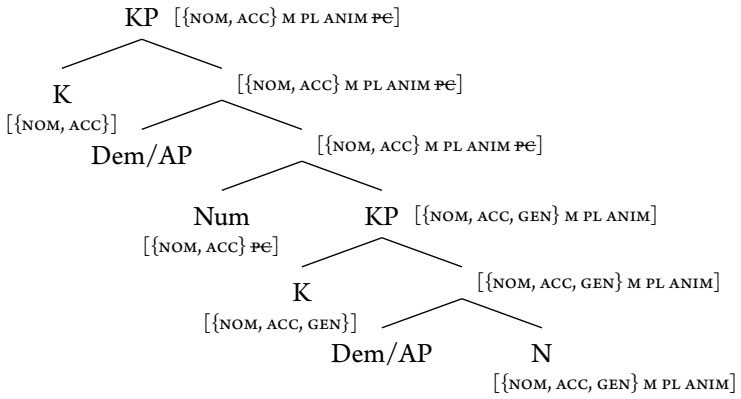
After percolation, the derivation moves out of the syntax. The tree in (75) depicts impoverishment of the paucal feature, which occurs as a result of the feature co-occurrence restriction in (74). As mentioned in Chapter 1, each language's feature hierarchy is comprised of both simplex features and feature combinations. Feature combinations are 'protected,' meaning that when possible, a feature contained in

36 See Titov (2017) for evidence that the animate feature exists in Russian independently of numeral constructions.

the combination should not be deleted to resolve violations of a given feature co-occurrence restriction. With regard to the effects of (74), this means that neither [ACC] nor [ANIM] should be deleted.

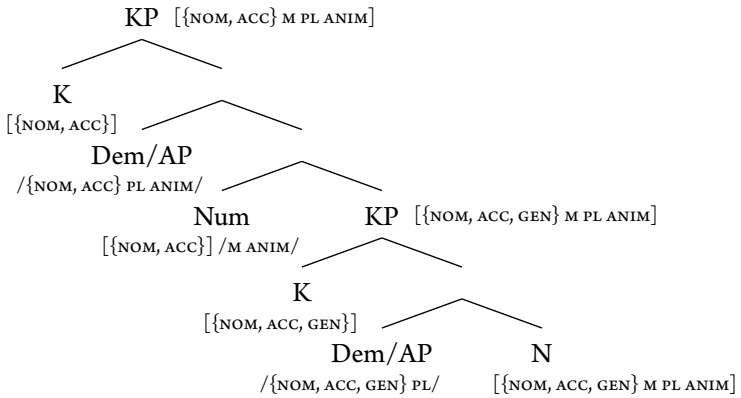
(74) [PC] cannot occur on nodes dominated by [ACC, ANIM]

(75)



The paucal feature is deleted since there are no observable effects of the paucal in animate accusative environments, similar to the downward homogeneous pattern in lexical case environments (Rappaport 2002). To this end, the feature co-occurrence restriction in (74) must be ordered *before* the one in (68) to prevent (68) from triggering [PL] deletion on the noun. When the resulting features are spelled out according to locality as in (76), the effect is ACC.PL.ANIM in the higher domain and GEN.PL in the lower domain. Prior to analyzing syncretism, the pattern appears to be aligned heterogeneous, but because the two forms are syncretic, the pattern can also be interpreted as downward homogeneous.

(76)



3.2.2.3 *Feminine examples: Underlyingly heterogeneous*

As mentioned in Chapter 2, feminine lower numeral constructions in Russian appear to display the downward homogeneous pattern in structural case environments because the majority of Russian feminine nouns have syncretic GEN.SG and NOM.PL forms (Rappaport 2002; Pesetsky 2013). When this syncretism is present, the form of the modifier in the lower domain is preferentially realized as nominative plural, rather than the genitive plural observed in masculine and neuter examples (Rappaport 2002; Asinari 2019). This is reflected in (77), with syncretism contributing to the appearance of a single domain of concord.

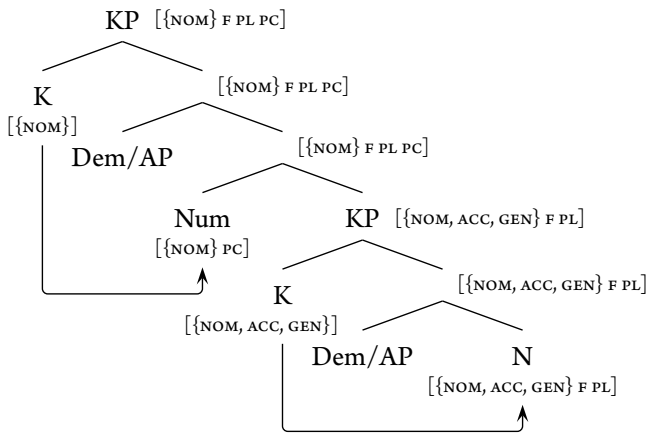
(77) *èt-i* *dv-e* *star-ye* *knig-i*
this-NOM.PL two-NOM.F old-NOM.PL book-NOM.F.PL/GEN.F.SG
'these two old books'

For the handful of feminine nouns that have distinct genitive singular and nominative plural forms, the noun realizes genitive singular in lower numeral constructions, with a genitive plural modifier in the lower domain (Rappaport 2002). Accordingly, I analyze even syncretic nouns as genitive singular, rather than nominative plural, which the following derivation will show.[37]

Continuing with the assumption that Russian lower numerals consistently assign genitive to their complements, the key step in this derivation is to obtain nominative from the set of genitive features on the lower KP. This is necessary since the case of the modifier in the lower domain is a direct result of the features on KP, and unlike feminine nouns, Russian modifiers do not display a NOM/GEN syncretism. The structure in (78) begins the syntactic stage of the derivation.

37 Pesetsky (2013, 121–2) points out that feminine surnames with the suffix *-in* and *-ov* , such as *Puškina* or *Ivanova* are sometimes taken as evidence that the form of the feminine noun in lower numeral constructions is actually NOM.PL (see also Franks 1994). These surnames have a special declension paradigm that appears to be a mix of the typical nominal and adjectival paradigms; the result is that these surnames have distinct NOM.PL and GEN.SG forms. However, Pesetsky points out that it may be feasible to analyze these surnames as adjectives modifying a null noun, which would then be consistent with the distribution of features discussed in the derivation above. This is possible since Russian has other surnames with entirely adjectival paradigms. Pesetsky discusses several points both in favor and against this analysis and decides that the results are inconclusive. Despite this inconclusiveness, these examples are compatible with the concord system. On the null noun analysis, the derivation proceeds as above. If, on the other hand, these particular surnames are in fact nouns realizing a NOM.PL form, then the derivation above can still be maintained for most feminine examples while the surnames are analyzed as a separate class that consistently realizes a nominative homogeneous pattern. This pattern parallels the BCS feminine lower numeral examples discussed in Chapter 5.

(78)



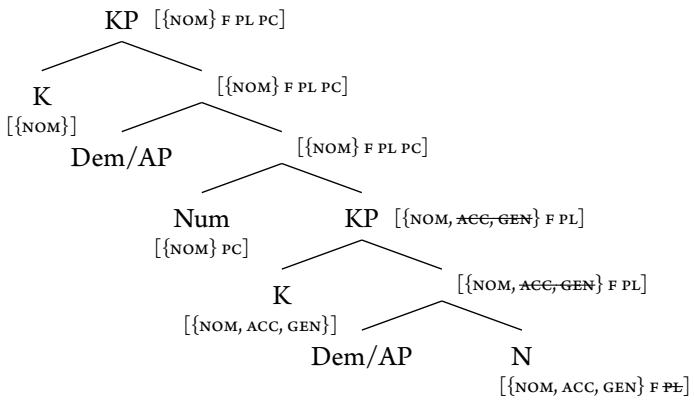
As with the other derivations, (78) depicts upward percolation of the noun's feminine and plural features. The lack of gender and number on the numeral allows the noun's ϕ-features to percolate to the higher KP along with the paucal feature of the numeral. Again, the numeral and noun participate in agreement for case.

Moving out of the syntax, the next stage in (81) requires the deletion of case features to allow nominative to take precedence throughout the entire construction. Nominative is derived in the lower domain following resolution of the feature co-occurrence restrictions in (79) and (80). These feature co-occurrence restrictions target case features on non-terminal nodes dominated by the feminine-paucal feature combination. As we saw in the previous derivation of an animate accusative example, feature combinations are protected. Consequently, neither [F] nor [PC] should be the target of deletion. The feature co-occurrence restriction in (68) also applies, resulting in a singular form of the noun. Notice that N retains its genitive case features since the feature co-occurrence restrictions specify non-terminal nodes.

(79) [GEN] cannot occur on non-terminal nodes dominated by [F, PC]

(80) [ACC] cannot occur on non-terminal nodes dominated by [F, PC]

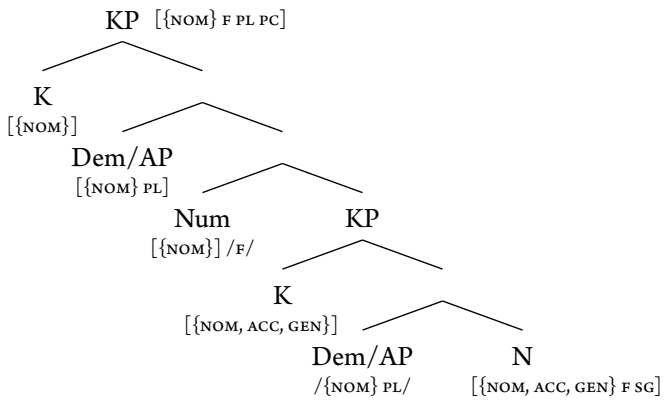
(81)



Case impoverishment results in nominative on the lower modifier, which matches the case of the higher domain and contributes to the appearance of an extended domain of concord in (82).[38] The noun realizes genitive singular, though the form is syncretic with the nominative plural form. For the few feminine nouns that lack the GEN.SG/NOM.PL syncretism, the lower domain would reflect GEN.PL on the modifier and GEN.SG on the noun. This would be derived like the aligned heterogeneous masculine example in Chapter 2. Distinguishing the feminine nouns that display this syncretism from the ones that do not would require an identifier to mark the noun and block the application of (79) and (80). The solution could be as simple as suggesting that the subclass of feminine nouns that does not participate in the syncretism is inherently specified with a class marker: [F*]. Since (79) and (80) specify only the [F] feature, these feature co-occurrence restrictions are not violated, and impoverishment is not triggered. A full analysis is beyond the scope of this thesis, however, and the derivation in (78)–(82) will be used as the representative of feminine lower numeral constructions since most Russian nouns do participate in the syncretism.

38 Although [PC] is is introduced in the higher domain, its effects are prevalent in the lower domain since impoverishment can be triggered by the feature content of dominating nodes. In this derivation, for example, the NOM/GENalternation is only found on the lower modifier. Nevertheless, we also predict the possibility of observable [PC] effects in the higher domain, though further research is needed to determine whether this is true.

(82)



Alternatively, some speakers prefer the genitive form of the lower modifier, even with a GEN.SG/NOM.PL syncretic noun (Rappaport 2002; Bailyn and Nevins 2008). In addressing these preferences, I hypothesize that the feature co-occurrence restrictions in (79) and (80) do not exist in the grammar of certain speakers, allowing the lower modifier to spell out genitive from the lower KP.

The above analysis extends to feminine lower numeral constructions in accusative case environments, though as we have seen, animacy has an additional impact on the derivation. *Inanimate* nouns and modifiers have syncretic nominative and accusative plural forms (Wade 2020). Thus, the NOM.PL form in the lower domain of the previous example is impossible to differentiate from ACC.PL in inanimate contexts, as shown in (83).

(83) a. *èt-i* *dv-e* *star-ye* *knig-i*
this-NOM.PL two-NOM.F old-NOM.PL book-NOM.F.PL
'these two old books'

b. *Ja vižu èt-i* *dv-e* *star-ye* *knig-i.*
I see this-ACC.PL two-ACC.F old-ACC.PL book-ACC.F.PL
'I see these two old books.'

With regard to animate examples, the Russian feature hierarchy ranks the [ACC, ANIM] feature combination above [F, PC] and orders the feature co-occurrence restriction in (74) before those in (79) and (80). This ranking and ordering is required because it is possible to have a feminine, animate lower numeral construction in an accusative environment, and the desired derivation is that in (74)–(76), where (74) results in [PC] deletion. In such an example where all four features of the feature combinations are present, (74) applies before other possible feature co-occurrence restrictions. (74) is then evaluated against the feature hierarchy, and

since [PC] is a member of the lower-ranked combination, it becomes the target of impoverishment.

These sections have shown that the pattern in Russian lexical case environments is truly downward homogeneous, while the animate and feminine examples in structural case environments appear to display the downward homogeneous pattern because of the surface effects of syncretism. It is certainly possible to further analyze the syncretisms with either an underspecification approach or additional impoverishment to obtain identical case features across both domains (see Bobaljik 2002), but it is unnecessary to complicate the derivations. We are then left with a neat generalization: Russian lexical case environments are homogeneous, while structural case environments are heterogeneous.

3.2.3 *Proposed order of Russian feature co-occurrence restrictions*

At this point, we have covered all of the Russian patterns, so this section summarizes the feature co-occurrence restrictions and discusses their potential ordering. Overall, the Russian feature co-occurrence restrictions require only a partial ordering; the feature co-occurrence restrictions in (84a) and (84b) should be applied first to prevent unwanted effects of [PC]. The deletions resulting from (84c)–(84f) do not affect each other's application, so their ordering is not strict. Likewise, (84a) and (84b) are not necessarily ordered with respect to each other. In general, the ordering of feature co-occurrence restrictions appears to be forced when there are multiple ways to resolve them (i.e., when feature co-occurrence restrictions overlap in features). The ordering requirement may therefore be a function of learnability.

(84) *Russian feature co-occurrence restrictions*

a. [PC] cannot occur on nodes dominated by [ACC, ANIM]

b. [PC] cannot occur on nodes dominated by [GEN]

c. [NOM], [ACC], [GEN] cannot occur on nodes dominated by [LOC]

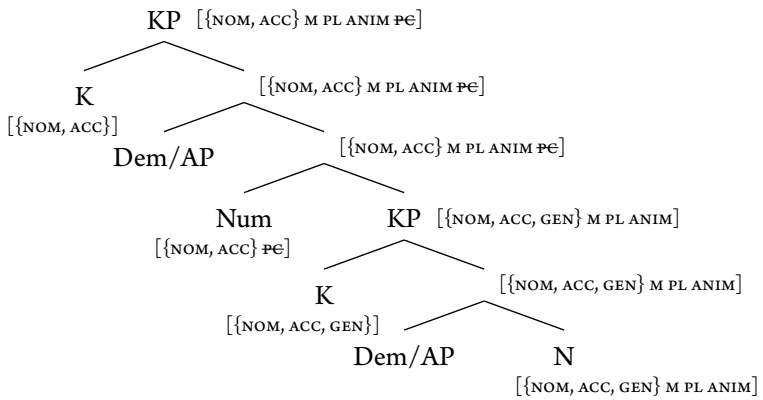
d. [GEN] cannot occur on non-terminal nodes dominated by [F, PC]

e. [ACC] cannot occur on non-terminal nodes dominated by [F, PC]

f. [PL] cannot occur on N dominated by [PC]

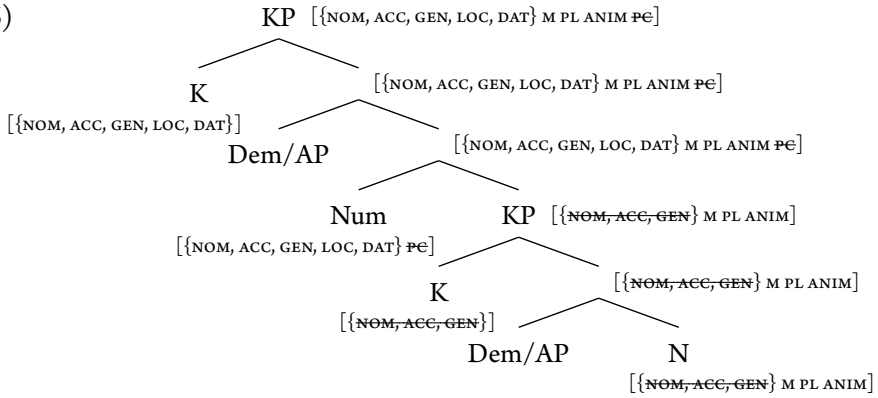
The feature co-occurrence restriction in (84a) results in the deletion of [PC] in animate accusative examples, as shown again below.

(85)



Since [ACC] is contained in the composition of the lexical cases, (84a) would also apply in animate lexical case examples, as shown in (86). This is not a problem since (84b) similarly results in [PC] deletion across all (animate and inanimate) lexical case environments.

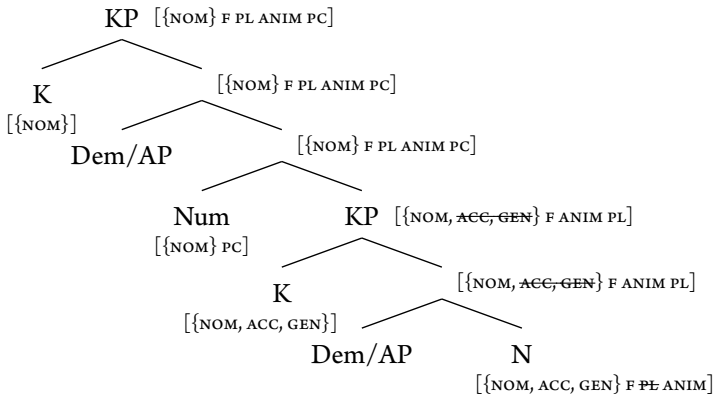
(86)



In lexical case environments, (84a) and (84b) could technically occur before or after (84c). As we can see above in (86), the effects of (84a) and (84b) (i.e., deletion of [PC]) are restricted to the higher domain since [PC] percolates from the numeral; conversely, because Russian numerals participate in case agreement, (84c) applies only in the lower domain, so deletion of [ACC] or [GEN] does not affect the application of (84a) and (84b.

However, (84a) and (84b) must apply before (84d)–(84f) to remove [PC] and prevent unwanted deletion of [GEN], [ACC], or [PL] in either animate accusative or lexical case environments. In an animate nominative environment, (84a) and (84b) are not applicable, so (84d)–(84f) apply normally, resulting in the heterogeneous pattern as shown in (87). We would also observe the same result in inanimate structural case environments such as (82).

(87)



Regarding the non-ordering of (84c)–(84f) with respect to each other, let us first consider the case-feature deletions triggered by violations of (84c)–(84e). If we are dealing with a lexical case environment, then (84d) and (84e) are not applicable since (84b) has already applied to eliminate [PC]. In a structural case environment, (84c) is not applicable, so the ordering of these three feature co-occurrence restrictions does not seem to matter. Turning to (84f), the result is [PL] deletion. Since (84c)–(84e) result in case deletion and are not dependent on [PL], their ordering with respect to (84f) does not matter. Given this partial ordering, we could hypothesize that feature co-occurrence restrictions resulting in the deletion of a class feature such as [PC] apply first, though there will not be enough data in this thesis to form a stronger conclusion.

3.3 POLISH

Like Russian, Polish numeral constructions display the downward homogeneous pattern in lexical case environments. Examples with lower numerals additionally display the pattern in structural case environments and because of the special categorial status of Polish lower numerals, we will see that these appear to be true instantiations of the downward homogeneous pattern.

3.3.1 *Higher numerals*

As previously discussed, the gender of the quantified noun visibly affects the outcome of Polish derivations, particularly in structural case environments. In lexical case environments, though, the outcome is always downward homogeneous regardless of the noun's gender. The full interaction of the Polish patterns with respect to each other will be discussed in Chapter 6, but this section offers a preview of

higher numeral constructions in lexical case environments. As shown in (88), the entire construction realizes the external case, in this instance, instrumental. The low demonstrative in (89) additionally indicates that although only one domain of concord is apparent, there is still motivation for two syntactic domains.

(88) *z* *t-ymi* *pięc-ioma* *wysok-imi* *żyraf-ami*
with this-INSTR.PL five-INSTR tall-INSTR.PL giraffe-INSTR.F.PL
'with these five tall giraffes'

(89) *z* *pięc-ioma* *t-ymi* *wysok-imi* *żyraf-ami*
with five-INSTR this-INSTR.PL tall-INSTR.PL giraffe-INSTR.F.PL
'with five of these tall giraffes'

The derivation differs slightly from those in structural case contexts because I assume that Polish numerals agree for case in lexical case environments. This assumption necessitates some discussion about the case hierarchy and the status of Polish numerals. More specifically, Chapter 1 showed that the decomposition of case translates to the following hierarchy: NOM< ACC< GEN< LOC< DAT< INSTR. In the current system, I hypothesize that when a numeral in a particular language agrees for a certain case, it must also agree for all cases higher in the hierarchy. This is expected given the hierarchical decomposition of case. Take [NOM] for example. While [NOM] constitutes the nominative case, it is also included in the composition of all higher cases. It naturally follows that if a numeral agrees for nominative, it also agrees for all higher cases.[39] We have already seen this behavior in Russian, where the numerals agree for the full range of the hierarchy, and Chapters 4 and 5 will show that BCS numerals never agree. Polish falls in the middle, as I assume that Polish numerals agree for case from the level of genitive and above; in other words, the lexical case environments.[40] Agreement for genitive and higher in the case hierarchy can be achieved with what I term a 'filtering-genitive' form of the numeral. In concrete terms, this form of the numeral is inserted with agreement slots filled by {NOM, ACC, GEN}, which must be checked in order to percolate; note that this form of the numeral contrasts with the 'pre-specified' accusative form, which lacks agreement slots altogether. If the numeral locates the set of genitive

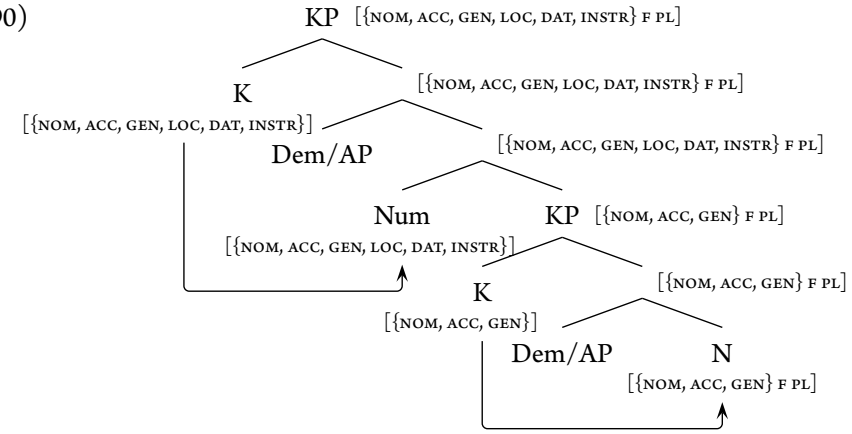
39 This kind of reasoning has been used elsewhere. In work on suppletion, for example, Smith et al. (2019) argue that if an element undergoes suppletion for a particular category, it also undergoes suppletion for any more marked categories as determined by markedness hierarchies (see also Bobaljik 2012).

40 It would be interesting to test other languages to determine whether agreement is truly based on the case hierarchy or rather a more general, lexical-structural divide. Thanks to Klaus Abels for raising this point.

features within its local agreement domain (on the higher K), an agreement relation is established, and the features of K are copied to the numeral for percolation through the higher domain. If, on the other hand, the numeral fails to locate the set of features, as in a nominative or accusative case environment, the set of genitive features on the numeral cannot be checked. The lack of checking triggers removal of the numeral's case agreement slots, and allows the genitive from the lower domain to percolate through the higher domain.[41] This latter situation results in the interrupted homogeneous pattern, which will be more thoroughly investigated in Chapter 6. In general, the filtering-genitive form of the numeral introduces a certain amount of counter-cyclicity to the derivation, which I will choose to simply accept in this thesis.[42]

With these assumptions in place we can proceed through the derivation, beginning in (90). The filtering-genitive form of the numeral is inserted, which necessarily blocks percolation of the genitive features assigned to the lower domain. The numeral's set of case features is successfully checked by K, so the set of instrumental case features is copied to the numeral for percolation through the higher domain. The ϕ-features originating in the lower domain percolate upward as usual.

(90)



In Chapter 2, we saw that for many speakers, Polish higher numerals are optionally pre-specified as accusative. If this form of the numeral were inserted, the derivation would still result in the downward homogeneous pattern. The case of the numeral would block percolation of genitive into the higher domain, but then [NOM], [ACC],

41 Here, we find that failure to agree results in removal of the numeral's case slots. Another conceivable outcome of failure to agree is default agreement, which we will see in Chapter 7. Assuming that slots for agreement features must have content, these outcomes are simply two kinds of responses to the lack of content.

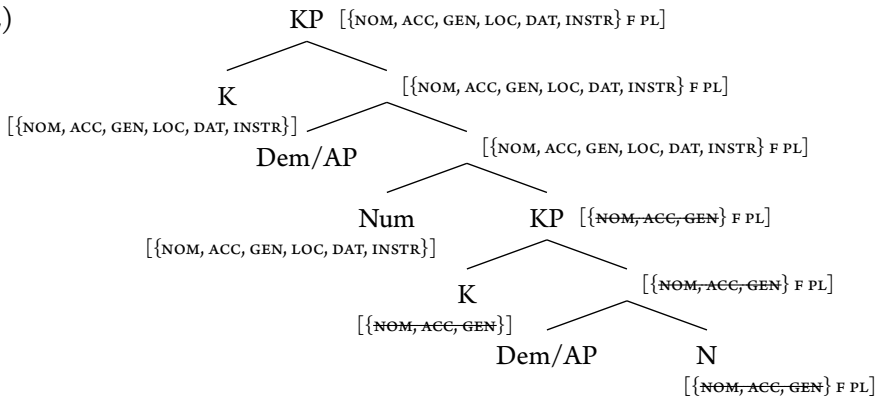
42 I do not see a simple way to avoid counter-cyclic percolation without introducing look-ahead into the derivation. Future iterations of this research could consider moving percolation out of the syntax (see Lieber 1989 and references therein), so long as it is ordered before impoverishment.

and [GEN] features would be subject to impoverishment in both domains, as we will see in the next stage of the derivation.

Moving out of the syntax, the next stage of this derivation closely resembles Russian lexical case environments. The feature co-occurrence restriction in (62), repeated below as (91), is also present in Polish. This triggers deletion of the features that compose the genitive case throughout the lower domain.

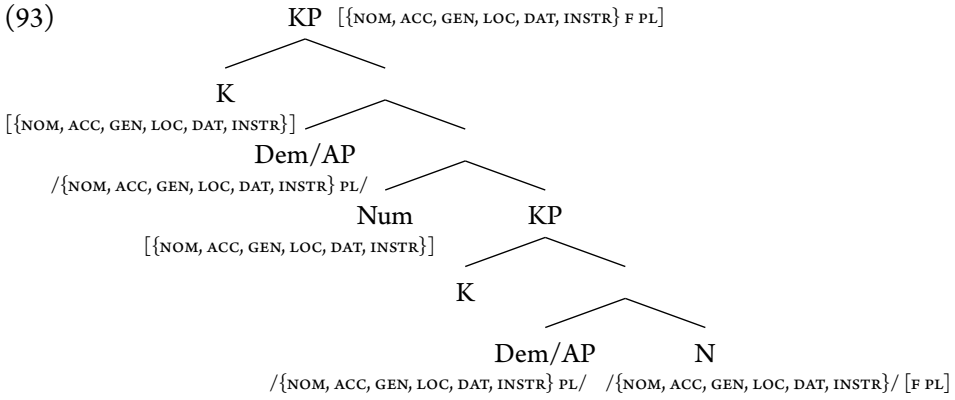
(91) [NOM], [ACC], [GEN] cannot occur on nodes dominated by [LOC]

(92)



In the final stage of the derivation, INSTR.PL is ultimately realized throughout the construction, extending the domain of concord to the level of the noun.

(93)



This derivation would proceed in the same way across all lexical case environments since the [LOC] feature of the feature co-occurrence restriction is contained in the locative, dative, and instrumental cases. As discussed with regard to Russian in §3.2.1, a locative case environment requires tolerance for violations of (91). While this solution involves stipulations about numeral form, it conforms to one

of the primary emphases of this thesis—that much of language variation can be attributed to the semi-lexical numeral's feature specification.

3.3.2 *Lower numerals*

Like the higher numerals, Polish lower numeral constructions display the downward homogeneous pattern in lexical case environments. This pattern also extends to lower numeral constructions in structural case environments. Because of the prevalence of the downward homogeneous pattern, many have observed that Polish lower numerals are comparable to adjectives (see Rappaport 2003; Miechowicz-Mathiasen 2011; Dziubała-Szrejbrowska 2014). However, we will see that this is a mere resemblance to adjectival concord; syntactically, the lower numerals should not be analyzed as adjectives.

3.3.2.1 *Lexical case environments*

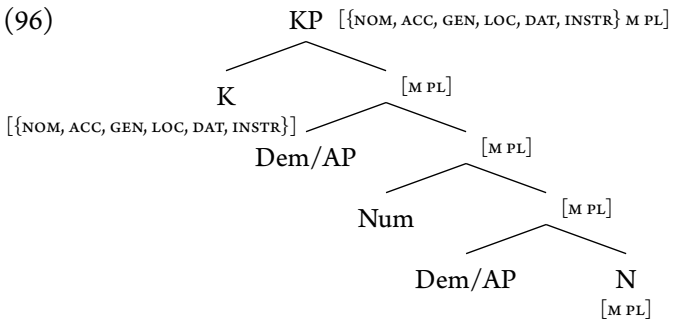
Chapter 6 will show that lower numerals can have two forms—a bare form and a form that selects the [VIR] gender feature and assigns genitive case. Because of the availability of two forms, there are actually two possible derivations in lexical case environments, though both result in the downward homogeneous pattern. This section focuses only on the derivation containing the bare form, while the other is analyzed in Chapter 6. With the bare form, the numeral receives features in concord rather than agreeing or assigning case. Note that a lower demonstrative is still possible in these examples, providing evidence of two syntactic domains.

(94) *z* *t-ymi* *dw-oma* *głodn-ymi* *tygrys-ami*
with this-INSTR.PL two-INSTR.M hungry-INSTR.PL tiger-INSTR.M.PL
'with these two hungry tigers'

(95) *z* *dw-oma* *t-ymi* *głodn-ymi* *tygrys-ami*
with two-INSTR.M this-INSTR.PL hungry-INSTR.PL tiger-INSTR.M.PL
'with two of these hungry tigers'

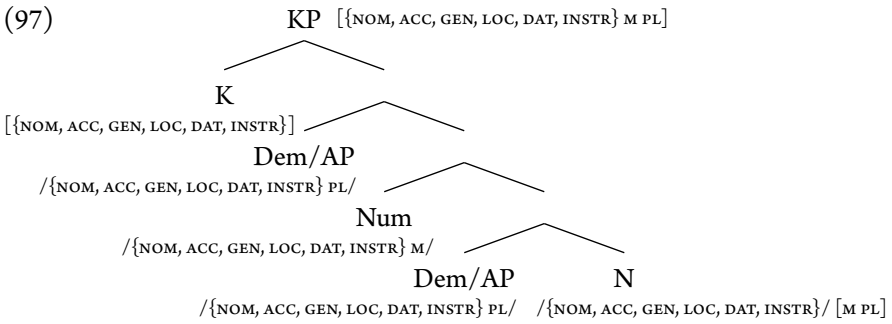
Derivations containing the bare form of the numeral are simple since genitive is not assigned to the lower domain.[43] The features of K percolate to KP along with the ϕ-features of the noun, as in (96).[44]

(96)



In spellout, the features of KP are simply realized throughout the construction, as depicted in (97).

(97)



Regarding the noun's agreement status, previous derivations have shown that it always agrees for case with the local K. In this example, I assume that the noun receives case features in concord since agreeing with K would require the noun to agree across the numeral, which is more local to K. However, the agreement status of the numeral and noun are not especially critical in this example. The outcome of the derivation would be the same, regardless of whether one of them agrees for case or neither agree.

43 This lack of genitive assignment contrasts with both Russian and BCS lower numeral examples, which provide evidence of genitive in the lower domain in structural case environments. I have also omitted [PC] in the Polish derivations since it does not have any observable effects.

44 In some theories, nominative is considered to be the absence of case, and by extension, KP. This view does not seem to be compatible with the proposed system. While I assume KP appears when any case is assigned, there is a possible alternative to the representation of nominative case that is compatible with the system. In particular, nominative could be the absence of accusative in the presence of the K-node.

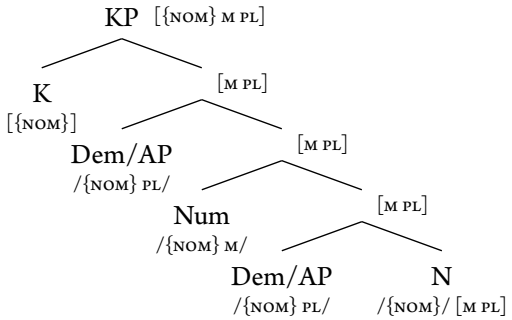
3.3.2.2 *Structural case environments*

In structural case environments, the pattern varies according to the gender of the noun. Virile examples are associated with two possible patterns: downward homogeneous and interrupted homogeneous, while non-virile examples display only downward homogeneous concord, as shown in (98).

(98) *te* *dw-a* *głodn-e* *tygrys-y*
this.NOM.PL two-NOM.M hungry-NOM.PL tiger-NOM.M.PL
'these two hungry tigers'

The derivation is very straightforward, as we saw in (96)–(97). The external case features percolate to the higher KP, along with the ϕ-features of the noun. The features on KP are then realized throughout the entire construction, as depicted in the condensed structure in (99).

(99)



This derivation also applies to constructions containing virile nouns if the bare form of the numeral is used; the selecting form of the numeral, which results in the interrupted homogeneous pattern, is explored in Chapter 6.

3.4 A TYPOLOGICAL REFLECTION

The derivations in this chapter provide a starting point for a comparison of Russian and Polish. We have seen that in both languages, numeral constructions display downward homogeneous concord in lexical case environments. Moreover, the lexical case derivations utilize the same feature co-occurrence restriction, namely (62). The differences observed can be attributed to varying properties of the numeral. In particular, Russian lower numeral constructions do not display true downward homogeneous concord in structural case environments and as such, Russian demonstrates a homogeneous/heterogeneous divide between lexical and

structural case environments. By contrast, Polish lower numeral constructions exhibit the downward homogeneous pattern across all case environments. This is because Polish has a special, bare form of the lower numerals. The next two chapters examine BCS, and the specific properties of numerals will again play a significant role. We will see that the properties of BCS numerals differ from both Russian and Polish, resulting in distinct concord patterns.

4

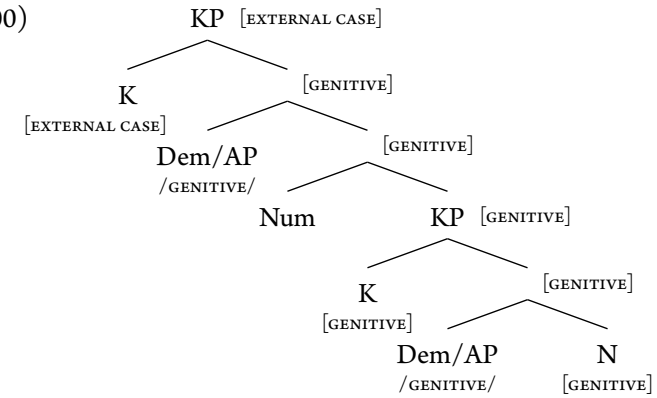
UPWARD HOMOGENEOUS CONCORD IN BCS

4.1 INTRODUCTION

BCS numeral constructions display distinct concord patterns in comparison to Russian and Polish. The uniqueness of BCS can largely be attributed to the numerals' lack of participation in case agreement, which affects the height of genitive percolation beyond the lower domain. This chapter focuses on the upward homogeneous pattern of higher numeral constructions. The pattern is characterized by a single domain of concord that reflects the internally assigned genitive case. In examining this pattern, the chapter also addresses the puzzling behavior of BCS higher numerals in lexical case environments. We will see that while higher numeral constructions are ungrammatical as complements of dative- and instrumental-case-assigning verbs, they are acceptable as complements of dative and instrumental prepositions. The hierarchical decomposition of case, the third hypothesis introduced in Chapter 1, plays a key role in the observed grammaticality patterns.

The tree in (100) captures the basics of the upward homogeneous pattern. Since the numeral does not agree for case, genitive is able to percolate through the higher domain. Depending on the case of the higher KP, genitive either continues to percolate and overrides the set of case features on KP or ceases to percolate one node below KP if it cannot override the external case features.

(100)



As previous chapters have shown, case override is contingent upon containment relations. When genitive cannot override the external case, it is genitive case that

spells out on available terminals since concord is sensitive to locality. The ungrammaticality of numeral constructions in dative and instrumental case environments can thus be captured with a requirement that the case features of the dominating KP be realized (in a system that has morphological case). In dative and instrumental examples where genitive spells out as the local dominating case, there are then no available terminals to realize the dative or instrumental case features of KP. Assuming that case override cannot occur in concord, the derivation crashes. Although this realization requirement has only now been formally introduced, it extends naturally to the Russian and Polish derivations.[45]

4.2 NOMINATIVE, ACCUSATIVE, AND GENITIVE ENVIRONMENTS

In nominative, accusative, and genitive case environments, BCS higher numeral constructions display the pattern in (101). Here, genitive is realized above and below the numeral, while the numeral itself surfaces in an indeclinable form (Giusti and Leko 1995; Bošković 2006, 2008; Šarić 2014; Čulinović 2017). Chapter 1 showed that these numeral constructions also allow a demonstrative below the numeral, providing further motivation for two syntactic domains. As with the downward homogeneous pattern, we again encounter a domain mismatch—a single domain of concord with two underlying syntactic domains.

(101) *ov-ih* *pet* *visok-ih* *žiraf-a*
this-GEN.PL five tall-GEN.PL giraffe-GEN.F.PL
'these five tall giraffes'

I take the indeclinability of the BCS higher numerals as evidence that they do not participate in agreement for case or realize case features in concord. In other words, they are caseless (see Wechsler and Zlatić 2003; Bošković 2006; Stjepanović

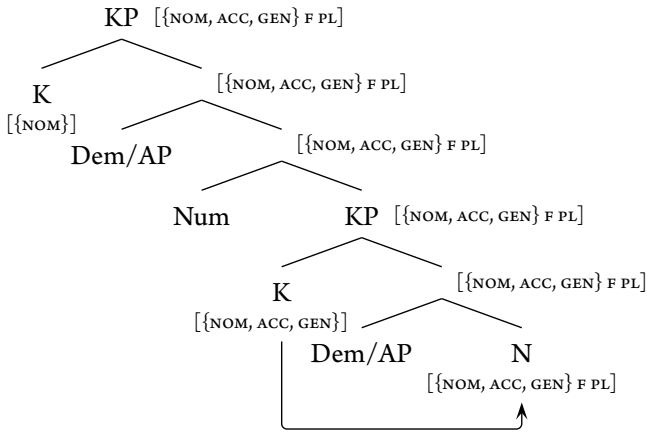
45 There is a question of how broadly this realization condition should be applied. For instance, BCS free relative constructions require strict case matching between clauses, where the relative pronoun must realize a single case dictacted by both the matrix clause and the relative clause (Gračanin-Yuksek 2008). Nevertheless, it has been observed that case mismatches are tolerated when the relative pronoun realizes a syncretic form (Milićević 2011). In such situations, it may be that elements in the dominating set of case features are subject to impoverishment. The impoverished set of case features on the dominating node would then be spelled out in concord, consistent with the realization requirement. Alternatively, it is possible that the form of the relative pronoun in free relatives results from the fusion of two sets of case features into a single spellout. This latter option resembles a spanning analysis (see Svenonius 2012), which will be discussed in §4.3.3. It is also possible for a case conflict to disappear simply because the form that is realized is the same across contexts.

2012).[46] With this distinction in place, we can now proceed through the derivation in a nominative context.

4.2.1 *Deriving the upward homogeneous pattern*

In the first stage, features percolate through the construction as shown in previous derivations. Crucially, the genitive features of the lower domain are able to percolate through the higher domain along with the noun's ϕ-features since the numeral does not participate in agreement and cannot block case percolation. The genitive features percolate up to the higher KP, where, as a superset, they override the nominative feature. This parallels the Polish derivation in Chapter 2, where we saw that genitive can attempt to override the features of K (in contrast to a successfully-agreeing numeral, which can never be overridden).

(102)



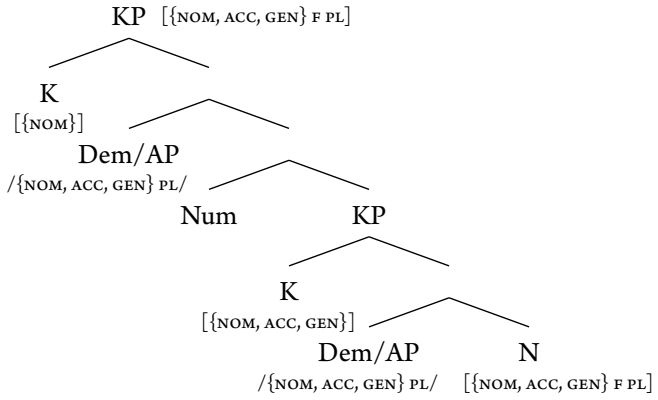
An interesting comparison can be made between the upward homogeneous and downward homogeneous patterns. In Chapter 3, we saw that impoverishment can be used to extend the concord domain of the external case. Here, percolation accomplishes a similar goal with the internal case. The genitive features percolate as high as possible, entering the higher domain and ultimately creating an extended domain of concord for the internally assigned genitive. The different outcomes of the upward homogeneous and downward homogeneous patterns can in part be attributed to the timing of domain extension in the derivation. The system always attempts to maximize the concord domain by percolating features

46 It is also possible that the BCS numerals realize a frozen NOM/ACC syncretic form and are not caseless (see e.g., Franks 1995; Bošković 2008; Stjepanović 2012). While I pursue the caseless route in this thesis, the NOM/ACC alternative is not problematic for the concord system. The outcome of the derivations would instead be interrupted homogeneous concord (as we will see with Polish in Chapter 6) rather than upward homogeneous.

as high as possible and by realizing them as low as possible. In the upward homogeneous pattern, the key domain extension occurs in the syntax, while in the downward homogeneous pattern, it occurs post-syntactically. Importantly, both occurrences of domain extension are linked to the semi-lexicality of the numeral. When semi-lexicality translates to a lack of participation in case agreement, the upward homogeneous pattern arises. In the downward homogeneous pattern, the semi-lexical numeral creates a transparent boundary between the two extended projections that allows for cross-domain effects of impoverishment.

The structure in (103) represents the post-syntactic mapping in which the features of the dominating KP are realized in spellout. As in previous derivations, the intermediate nodes have been disregarded for convenience. Percolation of the genitive extends the lower domain to the same level as the higher domain. This results in GEN.PL throughout the construction, deriving a single concord domain from two underlying syntactic domains.[47]

(103)



Because of the containment relations among cases, the derivation would proceed the same in an accusative case environment without further alteration. In a genitive case environment, the same result obtains whether the internally assigned genitive features override the externally assigned genitive features on KP, or whether the internal features stop percolating one node below. However, independent evidence from light-headed relative constructions suggests that a case does indeed override itself. In set-theoretic terms, a set is a superset of itself. In Grabovac 2022, I show that in BCS light-headed relatives, a light head in the matrix clause can be omitted when the case of the relative pronoun either matches the case of the light head or overrides it through containment. For example, (104) shows that a nominative,

47 BCS additionally contains a group of indeclinable quantifiers, such as *mnogo* 'many' or *nekoliko* 'several,' that pattern with the higher numerals and would be derived similarly (Wechsler and Zlatić 2003; Stjepanović 2012).

accusative, or genitive light head, a form of *ono*, can be omitted when the relative pronoun is genitive. This optionality suggests that genitive overrides these cases.

(104) Grabovac 2022 (6–8, ex. (6)–(8))

a. *Ti si (on-o) čega se boje.*
you are that-NOM what.GEN REFL fear
'You are what they fear.'

b. *Otkrivaš (on-o) čega se bojiš.*
reveal that-ACC what.GEN REFL fear
'You reveal what you fear.'

c. *S(j)ećaš se (on-oga) čega se boje.*
remember REFL that-GEN what.GEN REFL fear
'You remember what they fear.'

Parallel to what we will see in the derivations of the numeral constructions, genitive cannot override dative or instrumental in the light-headed relatives. This is indicated by the ungrammaticality that results when the light head is omitted in (105a) and (105b). The grammaticality of the case-matching examples in (105c) and (105d) without the light head provides further evidence that a case overrides itself.

(105) Grabovac 2022 (Appendix, ex. (5)–(6))

a. *Rugaju se *(on-ome) čega se bojiš.*
mock REFL that-DAT what.GEN REFL fear
'They mock what you fear.'

b. *Bave se *(on-ime) čega se bojiš.*
pursue REFL that-INSTR what.GEN REFL fear
'They do what you fear.'

c. *Rugaju se (on-ome) čemu se diviš.*
mock REFL that-DAT what.DAT REFL admire
'They mock what you admire.'

d. *Ponosiš se (on-ime) čime se baviš.*
take.pride REFL that-INSTR what.INSTR REFL pursue
'You are proud of what you do.

4.2.2 *A note on prequantifiers*

Babby (1985, 1987) discusses a set of Russian examples involving 'prequantifiers,' which appear to display a pattern resembling upward homogeneous concord rather than the predicted aligned heterogeneous pattern. In structural case environments, the prequantifier (so named because it precedes the quantifier) realizes genitive case, as shown below in (106).

(106) adapted from Babby 1985 (6, ex. (11))

Ja	*vypil*	*dobr-yx*	*pjat'*	*bol'š-ix*	*butyl-ok*
I	drank	good-GEN.PL	five.ACC	big-GEN.PL	bottle-GEN.PL

vin-a.
wine-GEN.SG
'I drank a good five big bottles of wine.'

Despite similar appearances, the prequantifier examples should not be analyzed on par with BCS. Franks (1995) points out that the Russian prequantifiers form a small group of adjectives that exclusively modify the quantifier, while in general, the BCS upward homogeneous examples do not effect the same semantic distinction.[48] An additional difference between the Russian and BCS examples is captured in

48 Polish also contains prequantifier examples in which certain adjectives appear to modify the numeral directly. Unlike Russian, the Polish examples exhibit the typical concord patterns displayed by Polish numeral constructions. For example, Willim (2015, 325, ex. (17)) provides the following example, which indicates that both the aligned heterogeneous and interrupted homogeneous patterns are allowed with the prequantifier (but see Lyskawa (2020, 25, n.20) for a contrasting interpretation of the example).

(i)

niepełn-e/niepełn-ych	*pięćdziesiąt*	*butel-ek*	*vin-a*
almost-ACC.PL/almost-GEN.PL	fifty	bottle-GEN.PL	wine-GEN

'almost fifty bottles of wine'

The semantics of these examples suggests that they should be analyzed like Russian, using a structure in which the prequantifier directly modifies the numeral, as in (109). Willim (2015) argues that the scope relations in (i) indicate that genitive on the prequantifier must be derived independently of extraction from the noun phrase. Like Russian, genitive case on the prequantifier in the interrupted homogeneous pattern is arguably licensed by the numeral. The accusative case of the prequantifier in the aligned heterogeneous pattern requires reference to the pre-specified accusative form of the numeral, as introduced in Chapter 2. We may suppose that pre-specified accusative numerals do not license genitive on the prequantifier, but rather accusative. Alternatively, the pre-specified accusative numeral may not license any case on the prequantifier, which could realize accusative as a result of concord. This explanation is rather stipulative, and future research could work to improve upon the theory. The behavior and interpretation of prequantifier examples are often secondary to the discussions of the general concord patterns of numeral constructions and could therefore benefit from individual attention.

(107). Here, the genitive case of the prequantifier remains even when a higher modifier realizes the external case.

(107) adapted from Babby 1985 (10, ex. (20))

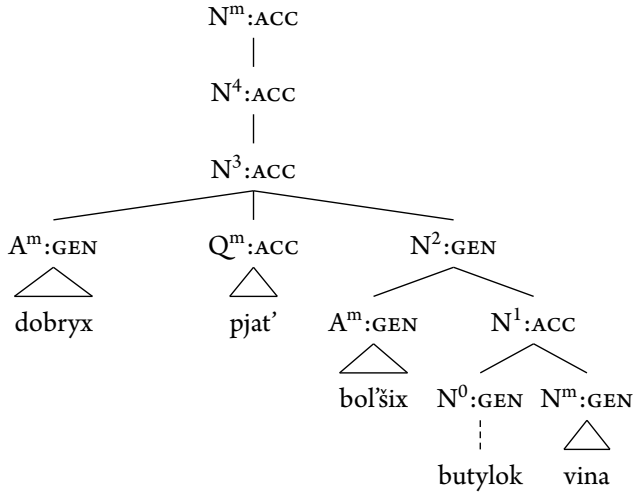
za	*ostavš-iesja*	*nepoln-yx*	*pjat'*	*let*
for	remaining-ACC.PL	incomplete-GEN.PL	five.ACC	year-GEN.PL

vojn-y
war-GEN.SG

'for the remaining not quite five years of the war'

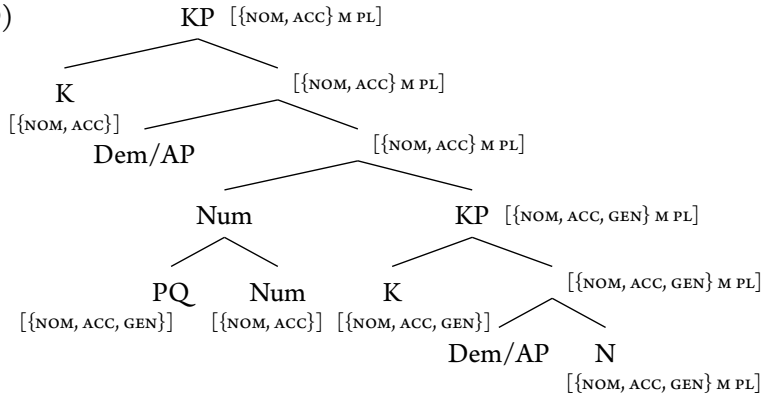
In addressing the Russian examples, I suggest that the prequantifier has a syntactically closer relationship with the numeral than does a regular modifier—in particular, the prequantifier forms a constituent with the numeral. This syntactic relationship is motivated by the semantic function of the prequantifier, which directly modifies the numeral (Crockett 1976). The analysis I adopt for these examples is similar to the analysis outlined by Babby (1987, 126–7) in which the prequantifier directly modifies the numeral head. Although Babby admits that this analysis "is appealing because it involves a more direct match between the syntactic and semantic bracketing of the phrase" (1987, 127), he ultimately adopts a different analysis that more easily accounts for case and number marking in his system. When the prequantifier directly modifies the numeral head, Babby's proposal encounters difficulties in accounting for the observed case patterns. In his system, genitive case assignment results when an element is c-commanded, rather than dominated, by the maximal projection of the numeral. He also argues that the plural marking on the prequantifier presumably results from agreement with the nominal head, but if the prequantifier were contained in the numeral's maximal projection, it would be predicted to agree with the numeral. Abandoning the approach in which the prequantifier directly modifies the numeral head, Babby ultimately adopts the ternary-branching structure below. Note that superscripts on the node labels indicate the level of projection; a superscripted 'm' represents the maximal projection.

(108) adapted from Babby 1987 (123, ex. (63))



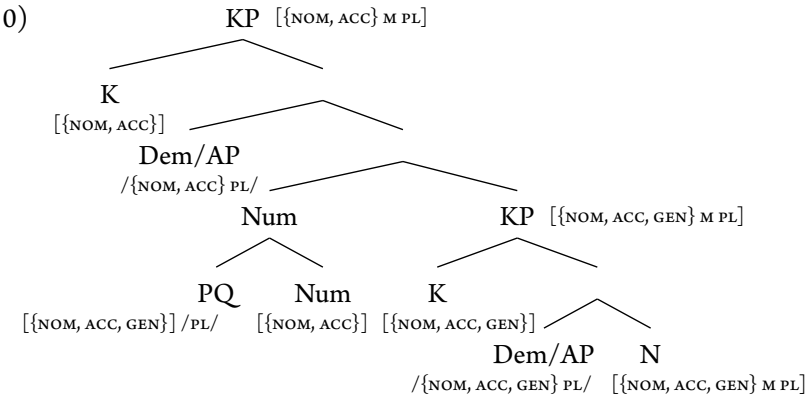
By contrast, the current concord system does not encounter serious difficulties if the prequantifier is analyzed as a direct modifier of the numeral. As a sister of the numeral, I hypothesize that the prequantifier's genitive case can be licensed by the numeral, as depicted in (109). Otherwise, the derivation proceeds as usual. Since Russian numerals agree for case, the genitive assigned to the lower domain is blocked from percolation into the higher domain, though ϕ-features percolate throughout.

(109)



In concord, the higher domain realizes accusative plural, while the lower domain realizes genitive plural. Since the numeral licenses genitive case on the prequantifier, it is blocked from realizing accusative in concord, though it does realize plural number.

(110)



4.3 DATIVE AND INSTRUMENTAL ENVIRONMENTS

Chapter 3 showed that lexical case environments result in the downward homogeneous pattern in both Russian and Polish. This also appears to be a common lexical case pattern in other Slavic languages (see Franks 1995), but the downward homogeneous pattern is curiously absent with BCS higher numeral constructions. Instead, BCS numeral constructions result in ungrammaticality as complements of dative- and instrumental-case-assigning verbs (Giusti and Leko 1995), though they are grammatical as complements of prepositions. The behavior of BCS numeral constructions in lexical case environments has garnered attention in the literature but as yet does not have a universally-accepted analysis. The following sections explore the differences between verb-governed and preposition-governed environments and highlight the ease of accounting for the unique behavior of BCS within the proposed concord system.

4.3.1 *Lexical-case-assigning verbs*

Dative- and instrumental-assigning verbs cannot take higher numeral constructions as complements (Franks 1995; Wechsler and Zlatić 2003; Bošković 2006; Stjepanović 2012), exemplified below. Notice that the result is ungrammatical whether the numeral construction surfaces in genitive or the case imposed by the verb.

(111) a. **V(j)eruj-u t-ih pet nov-ih proizvod-a.*
trust-3PL that-GEN.PL five new-GEN.PL product-GEN.M.PL
'They trust those five new products.'

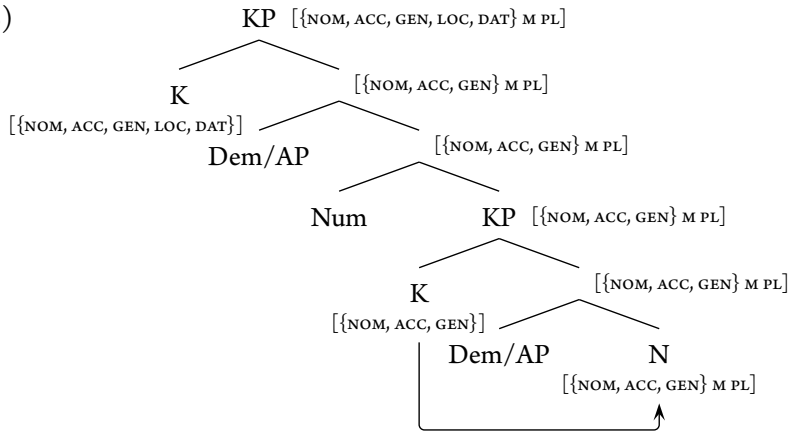
b. **V(j)eruj-u t-im pet nov-im proizvod-ima.*
trust-3PL that-DAT.PL five new-DAT.PL product-DAT.M.PL
'They trust those five new products.'

(112) a. **Kraljica vlada t-ih pet velik-ih zem-a-lja.*
queen rules that-GEN.PL five large-GEN.PL country-PL-GEN.F
'The queen rules those five large countries.'

b. **Kraljica vlada t-im pet velik-im*
queen rules that-INSTR.PL five large-INSTR.PL
zemlj-ama.
country-INSTR.F.PL
'The queen rules those five large countries.'

The ungrammaticality of (111) and (112) is easily accounted for given the hierarchical view of the case system. Let us consider how this unfolds in (113) with a dative case environment. As before, the set of genitive features percolates into the higher domain due to the numeral's lack of agreement, but this time, the set of genitive features cannot reach the higher KP since it is not a superset of the dative features. This is based on the fact that the set of dative features is not contained in the set of genitive features.

(113)

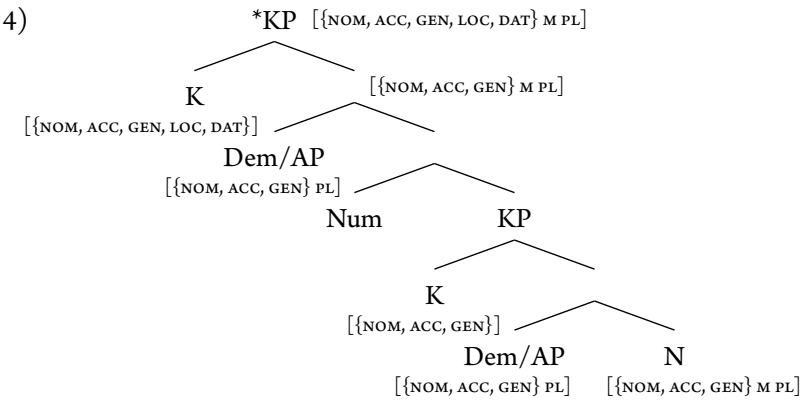


Since concord is sensitive to locality, the genitive rather than dative features are realized throughout the numeral construction.[49] There are no available terminals to realize the dative features of the dominating KP, so the derivation crashes, as shown in (114).[50]

49 As mentioned in Chapter 3, case override is only possible during feature percolation and cannot apply in concord. Concord requires that the closest set of features is spelled out.

50 Though the higher numerals are typically considered ungrammatical as complements of dative case-assigning verbs, there is some variation among speakers (see Franks 2002; Browne and Alt 2004).

(114)



It is not difficult to see how the same result would obtain in an instrumental case environment. Again, the genitive features percolating from the lower domain would not be able to override the instrumental features on the higher KP, therefore stopping one node below. Genitive would then be realized as the most local set of features, blocking realization of the instrumental features from KP.

4.3.2 *Prepositions: A spanning analysis*

The current system predicts derivations to crash when the case features of a dominating node are unable to be realized. This prediction implies a potential for repair if the features can be realized elsewhere. BCS prepositions, which have the ability to take indeclinable numeral constructions as complements, demonstrate this repair potential—a property that sets them apart from lexical-case-assigning verbs, particularly in dative and instrumental contexts. The derivations in this section adopt a spanning analysis to account for the ability of prepositions to both assign and realize case. A span can be defined as a complement sequence of heads that is realized as a single morphological exponent (Svenonius 2012, 1–2; see also Williams 2002; Abels and Muriungi 2008; Merchant 2015; Svenonius 2016). Apart from its convenience in explaining the BCS data, the span analysis is independently motivated. The existence of portmanteaux, such as the French preposition-determiner combinations *du* (*de* + *le*) and *au* (*à* + *le*), provides cross-linguistic evidence of

Since I have established that the ungrammaticality of numeral constructions in dative environments results from the inability of KP's case features to be realized, the acceptability reported here could result from a lack of [LOC] and [DAT] features on KP. One possible solution is a feature co-occurrence restriction that bans [LOC] and [DAT] on non-terminal nodes in the context of an unmarked numeral ('unmarked' since BCS higher numerals appear to be featureless in comparison to the other numeral classes). If we take the structure in (113) as an example, the application of this feature co-occurrence restriction would result in the reduction of KP's features to genitive, which could then be realized unproblematically.

prepositions and functional heads realized together as single morphemes (see also Merchant 2015; Ostrove 2018; Taraldsen 2018). Following this insight, we will see that the BCS examples can be analyzed with a span between a preposition and the functional head K.

In general, BCS prepositions can be used unproblematically with indeclinable complements, though they regularly assign case (see Wechsler and Zlatić 2003; Alexander 2006; Stjepanović 2012). This is shown in the example below with the dative-assigning preposition *prema*:

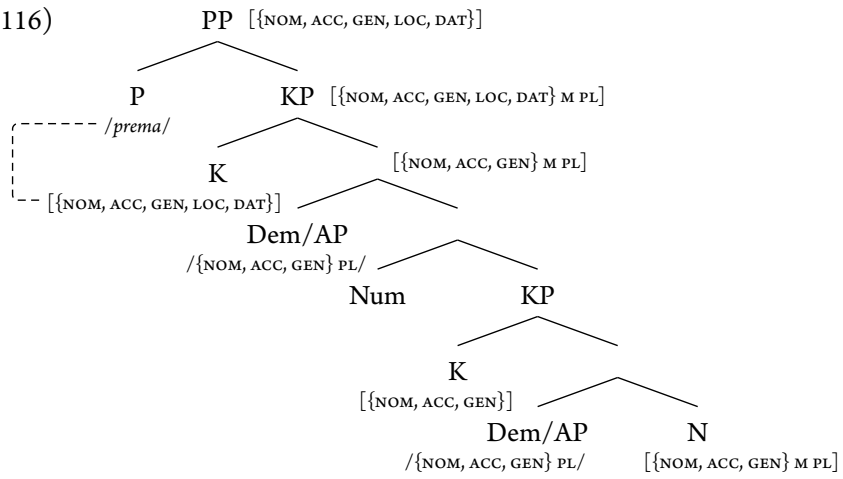
(115) a. *prema* *izlaz-u*
toward exit-DAT.M.SG
'toward the exit'

b. *prema* *pet* *izlaz-a*
toward five exit-GEN.M.PL
'toward the five exits'

Because we have seen that the ungrammaticality of dative- and instrumental-case assigning verbs with numeral complements results from the inability of the dominating case to be realized, prepositions must somehow be able to assign and realize case. Assuming that case is specified in the lexical entry of the preposition, then spanning easily accounts for this unique ability. When identical sets of case features are present in both the P and K heads, and the situation is such that the features on KP cannot be realized elsewhere, the features of P and K identify and spell out as one.

The structure in (116) depicts the final stage of a higher numeral derivation. As shown before in (113)–(114), the set of genitive features of the lower domain is allowed to percolate upward beyond the domain boundary. This set of features is unable to override the dative set of KP and consequently stops percolating one node below, which ultimately results in the realization of genitive throughout the numeral construction as the local case. Previous derivations in verb-governed environments have failed here, since the dominating dative case is not realized. This time, spanning is activated as a last resort.

(116)



Since P and K make up a complement sequence of heads, they form a span and spell out together as *prema*, illustrated with the spellout rule in (117). This satisfies the requirement that the dominating dative case is realized.

(117) $\text{P}_{[\{\text{NOM, ACC, GEN, LOC, DAT}\}]} + [\{\text{NOM, ACC, GEN, LOC, DAT}\}] \Longleftrightarrow /prema/$

In the current analysis, I assume that spanning is activated only as a last resort when the dominating case cannot otherwise be realized. If the preposition takes a regular declinable complement, spanning is not triggered since the dominating case features are able to be realized, and the preposition spells out alone. This condition also applies to accusative and genitive prepositions with numeral complements. Since the numeral constructions have been shown to be grammatical in both accusative and genitive environments through case override, spanning is unnecessary. The last-resort character of spanning in the BCS examples is consistent with the fact that the form which is ultimately realized differs from typical spanning examples. In the example above, the preposition *prema* spells out, but properties of the functional head K are not necessarily detectable. This contrasts with the more common portmanteaux examples of spanning, which often represent both heads. For example, French *des* combines elements of both *de* 'of' and *les* 'the$_{\text{PL}}$.'

One question remains: why are dative- and instrumental-case-assigning verbs not able to span with K to prevent the derivation from crashing? Svenonius (2012) observes that spanning is typically confined to a single extended projection. The verbal head and K are certainly located in separate extended projections, so on this line of reasoning, we correctly predict that V cannot span with K to save the construction. On the other hand, it is not necessarily clear that P and K can be analyzed as part of the same extended nominal projection. Regarding this point,

Grimshaw (2005) suggests the categorial status of prepositions may be compatible with both nominal and verbal extended projections. However, like numerals, the categorial status of prepositions has long been subject to discussion (see Rauh 1993; Zwarts 1995; Corver and van Riemsdijk 2001; Baker 2003; a.o.), so it does not seem wise to take for granted their inclusion in the extended nominal projection. Even so, the literature indicates that spanning exists independently among prepositions and functional heads, but to the best of my knowledge, equivalent examples involving verbs are rare, if they constitute true examples at all.

4.3.3 S(a)-*insertion*

In addition to its use as a comitative marker (Klajn 2003), the instrumental preposition *s(a)* 'with' has a special rescuing effect on instrumental-case-assigning verbs with indeclinable complements (Franks 1995, 2002; Zlatić 1997; Bošković 2006, 2008).[51] The BCS examples can be saved by simply inserting *s(a)* above the numeral construction, exemplified in (118).[52] Notice that *s(a)*-insertion does not necessarily give rise to the comitative reading that normally occurs with *s(a)* as a preposition. In contrast to the prepositions discussed in the previous section, this section argues that the *s(a)* involved in *s(a)*-insertion examples is actually a case particle.

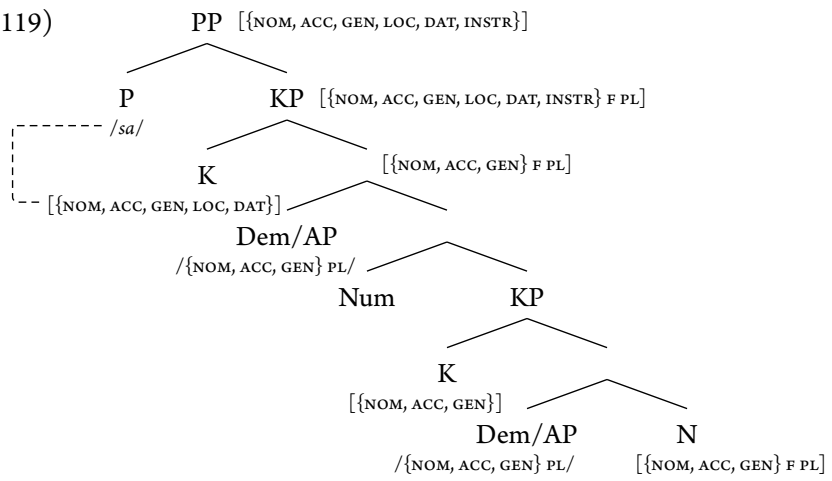
(118) *Kraljica vlada s(a) t-ih pet velik-ih zem-a-lja.*
queen rules with that-GEN.PL five large-GEN.PL country-PL-GEN.F
'The queen rules those five large countries.'

As we have seen, the higher numerals exhibit upward homogeneous concord. Given the standard use of *s(a)* as an instrumental preposition, it seems possible to incorporate it into the derivation by merging a PP and then applying the spanning analysis from §4.3.2, whereby P and K are realized as a single morpheme. This possibility is depicted in (119). However, such an analysis would require look-ahead. While the PP is inserted in the syntax, Chapter 5 will show that the derivation cannot fail until all possibilities of repair by impoverishment have been exhausted post-syntactically.

51 *S(a)* can be realized as *sa* or *s* according to the first letter of the subsequent word, as well as language-specific preferences. Alexander (2006) mentions that Bosnian alternates between *s* and *sa*, while Croatian uses *s*, except before words beginning with *s*, *z*, *š*, or *ž*, where the vowel functions as a pronunciation aide. Serbian primarily uses *sa*.

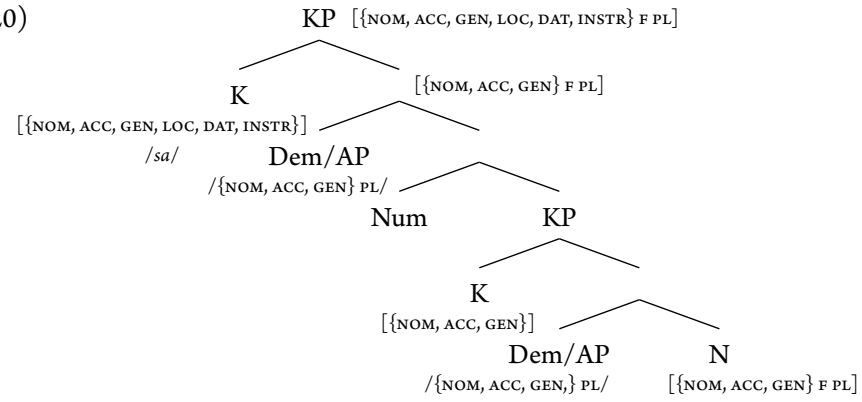
52 The rescuing effect of *s(a)* applies throughout BCS. This includes higher numeral constructions, lower numeral constructions (discussed in Chapter 5), and mixed collectives (discussed in Chapter 2), as well as indeclinable nouns (Wechsler and Zlatić 2003; Bošković 2006).

(119)



Since *s(a)* in these examples seems to be devoid of semantics, a more promising alternative is to simply treat *s(a)* as a semantically-suppressed form of the preposition that is realized directly on K, as shown in (120). In other words, *s(a)* functions as a case particle in these examples. This approach differentiates *s(a)*-insertion from its normal prepositional use, as well as from BCS prepositions in general, which do not have the same rescue capacity. In an instrumental environment, then, genitive ultimately spells out on the modifiers as the local set of case features, but *s(a)*-insertion on K saves the derivation. Since the dominating case is realized, the derivation is successful.

(120)



In the examples above, *s(a)* appears to be a mere realization of instrumental case. This is consistent with a view of *s(a)*-insertion as a last resort operation, which occurs only when instrumental case cannot otherwise be realized (see Franks 2002; Bošković 2006, 2008). However, some speakers appear to extend its usage beyond the numeral examples. Wechsler and Zlatić (2003) point out that *s(a)* is sometimes

used optionally with declinable complements of instrumental-case-assigning verbs, citing the following examples.[53] The data are puzzling if *s(a)* is only inserted as a repair.

(121) adapted from Wechsler and Zlatić 2003 (147, ex. (62))

a. *Oni upravljaju (sa) ov-im preduzeć-em.*
they manage with this-INSTR.SG company-INSTR.SG
'They manage this company.'

b. *Oni rukovode (sa) držav-om.*
they rule with country-INSTR.SG
'They rule the country.'

Nevertheless, it is possible that *s(a)*-insertion originated as a repair but with time has begun to be regularized. To my knowledge, there are no accounts of the historical development of *s(a)*-insertion, so I hypothesize that *s(a)* originated as a regular preposition, and over time, grammaticalized into the case particle we see in *s(a)*-insertion. Given the lexical simplicity of *s(a)*, this seems a reasonable account, comparable to do-support in the verbal domain (Grimshaw 1997).

Another curious property of *s(a)*-insertion is that it cannot be used to repair instrumental adjuncts containing numeral constructions, as the following examples show.

53 The translations added in (121) are not provided in the original text.

(122) adapted from Bošković 2008 (7, ex. (27))

a. *Plovi-o je mor-em.*
sail-PST.M.SG AUX.3SG sea-INSTR.N.SG
'He sailed across the sea.'

b. **Plovi-o je pet mor-a.*
sail-PST.M.SG AUX.3SG five sea-GEN.N.PL
'He sailed across five seas.'

c. **Plovio je sa pet mor-a.*

In contrast to complements, Bošković (2008) contends that the instrumental declension of adjuncts specifies a particular semantic role. Following this view, if we maintain that *s(a)*-insertion is devoid of semantics, it is no surprise that *s(a)* fails to repair instrumental adjuncts, while a semantically heavier preposition can. Moreover, if *s(a)*-insertion involves a special version of *s(a)*, the fact that the rescue strategy is unique to instrumental-case-assigning verbs is easily explained. Assuming that other prepositions lack a semantically-suppressed version, and the verbal head cannot span with K, there is no way to save the derivation.

4.4 INTERIM SUMMARY OF BCS

This chapter has demonstrated the simplicity of analyzing the upward homogeneous pattern under the proposed concord system. The behavior of BCS numeral constructions has often been puzzled over in the literature, especially in comparison to other languages. There is not currently an analysis that is widely agreed upon, but the concord approach offers a competitive option. In this account, language variation is largely tied to properties of the numeral, while other aspects of the system remain constant. The next chapter reviews the remainder of the BCS patterns found with the lower numerals. Following the derivations, I will evaluate some popular accounts of numeral constructions and return to the challenges encountered by a purely agreement-based analysis.

5

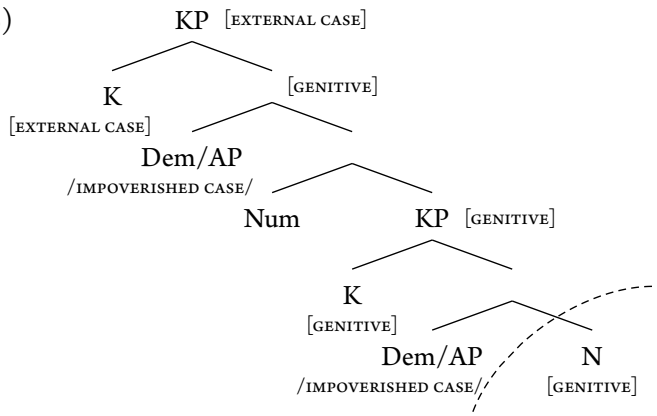
NON-ALIGNED HETEROGENEOUS CONCORD IN BCS

5.1 INTRODUCTION

The BCS lower numerals ('two,' 'three,' and 'four') were historically declinable, but in current usage, speakers tend to consistently use what was formerly the nominative/accusative form (Zlatić 1997; Hammond 2005; Šarić 2014; a.o.). This form of the lower numerals and their associated non-aligned heterogeneous pattern are grammatical in nominative, accusative, and genitive case environments (Giusti and Leko 1995; Wechsler and Zlatić 2003). However, the transition from a declinable form to a relatively frozen form poses complications for lower numerals in dative and instrumental case environments. In these particular contexts, the acceptability of lower numeral constructions is similar to that of the higher numeral constructions. Verb-governed dative contexts are typically considered unacceptable, while preposition-governed dative contexts are compatible with the non-aligned heterogeneous pattern. *S(a)*-insertion saves verb-governed instrumental examples. §5.3.3 demonstrates how the spanning and *s(a)*-insertion analyses adopted for the higher numeral constructions easily extend to the lower numerals.

The non-aligned heterogeneous pattern of the lower numerals is characterized by two domains of concord that do not align with the break in syntactic domains. The structure in (123) depicts the domain distribution. For BCS lower numeral constructions in particular, the modifiers realize nominative case in an extended domain of concord, while the noun realizes genitive. In addition to the mismatch in case features across the two concord domains, the BCS examples also display a mismatch in ϕ-features among the noun and modifiers. The derivations will again highlight the role of impoverishment in domain extension (see Figure 1.1), predominantly in creating the modifiers' extended domain of concord. The unusual feature distribution observed in these examples is primarily due to the analysis of paucal in the current system, which will be elaborated in the derivations.

(123)



The derivations will additionally show that the feature mismatch of the non-aligned heterogeneous pattern is found only with masculine and neuter lower numeral constructions; feminine examples are in fact upward homogeneous.

5.2 NOMINATIVE, ACCUSATIVE, AND GENITIVE ENVIRONMENTS

As mentioned above, BCS lower numeral constructions are grammatical in nominative, accusative, and genitive case environments. The derivations will show that the case and ϕ-feature mismatch which is characteristic of the non-aligned heterogeneous pattern is not present in feminine examples. Instead, feminine examples exhibit upward homogeneous concord realizing nominative plural, whereby the nominative form is derived from the internally assigned genitive case. The following subsections first address the masculine and neuter examples before proceeding to the feminine examples.

5.2.1 *Masculine and neuter lower numeral constructions*

The non-aligned heterogeneous pattern of masculine and neuter lower numeral constructions is exemplified in (124) and (125). These examples offer several points for discussion. First, notice that both the demonstrative and adjective are glossed as nominative plural, and the noun as genitive singular. This feature mismatch is common under non-paucal analyses of lower numeral constructions, which reject the existence of paucal as either a case or number feature in Slavic (e.g., Corbett 1983; Šarić 2014). The form of the modifiers is analyzed as nominative plural since a comparison of adjective declension paradigms indicates that it is neither genitive plural nor genitive singular like the noun (see Despić 2013 for an overview). In support of this analysis, an overview of subject-verb agreement

in Chapter 7 will show that agreement in lower numeral examples also suggests that nominative case should be present in the subject phrase because this kind of agreement is conditioned by nominative case in BCS (Zlatić 1997; Wechsler and Zlatić 2000; Despić 2013). Therefore, a key aspect of the derivation consists of accounting for the difference in case and number between the modifiers and the noun. Masculine lower numeral constructions are also unique in that masculine gender is neutralized on the modifiers and numeral.[54]

(124) *ov-a* *dv-a* *gladn-a* *tigr-a*
this-NOM.N.PL two-N hungry-NOM.N.PL tiger-GEN.M.SG
'these two hungry tigers'

(125) *ov-a* *dv-a* *dubok-a* *jezer-a*
this-NOM.N.PL two-N deep-NOM.N.PL lake-GEN.N.SG
'these two deep lakes'

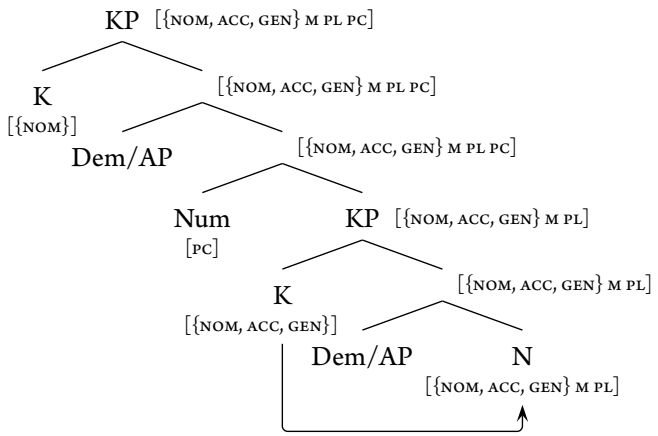
In acknowledging this feature variance, however, some analyses simply refer to a special 'paucal form' of nominals quantified by lower numerals and treat paucal as either a case or number feature (e.g., Franks 2002; Despić 2013; Ionin and Matushansky 2018).[55] Chapter 2 discussed some motivation against analyzing paucal as a number feature on par with singular and plural, and I will return to this discussion in §5.5 along with some challenges for the paucal case analysis. In light of these challenges, the current analysis instead treats [PC] as a class feature that simply denotes a subset of numerals but itself has no semantic import. This analysis notwithstanding, §5.5 will discuss how the system of concord developed in this thesis is compatible with both the paucal number and paucal case alternatives.

In examining a nominative case environment, the derivation proceeds as we have seen before. Beginning in the syntax, I assume that BCS lower numerals do not agree for case. This assumption is based on the fact that they rarely decline (and do so only as a result of speaker variation in dative environments, to be discussed in §5.3.2). Thus, the genitive assigned to the lower domain percolates through the higher domain, ultimately overriding nominative on KP. The ϕ-features of the noun also percolate through the higher domain along with [PC] from the numeral.

54 *Dva* in (124) is glossed as neuter though it actually realizes a syncretic masculine/neuter form. Of the lower numerals, only 'two' realizes gender. Because its form is dependent on the gender of the noun, the analysis assumes that the lower numerals are not inherently specified for gender and instead receive gender features through concord. In the current system, the numeral receives its gender specification from the spellout of dominating nodes and as such must be consistent with that of the modifiers.

55 The paucal form has also been referred to as the '234 form' (Browne and Alt 2004) and the 'counting form' (Alexander 2006).

(126)



Moving out of the syntax, I assume that BCS contains several feature co-occurrence restrictions, listed below. Together, these feature co-occurrence restrictions create the extended domain of concord for the modifiers, as their resolution results in impoverishment of [GEN], [ACC], and [M] along the spine of the construction, and [PL] on the noun. This is determined by the lower ranking of these features with respect to [PC] in the BCS hierarchy (see Appendix C).

(127) [GEN] cannot occur on non-terminal nodes dominated by [PC]

(128) [ACC] cannot occur on nodes dominated by [PC]

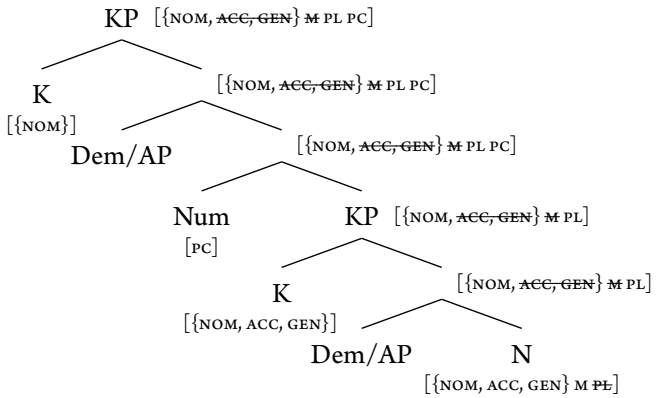
(129) [M] cannot occur on non-terminal nodes dominated by [PC]

(130) [PL] cannot occur on a non-feminine N dominated by [PC]

Let us consider each feature co-occurrence restriction in turn with regard to the tree in (131). Violations of (127) result in deletion of [GEN] along the spine of the structure. Critically, [GEN] is preserved on the noun as a terminal node, which ultimately realizes genitive case. The sensitivity of impoverishment to dominating nodes parallels the finding in previous derivations that concord is achieved through the realization of dominating nodes. As we have seen before, the ability of impoverishment to refer to dominating nodes follows implicitly from the concord-as-spellout approach since features are specified on heads and then percolate throughout the construction. However, just as concord is sensitive to locality, so is impoverishment. The dominating feature must be local to the target node. While the two may be located in separate extended projections, the semi-lexicality of the numeral entails a transparent boundary between the syntactic domains. This transparency allows [PC] to be analyzed as local to the nodes of the lower extended projection. Assuming that a node does dominate itself (Cushing 1978), [GEN] on

the higher KP is included in the deletions triggered by (127). With regard to (128), [ACC] is also deleted along the spine of the structure. Though N is also dominated by [PC], [ACC] is blocked from deletion on this head because doing so would result in an ill-formed set of case features, {NOM, GEN}. Introduced in Chapter 3, this requirement that only the outermost feature of a case set be deleted is reminiscent of Ackema and Neeleman's (2018) Russian Doll Principle and Zompì's (2019) Graduality constraint. At this point, it is necessary to emphasize that the nominative case which results on KP through impoverishment will condition subject-verb agreement (Chapter 7).[56]

(131)



With regard to (129), [M] is also deleted along the spine, resulting in neuter gender (see e.g., Kramer 2015; Ackema and Neeleman 2018; Adamson and Šereikaitė 2019).[57] Finally, (130) derives the singular form of masculine and neuter nouns, assuming that impoverishment of the plural results in singular (see Harley and Ritter 2002; Baerman, Brown, and Corbett 2005; Nevins 2011b; Ackema and

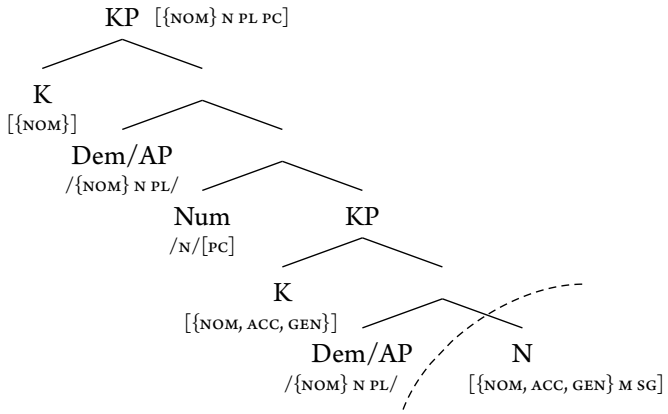
56 In Chapter 6, we will see a contrast with the Polish derivations in which accusative results on KP and forces default agreement. Although nominative and accusative are syncretic in these Polish examples, the case of KP cannot be analyzed as nominative because the default agreement on the verb would then be inexplicable.

57 In the sources cited here, the representation of gender features is more complex than the simple [M] and [F] used in this thesis. For example, Ackema and Neeleman (2018) represent masculine as [GENDER] and feminine as [GENDER FEMININE], with neuter as the absence of a gender feature. Since the derivations in this thesis do not involve any manipulation of the feminine feature (e.g., through impoverishment), I have opted for a simplified representation of the gender features, though a more refined view of gender would be compatible with the current concord system.

Neeleman 2018).[58] The analysis of a feminine example in §5.2.2 will demonstrate why the gender specificity of (130) is necessary.

In the final stage of the derivation, the features of the dominating nodes are realized on available terminals, as depicted in (132). The modifiers realize the dominating NOM.N.PL via concord, while the noun realizes GEN.M.SG because of its initial feature specification and participation in agreement. This results in two domains of concord that do not align with the underlying syntactic domains. Note that I have included [N] and [SG] in the tree to represent the neuter and singular features; this is merely for presentational clarity since I analyze each as the absence of a feature specification following impoverishment. Additionally, I assume that [PC] is not realized in concord since it is a class feature of the numeral. This is further motivated by the fact that there are no obvious effects of [PC] on the morphology of the nominal elements. With regard to case, I have analyzed the numeral as caseless. This is consistent with the caselessness of the higher numerals and also aligns with the observation that BCS lower numerals rarely decline. However, §5.3.2 will show that some speakers decline the lower numerals in dative case environments, which could be taken as evidence that the lower numerals do realize case, even in their apparently frozen form. If so, it may be that the numeral surfaces in a default nominative form, based on the complementarity of case assignment and case concord introduced in Chapter 1. This behavior resembles that of the Polish numerals to be discussed in the next chapter.

(132)



58 Chapter 2 mentioned that [PL] could be encoded in its own number phrase and introduced higher in the structure. In the aligned heterogeneous derivations discussed in that chapter, the desired pattern could be derived even if [PL] percolated from higher up in the structure. However, because the non-aligned heterogeneous pattern requires singular number on the noun, it is now necessary to assume that if [PL] is located in its own projection, the number head must agree with the noun (similar to the noun's relationship with K). [PL] would be located on the head and percolate up while also having established an agreement relation with the noun. [PL] would then be impoverished on N, while any modifiers would realize [PL] from dominating nodes.

This derivation would proceed the same way in both accusative and genitive case environments based on the ability of the internally assigned genitive to reach and override the case on the higher KP. Furthermore, this example includes a masculine noun, but a neuter lower numeral construction would be similarly derived. The neuter derivation would simply lack the impoverishment of [M] triggered by violations of the feature co-occurrence restriction in (129).

In the derivation above, we have seen that the noun introduces certain ϕ-features into the derivation, such as [M] and [PL], and then agrees for genitive case as usual. The modifiers, on the other hand, do not realize all of the same features as the noun, even the modifier located in the same extended projection as the noun. This feature mismatch motivates the use of impoverishment in the system. Without impoverishment, deriving the features of the modifiers would be very difficult, if not impossible. Abandoning the use of impoverishment would necessitate a reanalysis of paucal, either as a number feature or as a case, but for reasons discussed in §5.5, this introduces some undesirable complications. §5.5 will additionally show that even with a reanalysis, it is not clear that impoverishment can be avoided. It thus remains an important component of the concord system.

Before proceeding to the feminine derivations, an interesting parallel can be drawn with Russian. Chapter 3 (§3.2.2.3) demonstrated that in structural case environments, feminine lower numeral constructions do not display the aligned heterogeneous pattern of the Russian masculine and neuter examples. Instead, they actually display the non-aligned heterogeneous pattern; the noun is genitive singular while the modifiers typically realize nominative plural. As mentioned in Chapter 3, the majority of feminine nouns in Russian have syncretic NOM.PL/-GEN.SG forms, but those that do not realize genitive singular when quantified by a lower numeral (see Rappaport 2002). For this reason, I consistently analyze even syncretic examples as genitive singular.

(133) *èt-i* *dv-e* *star-ye* *knig-i*
this-NOM.PL two-F old-NOM.PL book-GEN.F.SG
'these two old books'

The fact that the feature mismatch in the BCS examples is not entirely unique lends support to the analysis of the lower numeral constructions and paucal feature adopted in this thesis.

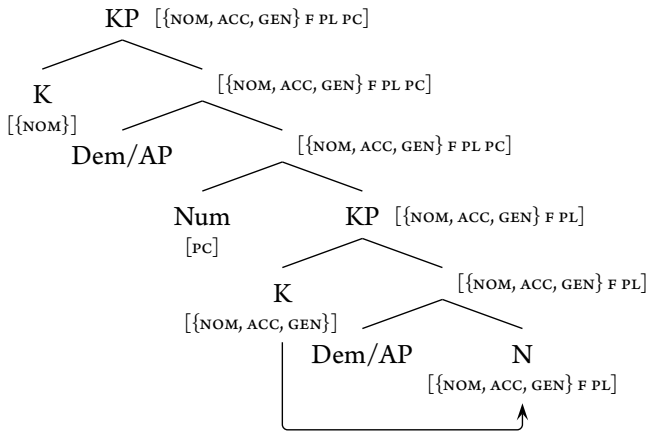
5.2.2 *Feminine examples: Upward homogeneous*

The concord pattern associated with BCS feminine lower numeral constructions differs slightly from the masculine and neuter examples. As we saw in Russian, feminine nominals display a morphological NOM.PL/GEN.SG syncretism. However, in BCS, Franks (1995, 125, n. 8) points out that there are slight and often overlooked pronunciation differences between the GEN.SG and NOM.PL forms; the form in feminine lower numeral examples, which lacks vowel length, is unambiguously NOM.PL (see also Alexander 2006, 59). This contrasts with the masculine and neuter lower numeral constructions, which can be analyzed with GEN.SG nouns and NOM.N.PL modifiers (Corbett 1983; Franks 1995).

(134) *t-e* *dv-(ij)e* *visok-e* *žiraf-e*
that-NOM.F.PL two-F tall-NOM.F.PL giraffe-NOM.F.PL
'those two tall giraffes'

Proceeding with the derivation in a nominative context, the structure below depicts feature percolation in the syntax. As with the previous derivation, the numeral does not agree for case, allowing the genitive features assigned to the lower domain to percolate up through the higher domain. These genitive features override the nominative feature on KP. The noun is specified with feminine and plural features, which percolate through both domains. The numeral is additionally specified with the paucal feature, which percolates through the higher domain.

(135)



After percolation, impoverishment applies post-syntactically as a result of the feature co-occurrence restrictions in (136)–(138). We have already seen the effects of (136) and (138) in the masculine and neuter derivations, but they are repeated below for convenience. Regarding (136), the result is again deletion of [GEN]

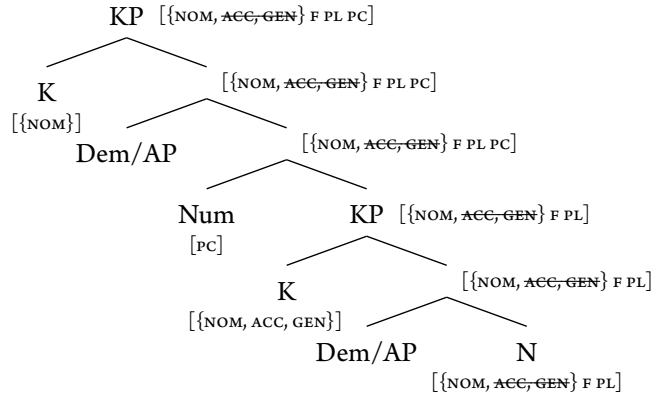
along the spine of the structure. (137) applies to delete [GEN] specifically on the noun in feminine lower numeral constructions since it must surface in nominative case. As we saw in some of the Russian feature co-occurrence restrictions, (137) contains a feature combination, [F, PC]. However, both [F] and [PC] as simplex features are ranked above [GEN] in the BCS hierarchy, so rather than functioning as a combination protected from impoverishment, [F, PC] serves primarily to specify the context of deletion—i.e., a feminine lower numeral construction. (138) then applies, resulting in [ACC] deletion throughout the structure. Again, the sensitivity of impoverishment to dominating nodes assumes locality, where effects in the lower domain are possible due to the semi-lexicality of the numeral. The previous derivation of a masculine example also contained the feature co-occurrence restrictions in (129) and (130) which resulted in the impoverishment of the [M] and [PL] features. These are not applicable to the current derivation since the not all of the relevant features are present.

(136) [GEN] cannot occur on non-terminal nodes dominated by [PC]

(137) [GEN] cannot occur on N dominated by [F, PC]

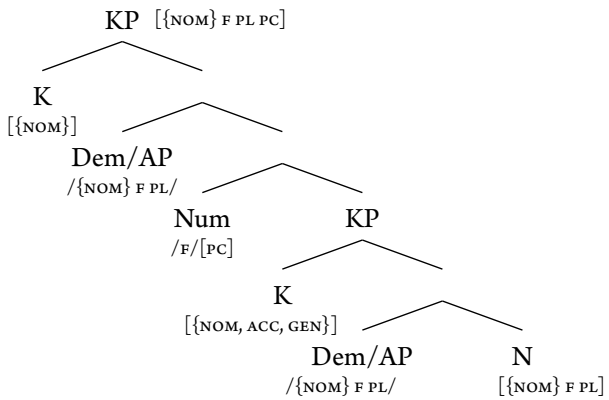
(138) [ACC] cannot occur on nodes dominated by [PC]

(139)



Finally, the features of KP spell out on available terminals. NOM.F.PL is realized throughout the construction. This can be categorized as the upward homogeneous pattern since the nominative features realized result from impoverishment of the internally assigned genitive.

(140)



This derivation is easily extended to accusative and genitive environments, both of which are grammatical with the frozen forms of lower numerals (Giusti and Leko 1995; Zlatić 1997; Wechsler and Zlatić 2003). Because the genitive of the lower domain can override both accusative and genitive on KP, the derivations in these environments would proceed exactly the same as above.

5.3 DATIVE AND INSTRUMENTAL ENVIRONMENTS

Like the BCS higher numeral constructions in Chapter 4, lower numeral constructions are typically considered ungrammatical in verb-governed dative and instrumental case environments but are acceptable with prepositions and *s(a)*-insertion (Giusti and Leko 1995; Zlatić 1997; Šarić 2014). The following subsections explore these contexts, demonstrating that the same analyses adopted for the higher numerals easily extend to the lower numerals. The ungrammaticality of lower numeral constructions as complements of dative- and instrumental-case-assigning verbs results from the inability of the case features of KP to be realized. A spanning analysis appropriately accounts for the grammaticality of the examples as complements of dative prepositions, and in instrumental examples, *s(a)*-insertion functions as a saving operation.

5.3.1 *Verb-governed contexts*

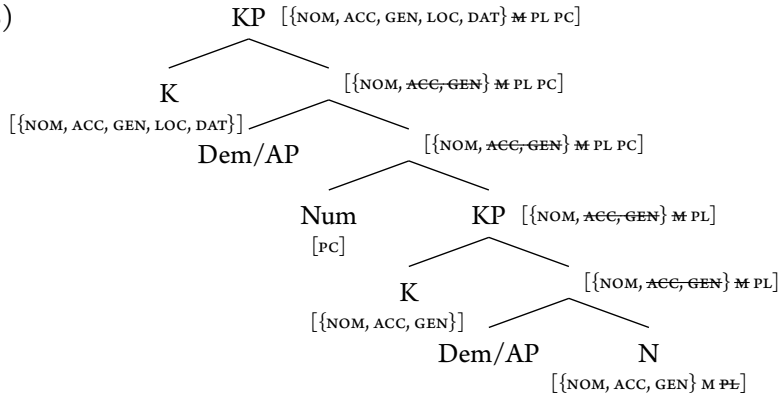
A prevalent opinion among speakers is that the non-aligned heterogeneous pattern (or upward homogeneous with feminine examples) of lower numeral constructions is simply ungrammatical in verb-governed dative and instrumental positions (Giusti and Leko 1995), demonstrated below with the dative-assigning verb *v(j)erovati* and the instrumental-assigning verb *vladati*.

(141) **V(j)eruj-u t-a dv-a nov-a proizvod-a.*
trust-3PL that-NOM.N.PL two-N new-NOM.N.PL product-GEN.M.SG
'They trust those two new products.'

(142) **Kraljica vlada t-e dv-(ij)e velik-e*
queen rules that-NOM.F.PL two-F large-NOM.F.PL
zemlj-e.
country-NOM.F.PL
'The queen rules those two large countries.'

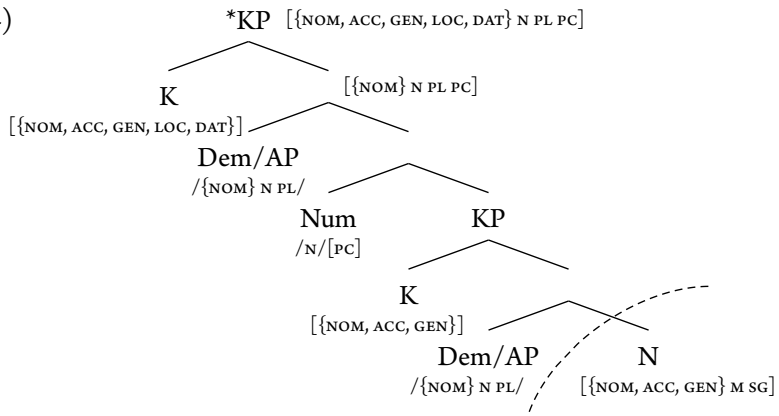
Let us examine a dative environment with a masculine lower numeral construction. Similar to the higher numeral derivations, the genitive features percolating from the lower domain are unable to override the dative features on KP since the set of genitive features does not contain the set of dative features. The structure in (143) depicts the first post-syntactic stage of the derivation, where impoverishment applies to resolve violations of the feature co-occurrence restrictions in (127)–(130).

(143)



The higher KP retains the set of dative features required to be realized as the case of the dominating node, but nominative is in fact the local case. Since there are no available terminals to realize dative, the derivation crashes, as shown below in (144). The derivation would similarly be predicted to crash in an instrumental case environment.

(144)



Speakers have a variety of ways to get around this ungrammaticality in verb-governed dative and instrumental contexts. In instrumental case examples, the most preferred strategy seems to be *s(a)*-insertion as we saw with the higher numeral constructions, and which will be discussed again in §5.3.3. In dative contexts, there is more variation, which will be covered in the next section. This is because unlike the higher numerals, the BCS lower numerals are still somewhat declinable for certain speakers. While some speakers simply avoid numeral constructions in verb-governed dative environments and employ a different verb or syntactic configuration (Zlatić 1997), others resort to the downward homogeneous pattern.

5.3.2 *Dative as a source of speaker variation*

Though the lower numerals have largely shifted away from their former declinability, certain speakers resort to the downward homogeneous pattern for lower numeral constructions in dative environments, exemplified in (145). For those who allow this pattern, it is common with *dva/dv(ij)e* 'two' but becomes progressively more difficult with *tri* 'three' and *četiri* 'four,' though all were historically declinable (Zlatić 1997; Hammond 2005; Thomas 2011). Based on my consultants' preferences, the downward homogeneous pattern appears to be less common among younger speakers, but a more formal study would have to be conducted to verify the specifics of the pattern's distribution.

(145) *V(j)eruj-u* *t-im* *dv-ama* *nov-im* *proizvod-ima.*
trust-3PL that-DAT.PL two-DAT.M new-DAT.PL product-DAT.M.PL
'They trust those two new products.'

A key step in this derivation is that impoverishment of [NOM], [ACC], and [GEN] makes the lower domain available for concord, thereby extending the possible

concord domain of the higher KP. This is comparable to the Russian and Polish downward homogeneous derivations in Chapter 3. Another crucial component of this derivation concerns the numeral's feature specification and case-assigning ability. The distribution of features in structural case examples suggested that the numeral assigns genitive in those environments. For consistency, we might assume that the numeral also assigns genitive in (145). However, the complementarity of case assignment and case concord makes it difficult to account for the case realized by the numeral. Recalling the historically declinable status of the lower numerals, we could instead suppose that they do not assign genitive case and have more of an adjectival character. The derivation would be much simpler, since impoverishment of the [NOM], [ACC], and [GEN] features would not be necessary, although [PC] impoverishment would still be required to prevent [M] and [PL] deletion. The lack of genitive assignment would also allow the numeral to realize the dominating case features in concord. However, I see no way to implement this solution and insert the desired form of the numeral without look-ahead.

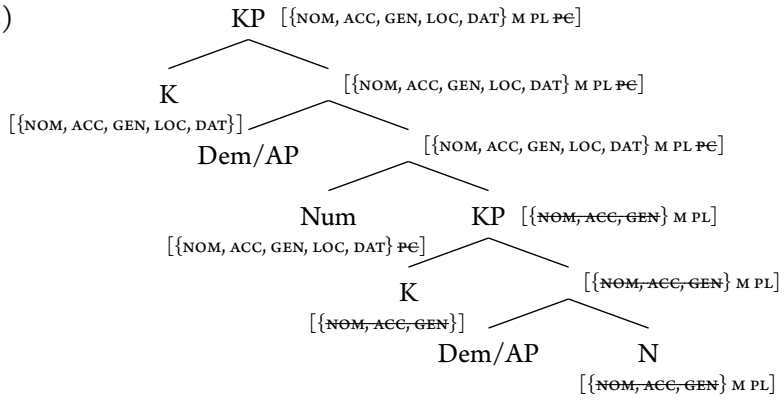
Alternatively, the grammar of the speakers who allow the dative downward homogeneous pattern may contain a filtering-dative form of the numeral (with dative case in its agreement slots), similar to the numeral form adopted in Polish. I will implement this option for now and later return to a discussion of its implications for other case environments.

The structure in (148) depicts the first post-syntactic stage of the derivation. In the previous stage, dative on the numeral was checked by K, allowing case agreement in the higher domain. Here, we see the application of two new feature co-occurrence restrictions, given in (146) and (147). Note that these are only present in the grammar of the relevant speakers who allow the downward homogeneous pattern. Since the ϕ-features of the noun are realized throughout the construction in the downward homogeneous pattern, impoverishment of [M] and [PL] triggered by the feature co-occurrence restrictions in (129) and (130) must be prevented from applying. Once (147) applies, (129) and (130) are no longer violated, assuming that [PC] is ranked below [GEN] in the BCS feature hierarchy. Thus, (146) and (147) should be ordered before the other BCS feature co-occurrence restrictions for this particular group of speakers. Additionally, (146) must be applied before (147) since (146) requires the presence of [PC] to trigger deletion of the case features. The resulting order of feature co-occurrence restrictions parallels Russian, where the feature co-occurrence restrictions required to derive the downward homogeneous pattern apply earlier than the others (see §3.2.3 in Chapter 3).

(146) [NOM], [ACC], [GEN] cannot occur on nodes dominated by [DAT, PC] (unless also dominated by [INSTR])

(147) [PC] cannot occur on nodes dominated by [DAT, PC] (unless also dominated by [INSTR])

(148)

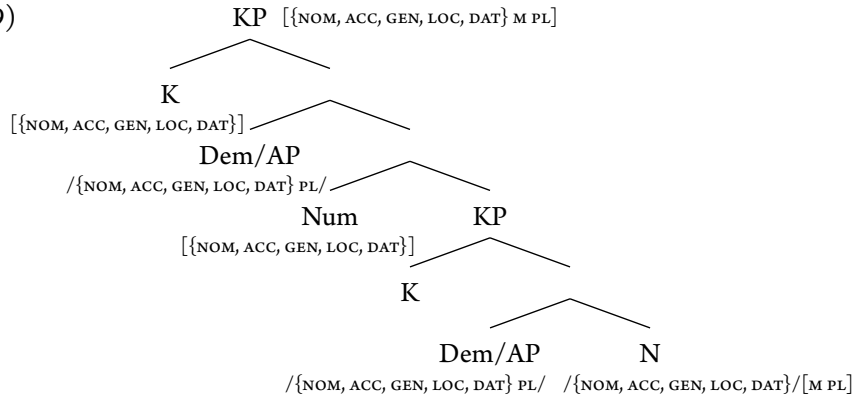


Since [DAT] is contained in the set of instrumental features, the conditional statement included in both (146) and (147) prevents the downward homogeneous pattern in instrumental case environments. While including a conditional in these feature co-occurrence restrictions is not ideal, the pattern is a matter of speaker variation rather than part of the primary grammar, so I will not attempt to improve upon it in this thesis. One question that remains, though, concerns the apparent unavailability of the downward homogeneous pattern in instrumental case environments. On this point I can only speculate, but it seems possible that because *s(a)*-insertion is available as a rescue strategy that is also available with higher numeral examples, it is preferred over the downward homogeneous pattern. In dative case environments, there is no true alternative to the downward homogeneous pattern because there is no dative equivalent to *s(a)*-insertion. The current solution, however, does not predict this impossibility of the downward homogeneous pattern in instrumental case contexts. Since dative is contained in the set of instrumental features, instrumental K should be able to check the filtering-dative numeral. To instead derive the non-aligned heterogeneous pattern that can be saved by *s(a)*-insertion, it may be necessary to adopt the decomposition of case discussed in Grabovac 2022. In particular, the behavior of BCS light-headed relative constructions (mentioned in Chapter 4) provides some evidence that cases are represented as sets of structures in the syntax which are post-syntactically 'flattened' to sets of features (i.e., the case decomposition that has been adopted thus far). In Grabovac 2022 I contend that case priority is determined in the syntax,

so if the structure {NOM, ACC, {GEN, LOC, DAT}} is adopted as the syntactic representation of dative and {NOM, ACC, {GEN, LOC, DAT, INSTR}} as the syntactic representation of instrumental, instrumental is not predicted to check dative due to a lack of containment.[59] As a result, the numeral's case slots are removed, and genitive is allowed to percolate from the lower domain. The feature co-occurrence restrictions in (127)–(130) or (136)–(138) take effect according to the gender of the noun.

For the purposes of this thesis, I will avoid implementing the case structures discussed above and instead return to the simplified version of the derivation. The structure in (149) depicts dative plural realized throughout the construction following the impoverishment of (148). The dative case features on the noun are also a result of concord since the genitive features received through agreement were targeted in the previous stage's impoverishment.

(149)



Many speakers who utilize the downward homogeneous pattern differentiate between lower numeral constructions involving 'two' and 'three' versus 'four.' 'Four' is the most difficult to decline and therefore may be simply avoided altogether in dative environments. For these speakers, the numeral itself and its ability to express the dative case determine the course of the derivation. For other speakers, there is some tolerance for the non-aligned heterogeneous pattern in dative case environments.[60] This preference is easily addressed with the feature co-occurrence

59 An alternative solution could involve a pre-specified dative numeral, just as we saw with the aligned heterogeneous pattern in Polish. However, this solution encounters an issue in structural case contexts since the dative features percolating from the numeral are predicted to override nominative or accusative on KP. We would then incorrectly predict the dative downward homogeneous pattern to be available in structural case environments.

60 If a speaker utilizes the downward homogenous pattern for 'two' and 'three,' which are easier to decline, but allows the non-aligned heterogeneous pattern with 'four' in a dative environment, the analysis becomes more complex. A full discussion of speaker variation in dative environments is well

restrictions in (150) and (151). These speakers, however, must have a slightly different ranking in their feature hierarchy compared to the downward homogeneous speakers. In particular, [DAT] (and [LOC]) would have to be ranked below rather than above [PC]. This ranking would result in [DAT] and [LOC] being deleted on KP. The feature co-occurrence restrictions in (127)–(130) would also apply to derive the non-aligned heterogeneous pattern, as shown in (152). The features of KP are reduced to NOM.N.PL, which are then realized throughout the construction.[61]

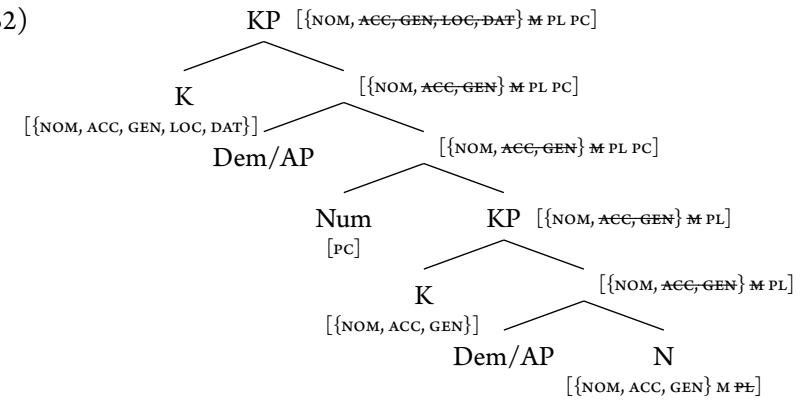
(150) [DAT] cannot occur on the same node as [PC]

(151) [LOC] cannot occur on the same node as [PC]

beyond the scope of this thesis, but here I reflect on some initial thoughts. Numerals 'two' and 'three' would have dative-filtering forms, while 'four' would lack one. Since the lower numerals consist of only three numerals, I do not see a major issue with this stipulation. Complex numerals that end in 'two,' 'three,' or 'four' pattern with the lower numerals, but if we adopt an analysis whereby these larger numerals are coordinated compounds of a larger numeral with a lower numeral (Ionin and Matushansky 2006), we avoid having to make this stipulation for an infinite number of forms. With regard to implementation of the solution, it may be that for this subgroup of speakers, [DAT] and [PC] are located at the same level in the feature hierarchy. This implies that when [DAT] and [PC] are both included in a feature co-occurrence restriction, either feature may be deleted to resolve a violation. With 'two' and 'three,' (146) and (147) would apply with the effects we have already seen in the main text. With 'four,' [DAT] would be deleted instead of [PC]. This would resolve violations of both (146) and (147), and then the derivation could proceed with the non-aligned heterogeneous feature co-occurrence restrictions in (127)–(130) (with the addition of [LOC] impoverishment, perhaps through (151)). This is not a perfect solution, however. For example, in the derivation of 'four,' it is difficult to determine how the deletion of [DAT] could resolve violations of (146) in which [DAT, PC] is listed as a protected combination (and as such, should prevent deletion of either of its member features). It may be possible to resolve this issue by revising the formulation of (151) to include [DAT] and [PC] as simplex features rather than a combination. After all, both are located above [GEN], [ACC], and [NOM] in the BCS hierarchy, so the resulting deletions would remain the same. To link a particular resolution of the feature co-occurrence restrictions—[PC] impoverishment or [DAT] impoverishment—to a specific lower numeral would involve positing that 'two,' 'three,' and 'four' each have a unique identifier in addition to the presence or absence of the filter.

61 For these speakers, the feature co-occurrence restrictions in (150) and (151) imply that locative and dative prepositions do not have to resort to a spanning analysis to accommodate the grammaticality of the lower numeral complements that surface in the non-aligned heterogeneous form. The derivation would proceed as in (152), and since KP's features are able to be realized, the preposition would not be forced to span with K to save the construction.

(152)



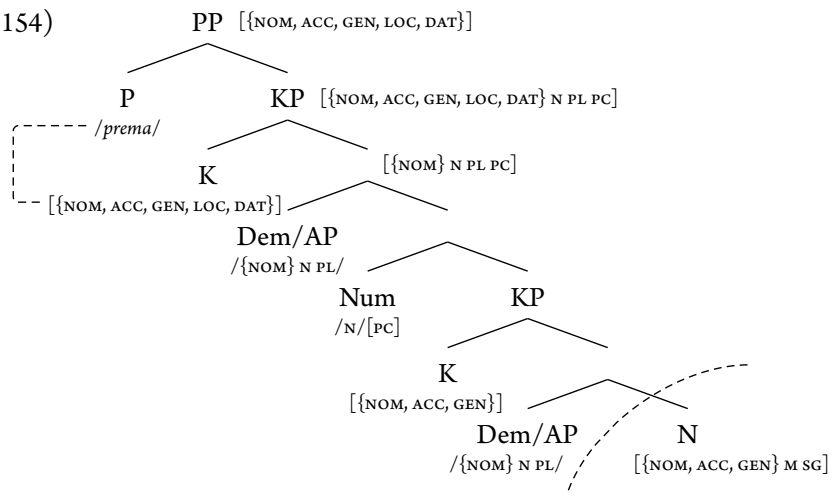
5.3.3 *Preposition-governed contexts and* s(a)*-insertion*

This subsection reviews the grammaticality of lower numeral constructions as complements of prepositions (Zlatić 1997), as well as the special status of *s(a)*-insertion in instrumental environments (Šarić 2014). Let us first consider a dative preposition, as shown in (153).

(153) *prema dv-a izlaz-a*
toward two-N exit-GEN.M.SG
'toward the two exits'

The spanning analysis works the same way as with the higher numeral constructions. A partial derivation is depicted in (154). After the application of the required impoverishment in the non-aligned heterogeneous derivation, nominative results as the local dominating case to be spelled out on available terminals. Since there are then no terminals to realize the features on KP, K spans with P as a last resort to save the construction.

(154)

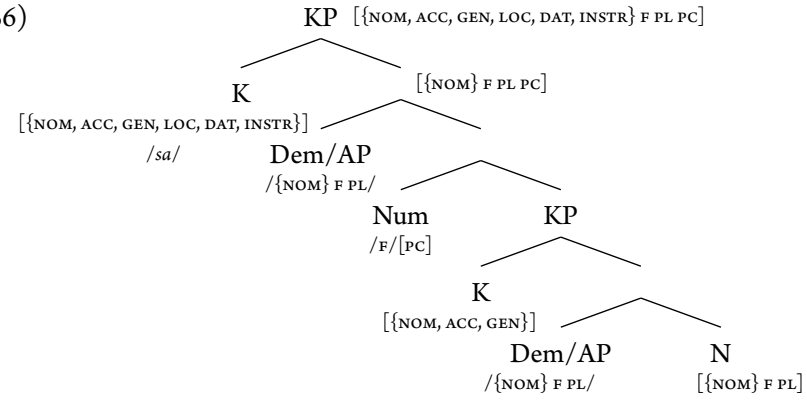


Lower numeral constructions can also be saved by *s(a)*-insertion in instrumental case contexts (Šarić 2014), as (155) shows.

(155) *Kraljica vlada *(sa) t-e dv-(ij)e velik-e*
queen rules with that-NOM.F.PL two-F large-NOM.F.PL
zemlj-e.
country-NOM.F.PL
'The queen rules those two large countries.'

The structure in (156) depicts a partial derivation. Nominative is realized as the local case, but K is spelled out as *s(a)* as a last resort to satisfy the realization condition of the dominating node. As discussed in Chapter 4, the special semantics of *s(a)*-insertion motivates analyzing *s(a)* in these examples as a case particle, distinct from prepositions.

(156)



5.4 A RECAP OF THE BCS FEATURE CO-OCCURRENCE RESTRICTIONS

At this stage, we have covered all of the BCS concord patterns. The main feature co-occurrence restrictions are listed below. The feature co-occurrence restrictions introduced in (146)–(147) and (150)–(151) of §5.3.2 have been omitted since they were introduced to accommodate speaker variation, whereas those in (157) seem to be part of the main grammar of BCS. Recall that (157a) was introduced in Chapter 2 with the aligned heterogeneous pattern displayed by mixed collectives.

(157) *BCS feature co-occurrence restrictions*

a. [GEN] cannot occur on the same node as [MIX]

b. [GEN] cannot occur on non-terminal nodes dominated by [PC]

c. [GEN] cannot occur on N dominated by [F, PC]

d. [ACC] cannot occur on nodes dominated by [PC]

e. [M] cannot occur on non-terminal nodes dominated by [PC]

f. [PL] cannot occur on a non-feminine N dominated by [PC]

Unlike in Russian, it is not necessary to assume any required order of application for these feature co-occurrence restrictions. Given of the layout of the BCS feature hierarchy (Appendix C), each of these restrictions preserves a class feature, [MIX] or [PC], in favor of deleting a lower-ranked case or ϕ-feature. The accusative feature co-occurrence restriction in (157d) is inherently ordered after (157a)–(157c) because of the condition on preservation of the well-formedness of case sets, but no additional order is needed.

5.5 REVISITING THE STATUS OF PAUCAL

Now that the full range of BCS derivations has been covered, we can return to a discussion regarding the status of paucal in the current system. The BCS and Russian derivations have treated [PC] as a class feature inherently present on the lower numeral. We have seen that [PC] is included as a marked feature in many of the feature co-occurrence restrictions, and it typically triggers impoverishment since it is a high-ranked feature in both the BCS and Russian hierarchies. The paucal-class-feature analysis provides an alternative to the two major competing views of the feature, paucal case and paucal number. While I have provided motivation against these two views, this section argues that the concord system developed in this thesis holds even if paucal is reanalyzed as a case or number feature.

Regarding paucal case (e.g., Mel'čuk 1980; Franks 1995; Rappaport 2002; Ionin and Matushansky 2018), an essential part of the analysis includes fitting paucal into the case hierarchy established in Chapter 1. Suppose that lower numerals assign paucal rather than genitive case. In this chapter, we have seen that BCS lower numeral constructions are grammatical in nominative, accusative, and genitive case contexts but problematic in dative and instrumental case contexts. The grammaticality of these examples suggests that paucal should be located above genitive but below dative in the case hierarchy. Since the pattern associated with paucal case surfaces in genitive environments, paucal seems to override genitive (as well as accusative and nominative located lower in the case hierarchy). With regard to locative case, it is not entirely clear whether paucal should override locative. BCS lower numeral constructions are grammatical as complements of locative prepositions, but locative is only assigned by prepositions and never verbs. Therefore, it is uncertain whether the grammaticality of BCS lower numerals in this context is due to case override or the ability of prepositions to span with K. However, situating paucal somewhere between genitive and dative will suffice for now. Turning to the Russian examples, Chapters 2 and 3 showed that lower numeral constructions realize the aligned heterogeneous pattern in nominative and accusative case environments and downward homogeneous in lexical case environments. This suggests that in Russian, paucal is located below genitive in the case hierarchy since paucal is unable to override genitive in genitive environments. Thus, the inclusion of paucal in the case hierarchy would have to be subject to language variation, even though the case hierarchy is taken as a universal (Caha 2009).

This is not necessarily fatal to the analysis of paucal as a case. Let us accept its variable position and assume that paucal is incorporated where appropriate in the hierarchy for each individual language. We then have to determine what number feature it occurs with on the elements in lower numeral constructions. Suppose that the noun and modifiers in all examples realize a paucal plural form (Ionin and Matushansky 2018). If so, the analysis and basic tenets of the concord system remain the same. The numeral would assign paucal rather than genitive case, and the derivations would require less impoverishment because the ϕ-features of the numeral and modifiers would no longer be subject to a feature mismatch. To derive the downward homogeneous pattern in lexical case environments, impoverishment of case features would still be required to make the lower domain transparent for concord, but this is achievable in the current concord system. Nonetheless, some additional complexities arise with the need to address the similarity of paucal plural forms with genitive singular and nominative plural forms. Constraining

these syncretisms would likely require adding more spellout rules to the concord system. While this is certainly doable, it does not make for an obviously simpler analysis than the paucal-class-feature account.

Let us now consider paucal as a number feature. The next step in the analysis requires determining which case co-occurs with paucal number in the lower numeral constructions. One possibility is genitive (Asinari 2019), as this would be consistent with the case-assigning properties of the higher numerals. However, explaining the regular subject-verb agreement that occurs with lower numeral examples then poses a challenge since verbs (in the languages under investigation) typically only agree with nominative subjects, and nothing in the numeral construction would be nominative. An alternative is to assume that the elements of the numeral construction realize nominative paucal (e.g., Rakhlin 2003; Bailyn and Nevins 2008). This would easily resolve the subject-verb agreement issue encountered by the genitive-paucal analysis. Nevertheless, there are a number of other factors to address. For one, why is the form nominative? Do lower numerals, in contrast to higher numerals, not assign genitive case, or is nominative case derived through impoverishment of the genitive? Is the form realized by the elements in the lower numeral construction consistently nominative paucal, even in non-nominative environments? If so, impoverishment would be required as we have seen throughout this chapter. Otherwise, it would be necessary to analyze the co-occurrence of paucal number with other case values and the abundance of syncretism with non-paucal number. Such a system becomes difficult to constrain, but concord as spellout is still a viable approach.

The preceding discussion represents only a small number of the challenges introduced by the status of paucal. Based on the explanatory complexities encountered by both the paucal case and paucal number analyses, the paucal class feature analysis adopted here seems the most reasonable, but the core of the proposed concord system can accommodate an alternative analysis.

5.6 CHALLENGES FOR AGREEMENT-BASED ANALYSES

Chapter 2 outlined two potential directions for an agreement-based analysis of the numeral constructions. The primary challenge for both options had to do with the feature valuation of the modifiers in the construction. The modifiers could either participate in multiple agreement relations that occur in various directions, or they could agree with the noun after the noun's features are valued. This section returns to the second of those two options, as we now have now encountered data that

pose an issue. In particular, the BCS non-aligned heterogeneous pattern contains a mismatch in both case and ϕ-features across the two domains. With a neuter noun, any modifiers in the construction realize nominative case and plural number, while the noun itself is genitive singular. With a masculine noun, gender also differs, as masculine gender is preserved on the noun but neutralized on the modifiers. If we pursue an agreement-based analysis in which the modifiers' features are valued only after the noun's features have been valued, it is not clear how to successfully derive the pattern.

Let us consider the NOM.N.PL form of the lower modifier against the GEN.M.SG noun. Thus far, I have taken agreement to be a syntactic process (though this will be slightly revised in Chapter 7). Since singular on the noun is derived via post-syntactic impoverishment, at the point of feature-copying, genitive, masculine, and plural features are copied to the modifier. Once this copying occurs, impoverishment occurs on both the noun ([PL] impoverishment) and the modifier ([GEN], [ACC], and [M] impoverishment). This would derive the desired GEN.M.SG form of the noun and NOM.N.PL modifier. However, we also have to account for the NOM.N.PL form of the modifier in the higher domain. The overview of subject-verb agreement in Chapter 7 will argue that agreement across extended projection boundaries involves both a syntactic stage to establish the agreement relation and a post-syntactic stage for feature-copying (see Chung 1998; Benmamoun, Bhatia, and Polinsky 2009; Arregi and Nevins 2012). Since the higher modifier is located in a separate extended projection from the noun, the noun's features are predicted to be copied after impoverishment. This would result in the wrong set of features on the higher modifier.

Previous chapters, however, have argued that the boundary between the two extended projections in the numeral construction is more transparent than usual because of the numeral's semi-lexicality. Thus, maintaining that two-stage agreement results in an incorrect set of features on the higher modifier may not be the strongest argument against an agreement-based analysis of the non-aligned heterogeneous pattern. A stronger argument, however, can still be found when considering the effects of impoverishment. If agreement within the numeral construction occurs entirely in the syntax, our constraints on impoverishment are lost. In an agreement-based analysis, impoverishment has to target individual modifiers after they have participated in agreement. It therefore seems possible to specify, for example, case impoverishment on Dem but number impoverishment on AP. This is quite powerful—in the concord account, impoverishment is restricted to heads and the dominating nodes to which features have percolated. Because of

percolation, dominating nodes contain (sub)sets of the same features, and impoverishment applies globally within the extended projection, thereby constraining its effects.

6

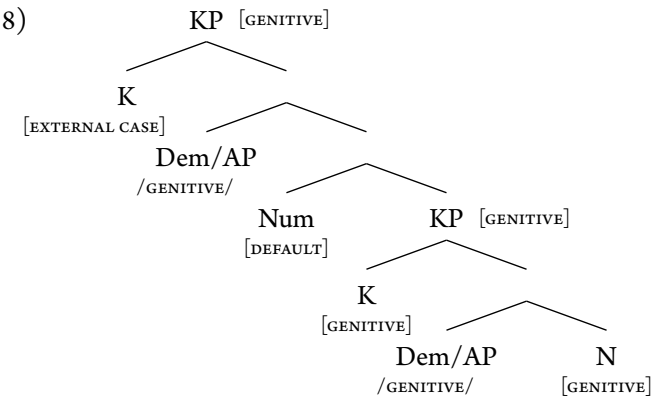
CONCORD IN POLISH

6.1 INTRODUCTION

Polish numeral constructions present a complicated distribution of concord patterns. Chapters 2 and 3 have shown that, like Russian, Polish displays the aligned heterogeneous pattern in structural case environments and the downward homogeneous pattern in lexical case environments. While the downward homogeneous pattern consistently appears in lexical case environments, however, this chapter will show that multiple patterns emerge with structural case. The pattern that is ultimately realized depends upon the class of the numeral (lower, higher, 1000+) and the gender of the quantified noun. As mentioned in Chapter 1, Polish distinguishes between virile and non-virile gender (see Swan 2002; Miechowicz-Mathiasen 2011; Dziubała-Szrejbrowska 2014; Witkoś and Dziubała-Szrejbrowska 2015; Klockmann 2017; a.o.). Nouns denoting male humans are marked with the [VIR] gender feature, while all other nouns are categorized as non-virile. In total, we will see that Polish numeral constructions display three distinct concord patterns across the various case, gender, and numeral groupings: aligned heterogeneous, downward homogeneous, and interrupted homogeneous.

Of these three patterns, only interrupted homogeneous concord has yet to be introduced. This pattern, depicted in (158), is characterized by what appears to be a single domain of concord for the internally assigned genitive case, but with default nominative realized on the numeral.

(158)



Although the pattern bears a strong resemblance to the BCS upward homogeneous pattern from Chapter 4, the numeral's default case in the interrupted homogeneous pattern crucially contrasts with the caselessness of the numeral in the BCS examples.

Table 6.1 summarizes the distribution of the concord patterns that will be covered in this chapter.

Table 6.1: Distribution of Polish patterns

CLASS	GENDER	CASE	PATTERN
Higher	Non-Vir	*Structural*	$[_{KP}$ACCUSATIVE … $[_{KP}$GENITIVE … $]]$
			$[_{KP}$GENITIVE … Num_{DEF} $[_{KP}$GENITIVE … $]]$
		Lexical	$[_{KP}$EXTERNAL CASE … $[_{KP}$EXTERNAL CASE … $]]$
	Vir	*Structural*	$[_{KP}$GENITIVE … Num_{DEF} $[_{KP}$GENITIVE … $]]$
		Lexical	$[_{KP}$EXTERNAL CASE … $[_{KP}$EXTERNAL CASE … $]]$
1000+ (numeral)	Non-Vir/ Vir	*Structural*	$[_{KP}$ACCUSATIVE … $[_{KP}$GENITIVE … $]]$
			$[_{KP}$GENITIVE … Num_{DEF} $[_{KP}$GENITIVE … $]]$
1000+ (nominal)	Non-Vir/ Vir	*Structural/ Lexical*	$[_{KP}$EXTERNAL CASE … $[_{KP}$GENITIVE … $]]$
Lower	Non-Vir	*Structural/ Lexical*	$[_{KP}$EXTERNAL CASE … $[_{KP}$EXTERNAL CASE … $]]$
	Vir	*Structural*	$[_{KP}$EXTERNAL CASE … $[_{KP}$EXTERNAL CASE … $]]$
			$[_{KP}$GENITIVE … Num_{DEF} $[_{KP}$GENITIVE … $]]$
		Lexical	$[_{KP}$EXTERNAL CASE … $[_{KP}$EXTERNAL CASE … $]]$

6.2 HIGHER NUMERAL CONSTRUCTIONS

This section begins the chapter with an analysis of the higher numeral constructions. We first consider structural case environments, which display a visible effect of gender on the resulting pattern and feature distribution. Non-virile examples alternate between the aligned heterogeneous and interrupted homogeneous patterns, while virile examples display only the interrupted homogeneous pattern. We then turn to the downward homogeneous pattern of lexical case environments. Throughout the derivations, we will see the significance of the fourth hypothe-

sis of the concord system introduced in Chapter 1: the complementarity of case assignment and case concord.

In the derivations that follow, it will be useful to refer to the declension paradigms of the higher numerals, demonstratives, and adjectives, provided in Tables 6.2–6.4. I will take these paradigms as a given, even though they introduce a number of their own complexities. The higher numerals differentiate between non-virile and virile gender, and the plural forms of demonstratives and adjectives do the same. According to Swan (2015), Polish contains four genders—the standard masculine, feminine, and neuter, plus virile (see also Corbett 1991). Instead of treating it as a fifth distinct gender, Swan takes the non-virile form to refer to the syncretism between masculine, feminine, and neuter (see also Rappaport 2003). In light of this, where no gender feature is included in the following glosses or derivational trees, it should be understood as non-virile.

6.2.1 *Structural case environments*

The subsequent derivations begin with the non-virile higher numeral constructions before proceeding to the virile examples. As introduced in Chapter 2, the potential pre-specification of accusative case on the numeral will account for the variation between the aligned heterogeneous and interrupted homogeneous patterns observed with the non-virile examples. Although the virile examples may also be specified with accusative, we will see that effects of case syncretism allow the pattern to be consistently analyzed as interrupted homogeneous.

6.2.1.1 *Non-virile examples*

Higher numeral constructions containing non-virile nouns display both the aligned heterogeneous and interrupted homogeneous patterns in structural case environments, as shown in (159) and (160).[62]

62 As mentioned in Chapter 2 (n. 22), while many speakers accept both patterns, some prefer only interrupted homogeneous concord. This can perhaps be linked to a shift from the numeral's formerly nominal status (discussed further in §6.3). For the former group, a difference in meaning may distinguish the two patterns. This difference is more apparent with certain pre-numeral adjectives than with demonstratives. In the aligned heterogeneous pattern, the adjective is interpreted as modifying the numeral, while it modifies the noun in the interrupted homogeneous pattern (for discussion, see Lyskawa 2020, 24–5). Certain accounts use this difference in interpretation to motivate an analysis in which the higher modifier in the interrupted homogeneous pattern is moved from a post-numeral position (Lyskawa 2020). For reasons discussed in §6.6.2, as well as disagreement among speakers regarding the existence of these different interpretations (see Willim 2015, 325–7), I avoid a movement analysis for the interrupted homogeneous pattern.

Table 6.2: Declension of Polish higher numerals[63]

	VIR	NON-VIR
NOM	-iu	-∅
ACC	-iu	-∅
GEN	-iu	-iu
LOC	-iu	-iu
DAT	-iu	-iu
INSTR	-iu/-iu	-ioma/-iu

Table 6.3: Plural declension of *ten* 'this'

	VIR	NON-VIR
NOM	ci	te
ACC	tych	te
GEN	tych	tych
LOC	tych	tych
DAT	tym	tym
INSTR	tymi	tymi

Table 6.4: Plural declension of Polish adjectives

	VIR	NON-VIR
NOM	-y/-i	-e
ACC	-ych/-ich	-e
GEN	-ych/-ich	-ych/-ich
LOC	-ych/-ich	-ych/-ich
DAT	-ym/-im	-ym/-im
INSTR	-ymi/-imi	-ymi/-imi

63 The higher numeral declension paradigm is subject to interpretation. Many sources that adopt the Accusative Hypothesis maintain that the nominative form does not exist, so the paradigm instead begins with accusative (Rutkowski 2002; Miechowicz-Mathiasen 2012). However, since nominative is the default case in Polish, this gap in the paradigm has been criticized (Klockmann 2017). While the analysis developed in this thesis shares insights with the Accusative Hypothesis, we will see that it is still possible to maintain a full paradigm as presented in Table 6.2.

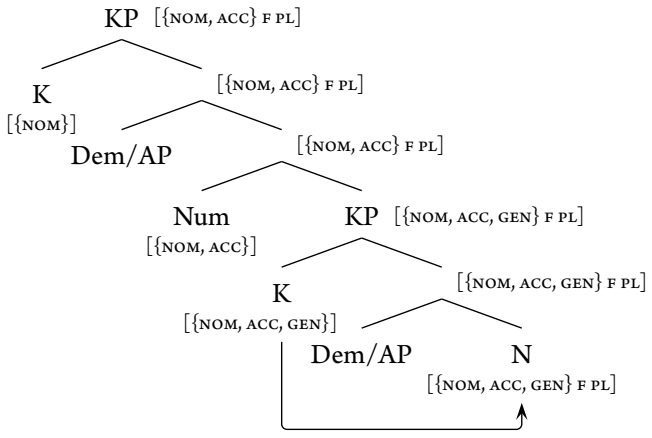
(159) *te* *pięć* *wysok-ich* *żyraf*
this.NOM/ACC.PL five.NOM/ACC tall-GEN.PL giraffe.GEN.F.PL
'these five tall giraffes'

(160) *t-ych* *pięć* *wysok-ich* *żyraf*
this-GEN.PL five.NOM tall-GEN.PL giraffe.GEN.F.PL
'these five tall giraffes'

Accounting for this pattern alternation provides one of the main challenges for any analysis of Polish numeral constructions. To this end, I propose that there are two forms of Polish higher numerals: the pre-specified accusative form and the filtering-genitive form that comes with genitive in its agreement slots. As discussed in Chapter 2, pre-specified accusative numerals never agree for case because they lack agreement slots. Filtering-genitive numerals agree only when they can be checked by a more richly specified K. While these constitute additional assumptions, all analyses of Polish numeral constructions are forced to make assumptions in one way or another due to the inherent complexity of the patterns. Moreover, the particular assumptions introduced here align with a consistent theme in this thesis—namely, that variation can largely be linked to the properties of the semi-lexical numeral.

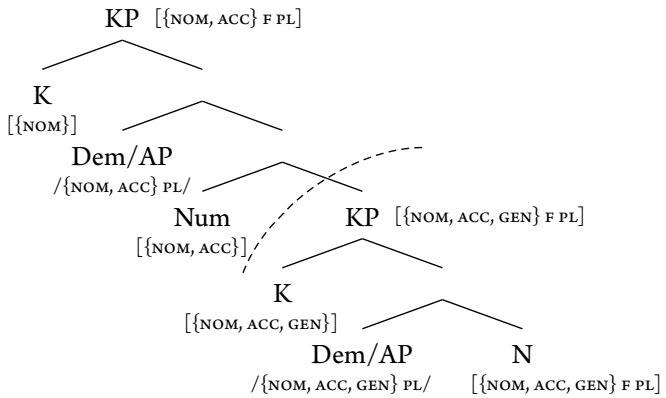
Let us begin the derivations with a brief review of the aligned heterogeneous pattern, which was discussed in full in Chapter 2. As usual, the derivation begins in the syntax. In structural case environments, Polish higher numerals do not agree for case. In this particular derivation, case agreement on the numeral is blocked because the numeral is already specified with {NOM, ACC}, which percolates through the higher domain and blocks percolation of the lower genitive.

(161)



In spellout, accusative (non-virile) plural is realized in the higher domain and genitive plural in the lower domain. We obtain two domains of concord that align with the underlying syntactic domains. Chapter 7 will return to this pattern and its associated default subject-verb agreement to lend support to the realization of accusative case in the higher domain. Using this accusative to explain default agreement aligns with the predictions of the 'Accusative Hypothesis' introduced in Chapter 2, though utilizing an accusative-specified numeral differs from the source of accusative in most approaches (see Przepiórkowski 1999; Franks 2002; Miechowicz-Mathiasen 2011, 2012; Witkoś and Dziubała-Szrejbrowska 2018; a.o.).

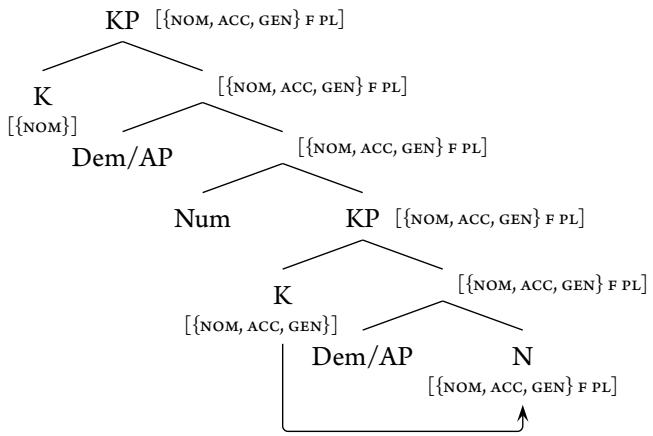
(162)



In an accusative case environment, the pattern is similarly derived since the internally assigned genitive is blocked from percolating into the higher domain by the accusative-specified numeral.

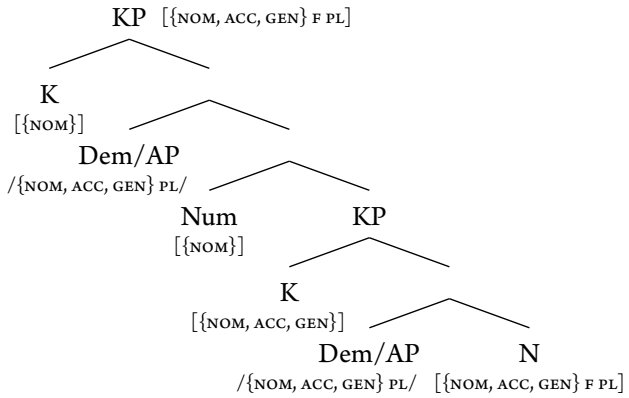
Let us now turn to the interrupted homogeneous pattern, which results when the genitive-filtering numeral is inserted but fails to be checked by K. Since K's case specification is poor, {NOM} in this example, it cannot check the genitive features of the numeral. As a result, the numeral's case slots are deleted, allowing the genitive assigned to the lower domain to percolate into the higher domain along with the ϕ-features, depicted in (163). Genitive overrides nominative on KP.

(163)



In the post-syntactic mapping, we can proceed directly to spellout, where the features of KP are realized on available terminals, resulting in genitive plural throughout the construction. However, the complementarity of case assignment and case concord prevents the numeral from realizing the dominating genitive case features. Consequently, it surfaces in a default nominative form.[64]

(164)



The same pattern is found in accusative case environments since the genitive features percolating from the lower domain override accusative on KP.

The complementarity condition gives rise to some important implications. In particular, the interrupted homogeneous pattern is never predicted to appear with anything other than default case on the numeral. When the numeral assigns genitive and does not agree for case, it must realize a default form if declinable. Here, we can also draw a parallel with the upward homogeneous pattern of BCS. Apart from the form of the numeral, the upward homogeneous and interrupted homogeneous patterns look very similar. Since the Polish numerals are declinable (at least

64 See Klockmann (2017, 137) for evidence that nominative is the default case in Polish.

somewhat), as shown in Table 6.2, I suggest that the numeral should be analyzed as realizing case (see also Klockmann 2017). Similarly, Willim (2015) analyzes case on the higher numerals since Polish also contains indeclinable quantifiers such as *dużo* 'many/much' which have a different distribution from the higher numerals. Willim points out that these indeclinable quantifiers are not available in lexical case contexts, just as we saw with BCS in Chapter 4. If the BCS numerals were declinable or analyzed as a NOM/ACC syncretic form (see Chapter 4, n. 46), we would predict the interrupted homogeneous pattern.

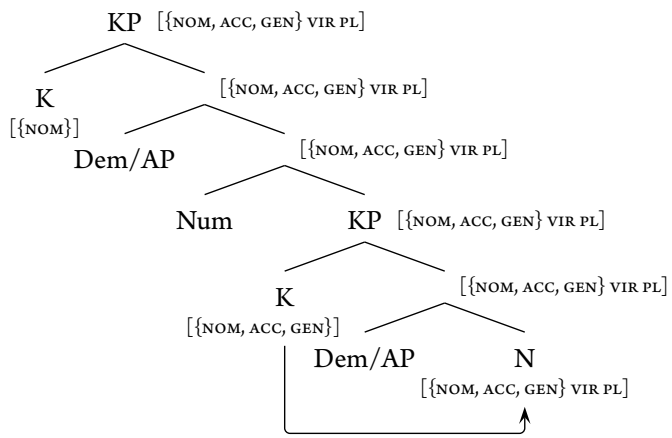
6.2.1.2 *Virile examples*

Since all Polish higher numerals have two forms, the virile examples also have two possible derivations. However, case syncretism, included in the gloss of (165), allows us to interpret the same concord pattern in both derivations and avoid any additional stipulations with virile examples. For consistency with non-virile examples as well as virile lower numeral constructions, I analyze this pattern as interrupted homogeneous. This characterization of the pattern distribution is also motivated by the fact that the speakers who do not allow alternation with non-virile examples only accept the interrupted homogeneous pattern.

(165) *t-ych* *pięc-iu* *wysok-ich*
this-ACC.VIR/GEN.PL five-NOM/ACC.VIR tall-ACC.VIR/GEN.PL
chłopc-ów
boy-ACC/GEN.VIR.PL
'these five tall boys'

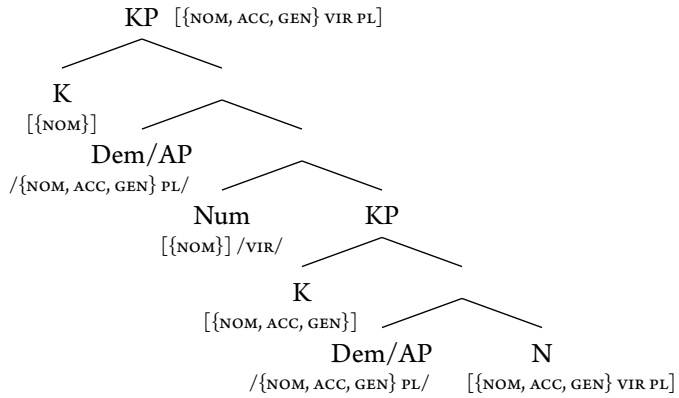
Let us begin with a genitive-filtering numeral. The derivation proceeds just as it did above with the non-virile example. As before, the numeral does not agree for case because it fails to be checked by K. The numeral's agreement slots are removed as a result, and the internally assigned genitive is able to percolate through the higher domain along with the ϕ-features of the noun.

(166)



In the post-syntactic mapping, genitive (virile) plural spells out on available terminals (as shown in Tables 6.3 and 6.4, the genitive plural form is syncretic across virile and non-virile gender). However, because of the complementarity of case assignment and case concord, the numeral cannot realize the dominating genitive features and instead realizes a default nominative form. I suggest that this default form spells out with *-iu* in the presence of [VIR], which is realized on the numeral in concord.

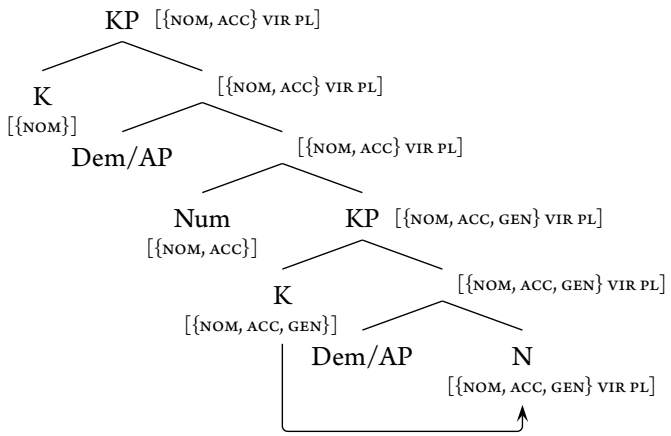
(167)



An accusative case environment would result in the same output since the internal genitive features would override the accusative features on KP.

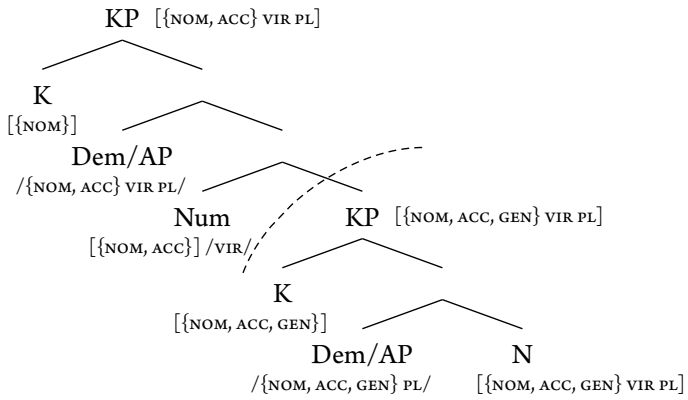
Let us now consider the alternative derivation in which the numeral is pre-specified with accusative. Again, this specification prevents agreement (due to an absence of agreement slots) but blocks upward percolation of the internally assigned genitive.

(168)



Proceeding to spellout, ACC.VIR.PL is realized in the higher domain and GEN.(VIR).PL in the lower domain. As the structure in (169) indicates, this derivation appears to result in the aligned heterogeneous pattern. However, case syncretism between ACC.VIR.PL and GEN.PL on the modifiers and numeral allows for some flexibility in terms of interpreting the resulting concord pattern. This is not problematic—in fact, taking advantage of the existing syncretism allows us to follow the simplest course for the derivation. We are able to avoid adding more stipulations to the grammar for virile examples, which are unavoidable in an agreement-based account (see §6.6.1). For consistency with virile lower-numeral examples, I maintain that interrupted homogeneous is the general structural-case pattern of virile higher numeral constructions.

(169)



6.2.2 *Lexical case environments*

In lexical case environments, the resulting concord pattern is always downward homogeneous regardless of the noun's gender, as shown in (170) and (171). Note

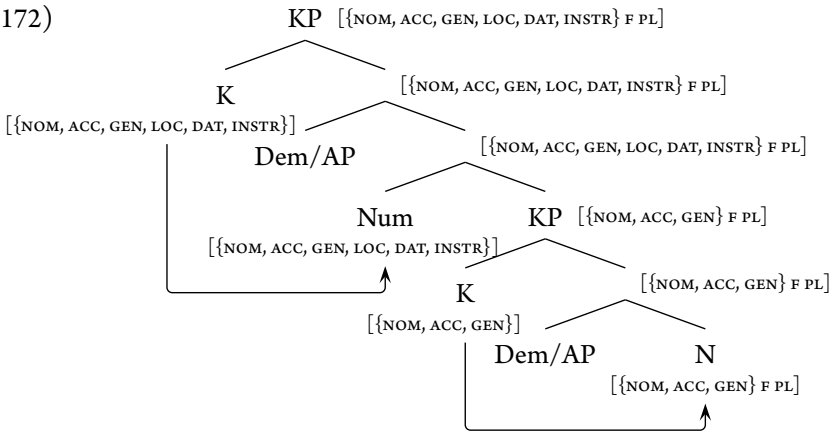
that in the examples below, the absence of gender in the gloss indicates 'non-virile'; the [VIR] feature is included in the gloss even though the resulting form is syncretic with non-virile in these contexts.

(170) *z* *t-ymi* *pięc-ioma* *wysok-imi* *żyraf-ami*
with this-INSTR.PL five-INSTR tall-INSTR.PL giraffe-INSTR.F.PL
'with these five tall giraffes'

(171) *z* *t-ymi* *pięc-ioma* *wysok-imi*
with this-INSTR.VIR.PL five-INSTR.VIR tall-INSTR.VIR.PL
chłopc-ami
boy-INSTR.VIR.PL
'with these five tall boys'

Let us first turn to the derivation of a non-virile example. Since we are dealing with a lexical case environment (instrumental in this example), the numeral and noun both agree for case. As introduced in Chapter 3, the Polish numerals agree in lexical case environments, assuming that the numeral's agreement slots are specified with {NOM, ACC, GEN}, which is checked by K; K's features are then copied to the numeral to percolate through the higher domain. The numeral's agreement slots necessarily block percolation of the genitive features from the lower domain, but ϕ-features percolate through the construction as usual.

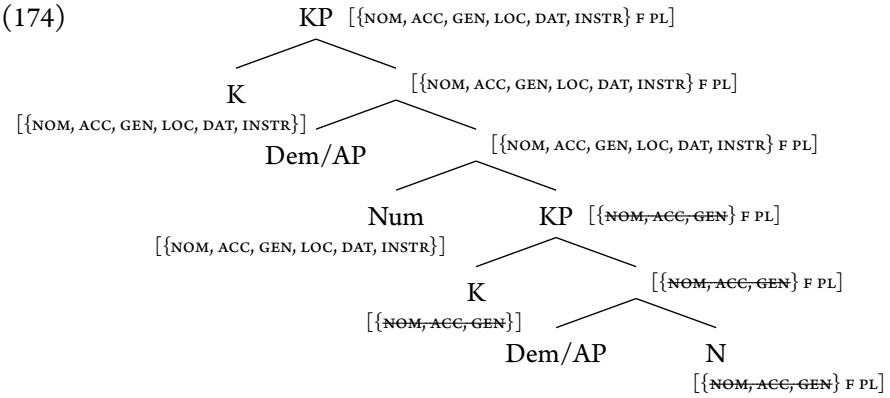
(172)



In the next stage, the feature co-occurrence restriction in (173) applies, resulting in the deletion of [NOM], [ACC], and [GEN] in the lower domain. As Chapter 3 pointed out, this feature co-occurrence restriction is identical to the one used in Russian lexical case environments.

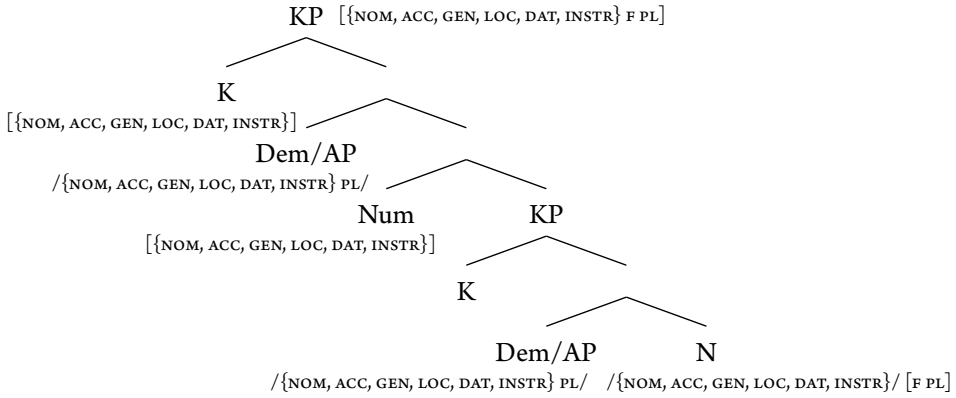
(173) [NOM], [ACC], [GEN] cannot occur on nodes dominated by [LOC]

(174)



In the final stage, instrumental plural is realized throughout the construction in an extended domain of concord.

(175)



The downward homogeneous derivations of Polish higher numerals proceed identically throughout lexical case environments. The hierarchical decomposition of case allows the feature co-occurrence restriction in (173) to apply across locative, dative, and instrumental case environments to derive the pattern (though see §3.2.1 in Chapter 3 for a discussion of the system's tolerance for violations of (173) in locative contexts). As discussed in Chapter 3, I avoid using impoverishment to derive the downward homogeneous pattern in genitive environments since genitive case results in both domains regardless.

We have so far only considered non-virile examples, but virile examples are derived identically since they are subject to the same feature co-occurrence restriction. I will therefore omit the derivation. On a final note, the insertion of a pre-specified accusative numeral rather than the filtering-genitive form would not

change the derivation. While genitive would be blocked from percolating into the higher domain, all [NOM], [ACC], and [GEN] features would be subject to impoverishment below the higher KP.

6.3 THE 1000+ CLASS

As discussed in Chapter 2, the Polish 1000+ class exhibits complex behavior that appears to fluctuate between nominal and numeral categories (Przepiórkowski 1999; Miechowicz-Mathiasen 2011; Klockmann 2017). It will be useful to refer to the declension paradigm in Table 6.5 in the following discussion. This paradigm parallels that of a regular non-virile noun (Swan 2002).

Table 6.5: Declension of 'thousand'

	SG	PL
NOM	tysiąc	tysiąc-e
ACC	tysiąc	tysiąc-e
GEN	tysiąc-a	tysiąc-y
LOC	tysiąc-u	tysiąc-ach
DAT	tysiąc-owi	tysiąc-om
INSTR	tysiąc-em	tysiąc-ami

When the 1000+ category is nominal, it displays the aligned heterogeneous pattern, as shown below.

(176) adapted from Miechowicz-Mathiasen 2011 (6, ex. (6b))

Ten	*tysiąc*	*list-ów*	*przyszed-ł*
this.NOM.M.SG	thousand.NOM.M.SG	letter-GEN.M.PL	come-PST.3M.SG

do Piotr-a.
to Peter-GEN

'This thousand letters came to Peter.'

(177) adapted from Przepiórkowski 1999 (195, ex. (5.337))

Te	*tysiąc-e*	*osób*	*już*
this.NOM.PL	thousand.NOM.M.PL	person.GEN.F.PL	already

przysz-ły.
come-PST.3PL

'These thousands of people already came.'

The derivation of (176) is provided in full in Chapter 2, and the derivation of (177) is nearly identical apart from [PL] specification on *tysiące*. Since the nominal derivation of 1000+ is so straightforward—both the 1000+ numeral and the noun agree for case, and both are fully specified with ϕ-features—I will not repeat it here and instead focus on the derivations in which 1000+ behaves as a higher numeral.

6.3.1 *1000+ numerals in structural case environments*

As a higher numeral, I argue that 1000+ alternates between the aligned heterogeneous pattern and the interrupted homogeneous pattern, as shown below. The numeral rather than nominal status of 1000+ can be ascertained from the default agreement that occurs on the verb in these examples, as default agreement is typical with higher numeral constructions (Klockmann 2017). In contrast to the regular higher numerals, however, 1000+ has both singular and plural forms.

(178) adapted from Przepiórkowski 1999 (195–6, ex. (5.335), (5.338))

a. *Te* *tysiąc* *osób* *już*
this.NOM.PL thousand.NOM.SG person-GEN.F.PL already
przysz-ło.
come-PST.N.SG
'The thousand people already came.'

b. *Te* *tysiąc-e* *osób* *już*
this.NOM.PL thousand-NOM.PL person-GEN.F.PL already
przysz-ło.
come-PST.N.SG
'These thousands of people already came.'

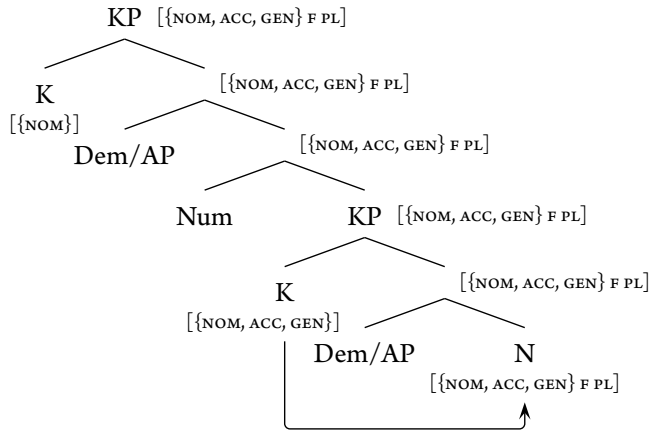
(179) adapted from Przepiórkowski 1999 (195–6, ex. (5.335), (5.338))

a. *T-ych* *tysiąc* *osób* *już*
this.GEN.PL thousand.NOM.SG person-GEN.F.PL already
przysz-ło.
come-PST.N.SG
'The thousand people already came.'

b. ? *T-ych* *tysiąc-e* *osób* *już*
this.GEN.PL thousand-NOM.PL person-GEN.F.PL already
przysz-ło.
come-PST.N.SG
'These thousands of people already came.'

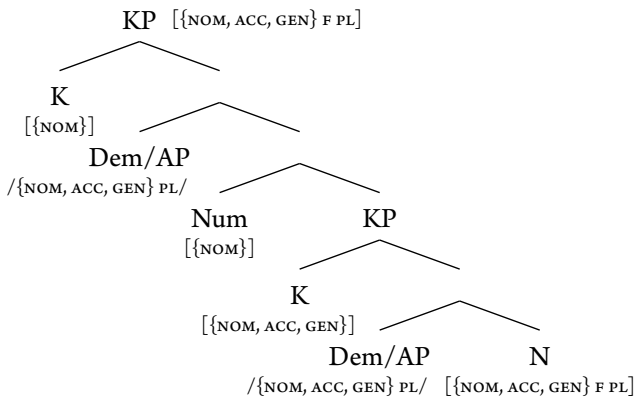
The aligned heterogeneous derivation was provided in Chapter 2 and relies on the numeral being specified with accusative, just as typical Polish higher numerals can be. Apart from the optional specification of [SG] or [PL] on the numeral, which I will delay discussing until §6.3.3, the derivation proceeds exactly as it did with the other higher numeral constructions outlined in §6.2.1 of this chapter. Likewise, the interrupted homogeneous pattern is derived identically to the genitive-filtering higher numerals that are unable to be checked. As shown in (180), the numeral does not agree for case, allowing the internally assigned genitive to percolate through the higher domain along with the ϕ-features of the noun.

(180)



In the next stage, GEN.PL spells out throughout the construction. However, given the complementarity of case assignment and case concord, the numeral is unable to realize the genitive features and instead surfaces in a default nominative form.

(181)



6.3.2 *Lexical case environments*

In lexical case environments, the pattern is always aligned heterogeneous (Swan 2002). Since other Polish higher numeral constructions are consistently downward homogeneous in lexical case environments, this seems to indicate that the 1000+ category remains nominal in lexical case environments. For a simple solution, albeit one that involves look-ahead, it may be that only nominal 1000+ can be inserted in lexical case contexts. A more involved but perhaps better solution would require the addition of a numeral-denoting feature to the feature co-occurrence restriction in (173) so that it is only violated in numeral contexts, thus preventing the downward homogeneous derivation with the nominal form of 1000+.

It is not immediately clear why this difference in behavior exists for 1000+, but it can perhaps be attributed to the diachronic development of the category. As many have observed, 1000+ seems to be in the process of 'numeralization' (see Przepiórkowski 1999; Klockmann 2012, and references therein). This parallels the earlier transition of the higher numerals, which historically originated as nouns but have since evolved into a distinct category (Przepiórkowski 1999; Miechowicz-Mathiasen 2011). Certain properties of 1000+ nominals are seemingly being reanalyzed on par with the higher numerals, though the availability of the aligned heterogeneous pattern with regular subject-verb agreement suggests that 1000+ still retains some of its nominal properties and has not yet fully numeralized. Despite this transitional status, the preceding derivations have shown that it is possible to posit a technical analysis of the 1000+ patterns in the synchronic grammar.

6.3.3 *Remaining puzzles*

Klockmann (2017) points out that examples such as (182) are possible.

(182) adapted from Klockmann 2017 (121, ex. (61))

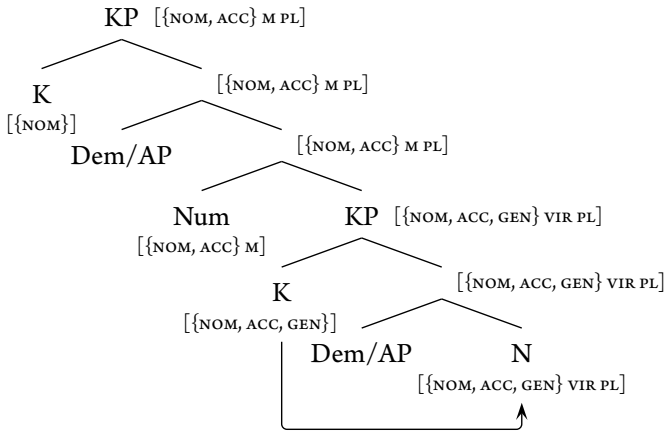
T-e	*tysiąc/tysiąc-e*	*chłopc-ów*
this.NOM.PL	thousand.NOM.SG/thousand.NOM.PL	boy-GEN.VIR.PL

spa-ło.
sleep-PST.N.SG
'These thousand/thousands of boys slept.'

Here, the demonstrative realizes a non-virile nominative plural form, which is typically observed in the aligned heterogeneous pattern of higher numerals. The numeral also realizes nominative, but the lower domain is genitive plural with a virile noun. The distribution of features in (182) is therefore unexpected because [VIR] is predicted to percolate and be realized in the higher domain. To address this example, I propose to slightly refine the characterization of the numeral form of 1000+ as we have seen it thus far. Since the category appears to be in the process of numeralization, I hypothesize that when 1000+ functions as a numeral, it is optionally specified with non-virile masculine gender (characteristic of its nominal form).

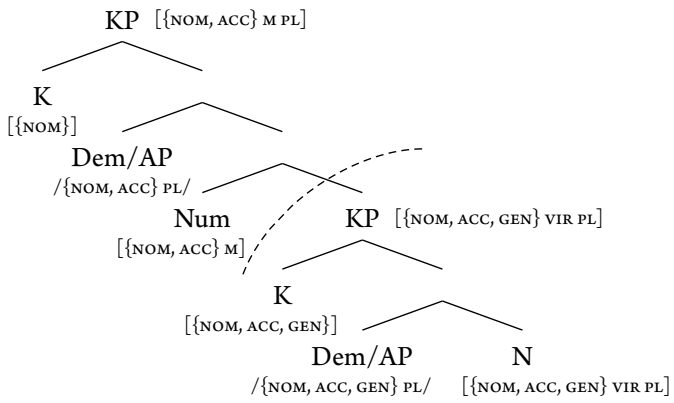
Given these assumptions, the derivation of (182) proceeds as follows. The numeral is specified with [M] and {NOM, ACC}, which percolate through the higher domain along with [PL] from the noun.

(183)



In spellout, the higher domain realizes accusative non-virile plural, given the masculine feature of the numeral, while the lower domain realizes genitive (virile) plural.

(184)



If, on the other hand, the numeral's gender is not specified, then the result with a virile noun is the interrupted homogeneous pattern. This result obtains whether or not the numeral is specified with accusative because of the ACC.VIR/GEN.PL syncretism. [VIR] from the noun would percolate through both domains, and either GEN.VIR.PL or ACC.VIR.PL would be realized in the higher domain.

The preceding discussion considers the various outcomes that arise with optional [M] and accusative specification when the numeral quantifies a virile noun, but what of non-virile examples? If the noun is non-virile, then the outcome of the derivation is dependent on the numeral's feature specification—aligned heterogeneous when pre-specified with accusative case and interrupted homogeneous when it contains a genitive filter, as we have seen with the regular higher numerals. Whether or not the numeral is specified for gender, non-virile features will result in the higher domain.

I now return to the appearance of [SG] or [PL] forms of 1000+ in example (182), with implications for the derivations in §6.3.1. This property differs from regular higher numerals but plausibly follows from the historical development of the 1000+ category to its current status. When 1000+ functions as a numeral, it is not possible to simply say that it realizes number features in concord because 1000+ itself is countable; therefore, when number appears on 1000+, it must be interpreted (see Landau 2016). This implies that 1000+ as a numeral is specified with a number feature, in contrast to typical higher numerals. When a numeral is specified with certain features, they are expected to percolate through the higher domain. If [PL] on the numeral percolates through the higher domain to be realized in concord, the correct feature distribution is derived. However, if 1000+ is instead singular, then elements in the higher domain are expected to surface in a singular form, contrary to what we see in (182).

Given this situation, it may be that when 1000+ functions as a numeral, its number feature cannot percolate and consequently does not block percolation of features from the lower domain. In working toward a potential explanation, one could take the nominal version of 1000+ as the basic form and derive the numeral version from it with the addition of a zero marker. Perhaps this marker blocks percolation of number, since typical higher numerals are not specified with number, but allows for its interpretation. Such a solution seems reasonable in light of the numeralization of the 1000+ category.

6.4 LOWER NUMERAL CONSTRUCTIONS

The concord patterns of Polish lower numeral constructions are also subject to effects of gender. While they are consistently downward homogeneous in lexical case environments, lower numeral constructions display alternating patterns in structural case environments. In contrast to the higher numeral constructions, it is the virile examples that vary between two possible patterns: downward homogeneous and interrupted homogeneous. Non-virile examples are consistently downward homogeneous across all case environments. We will see the two patterns of the virile examples can be explained by positing two forms of the lower numeral—one that is bare and another that functions more like a higher numeral. §6.4.1.2 will expand on the motivations and implications of this claim.

In investigating the patterns of the lower numerals, the following declension paradigms for 'two,' 'three,' and 'four' will be useful.

Table 6.6: Declension of *dwa* 'two'

	VIR	NON-VIR	FEM
NOM	dwaj/dwóch	dwa	dwie
ACC	dwóch	dwa	dwie
GEN	dwóch	dwóch	dwóch
LOC	dwóch	dwóch	dwóch
DAT	dwom	dwom	dwom
INSTR	dwoma	dwoma	dwiema

Table 6.7: Declension of *trzy* 'three' and *cztery* 'four'

	VIR	NON-VIR
NOM	-ej/-ech	-y
ACC	-ech	-y
GEN	-ech	-ech
LOC	-ech	-ech
DAT	-em	-em
INSTR	-ema	-ema

6.4.1 *Structural case environments*

The following subsections begin by discussing the non-virile examples, which always display the downward homogeneous pattern. We will see that these are easily derived under the assumption that the numeral does not assign case. The virile examples alternate between the downward homogeneous and upward homogeneous patterns. This alternation is attributed to two different forms of the numeral, a bare form (which also occurs in the non-virile examples) and a form that selects [VIR] and assigns genitive case. The two patterns are associated with distinct registers (Swan 2002), which provides motivation for this analysis.

6.4.1.1 *Non-virile examples*

The downward homogeneous pattern of the non-virile examples is exemplified in (185).

(185) *te* *dw-a* *głodn-e* *tygrys-y*
this.NOM.PL two-NOM hungry-NOM.PL tiger-NOM.M.PL
'these two hungry tigers'

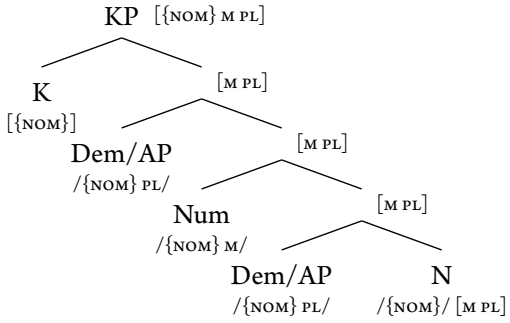
In the majority of examples, Polish lower numeral constructions do not appear to contain any evidence of genitive case assignment (none of the elements in the lower domain are genitive) or the paucal class feature, in contrast to lower numeral constructions in Russian and BCS. These observations motivate the assumption that Polish lower numerals do not assign case and are not specified with [PC]. However, I still assume that the examples have an underlying structure with two

syntactic domains because of the acceptability of a low demonstrative without any change in case distribution, as shown in (186).[65]

(186) *dw-a* *te* *głodn-e* *tygrys-y*
two-NOM this.NOM.PL hungry-NOM.PL tiger-NOM.M.PL
'two of these hungry tigers'

Nevertheless, the derivation is very simple. Since the pattern was covered in Chapter 3, this section will provide a condensed version of the derivation. The external case (nominative in this example) percolates to KP, while the ϕ-features of the noun also percolate through the construction. Since genitive case is not assigned, the features of KP are simply realized throughout in concord. As discussed in Chapter 3, the noun's case features could be the result of either concord or agreement with K. It goes without saying that the pattern would be derived the same way in accusative case environments.

(187)



The realization of gender on the numeral depends on whether the numeral is 'two' versus 'three' or 'four.' As shown above in Tables 6.6 and 6.7, 'two' distinguishes between virile, non-virile, and feminine gender. 'Three' and 'four' have only virile and non-virile forms just as plural demonstratives and adjectives only differentiate between virile and non-virile.

6.4.1.2 *Virile examples*

The virile examples display both downward homogeneous and interrupted homogeneous patterns in structural case environments.[66] The two patterns are exempli-

65 Chapter 1 (§1.2.2) mentioned that the numeral 'one' behaves as an adjective in the languages covered in this thesis. This analysis is relatively standard in the literature, but it may not be entirely accurate, at least according to the criteria set in this thesis. 'One' in fact allows a low demonstrative, which suggests an analysis similar to that of the Polish non-virile lower numeral examples.

66 Technically, this pattern alternation is only visible in nominative case environments. While it may still be present in accusative case environments, the ACC.VIR/GEN.PL syncretism makes it impossible to tell which pattern is realized.

fied below. As with the other examples, a demonstrative is allowed above or below the numeral with no effect on the concord pattern. This motivates analyzing both patterns with two syntactic domains.

(188) a. *ci* *dw-aj* *wysoc-y* *chłopc-y*
this.NOM.VIR.PL two-NOM.VIR tall-NOM.VIR.PL boy-NOM.VIR.PL
'these two tall boys'

b. *dw-aj* *ci* *wysoc-y* *chłopc-y*
two-NOM.VIR this.NOM.VIR.PL tall-NOM.VIR.PL boy-NOM.VIR.PL
'two of these tall boys'

(189) a. *t-ych* *dw-óch* *wysok-ich* *chłopc-ów*
this-GEN.VIR.PL two-NOM.VIR tall-GEN.VIR.PL boy-GEN.VIR.PL
'two of these tall boys'

b. *dw-óch* *t-ych* *wysok-ich* *chłopc-ów*
two-NOM.VIR this-GEN.VIR.PL tall-GEN.VIR.PL boy-GEN.VIR.PL
'two of these tall boys'

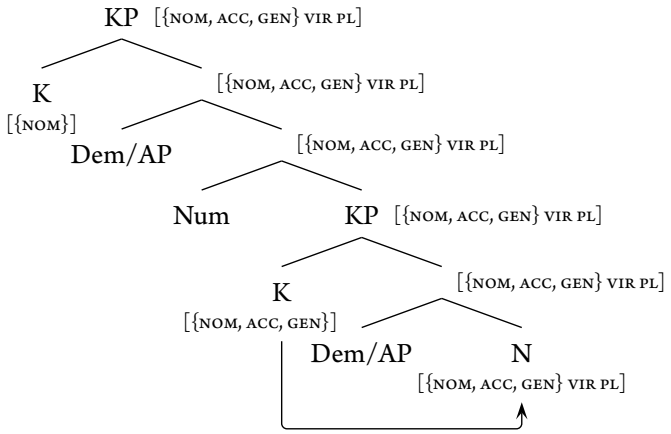
To differentiate the lower numerals from the higher numerals, I assume that the selecting form of the lower numerals is never pre-specified with accusative, despite other similarities to the higher numeral derivations. That being said, because we are dealing with virile examples that have ACC.VIR/GEN.PL syncretism, the presence or absence of {NOM, ACC} on the selecting numeral would not affect the outcome of the derivation. The downward homogeneous pattern in (188) is derived identically to the non-virile example in (186). Here, I assume that the bare form of the numeral is used, so genitive case is not assigned. In terms of the interrupted homogeneous pattern, I suggest that a special form of the numeral selects [VIR] and assigns genitive case, ultimately deriving the pattern. The gender specification is necessary since this pattern only obtains with virile lower numeral constructions. Genitive assignment is required to explain the genitive case that appears in the example.[67] While it may seem stipulative to assume two forms of the lower numerals, the patterns observed in (188) and (189) are associated with distinct registers. The downward homogeneous pattern is more common in written language, while the interrupted homogeneous pattern is typical of spoken language (Swan 2002;

67 Alternatively, some analyses, particularly those that adopt the Accusative Hypothesis, treat examples like (189) as accusative given the ACC.VIR/GEN.PL syncretism (Przepiórkowski 1996, 1999; Franks 2002). In the current system, deriving accusative would require more effort than analyzing the example as genitive, so while I adopt some insights of the Accusative Hypothesis elsewhere, I do not here.

Klockmann 2012). Each register has a single specification and a single grammar, though some speaker variation results due to the coexistence of the grammars.

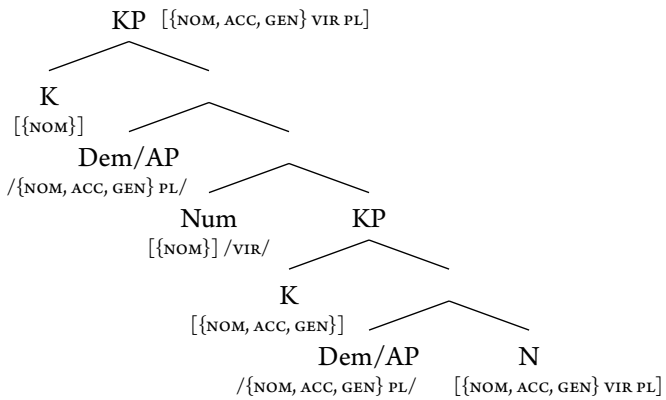
Let us proceed through the derivation of the interrupted homogeneous pattern. As with the higher numerals, I assume that the [VIR]-selecting form of the lower numerals does not agree in structural case environments. Note that the outcome of the derivation and distribution of patterns across case environments is not contingent upon whether the [VIR]-selecting numeral is also a filtering-genitive form that fails to be checked, or whether it simply lacks agreement slots. For simplicity, and for consistency among lower numeral derivations, I adopt the latter analysis. Thus, the genitive assigned to the lower domain is able to percolate through the higher domain, ultimately overriding the nominative feature on KP. The ϕ-features of the noun also percolate.

(190)



As before, the features of KP spell out on available terminals. Given the complementarity of case assignment and case concord, the numeral is not able to realize the dominating genitive features. Like the higher numeral derivations, the numeral resorts to a default nominative form that spells out as *-óch/-ech* in the presence of [VIR].

(191)



The availability of these two patterns with virile examples requires an important clarification. Notice that in (188) and (189), the form of the numeral differs. With the downward homogeneous pattern in (188), 'two' spells out as *dwaj* ('three' and 'four' would spell out as *trzej* and *czterej*). With the interrupted homogeneous pattern in (189), the form is *dwóch* (or *trzech*, *czterech*). The distinction between written and spoken registers again plays a key role. In both derivations, the numeral spells out NOM.VIR features, either through concord or a default mechanism, but the numeral's form is exclusive to the individual register. In the written register, the spellout of these features results in the *-aj/-ej* form of the numeral. In the spoken register, the *-aj/-ej* form does not exist, and the *-óch/-ech* form results instead.[68]

6.4.2 *Lexical case environments*

The lower numerals consistently display downward homogeneous concord in lexical case environments.

(192) *z* *t-ymi* *dw-oma* *głodn-ymi* *tygrys-ami*
with this-INSTR.PL two-INSTR hungry-INSTR.PL tiger-INSTR.M.PL
'with these two hungry tigers'

(193) *z* *t-ymi* *dw-oma* *wysok-imi* *chłopc-ami*
with this-INSTR.PL two-INSTR.VIR tall-INSTR.PL boy-INSTR.VIR.PL
'with these two hungry tigers'

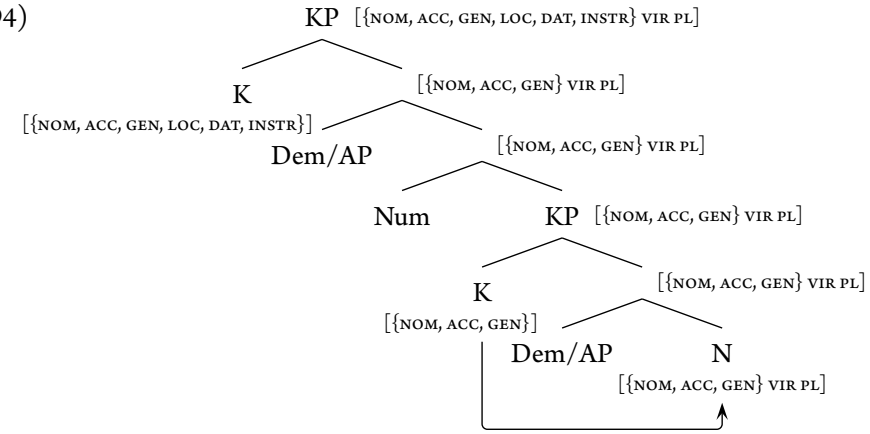
The derivation of a bare numeral was provided in Chapter 3 and is derived identically to (187). Since the numeral does not assign genitive case, the features

68 It is also possible that the spellout of features is consistent, while the spellout of the numeral root differs between registers.

on KP are able to be realized throughout the construction without the help of impoverishment. Note that like the higher numeral constructions, we could assume that these lower numerals also agree for case in lexical case contexts, and the derivation would not change. However, since the bare form of the numeral parallels the behavior of an adjective, I have assumed that it realizes case in concord rather than agreement.

The [VIR]-selecting form of the numeral also does not participate in agreement (though as mentioned above, the success of the derivation does not depend upon this assumption). This allows upward percolation of genitive into the higher domain, stopping one node below KP.

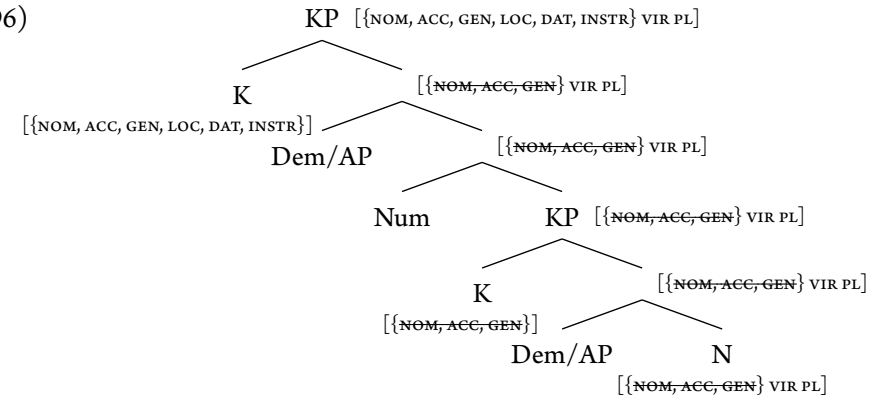
(194)



In the post-syntactic mapping, impoverishment applies to resolve violations of the feature co-occurrence restriction in (173), repeated below as (195).

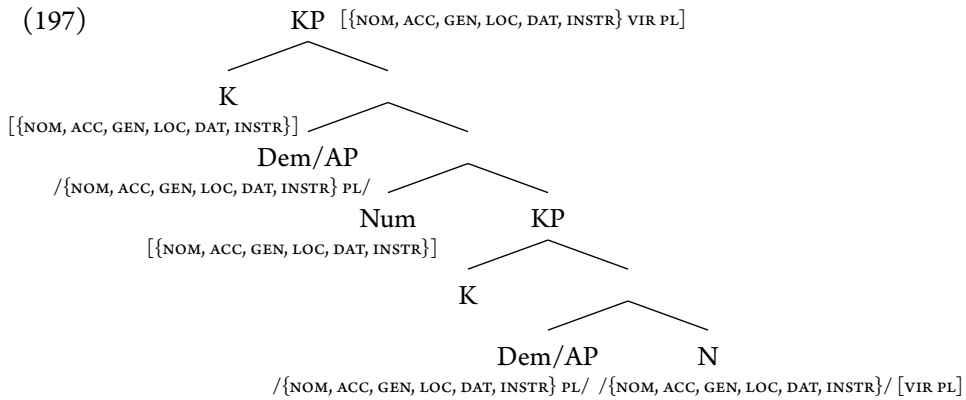
(195) [NOM], [ACC], [GEN] cannot occur on nodes dominated by [LOC]

(196)



As we have seen multiple times before, impoverishment opens up the lower domain for realization of the dominating features in concord.

(197)



While this derivation has proceeded in an instrumental case environment, no changes are required to address both locative (though as we have seen before, the system tolerates violations of (195)) and dative environments. In genitive case contexts, the feature co-occurrence restriction in (195) is not applicable, and the derivation proceeds without impoverishment.

6.5 POLISH FEATURE CO-OCCURRENCE RESTRICTIONS

At this point, the full range of Polish patterns has been derived. In contrast to both Russian and BCS, the Polish derivations include only one feature co-occurrence restriction, repeated in (198).

(198) *Polish feature co-occurrence restriction*

[NOM], [ACC], [GEN] cannot occur on nodes dominated by [LOC]

The relative lack of feature co-occurrence restrictions in Polish is likely due to the declinability of the lower numerals, as well as the absence of paucal in lower numeral constructions. Chapter 7 will revisit the individual feature hierarchies of the three languages to compare and contrast and ultimately draw some universal conclusions.

6.6 EVALUATION OF COMPETING ANALYSES

While the patterns of Polish numeral constructions present a complicated picture, the concord-as-spellout approach provides a relatively straightforward analysis. Moreover, the account of Polish coheres with the analyses of Russian and BCS. The set of hypotheses outlined in Chapter 1 is maintained, and language variation

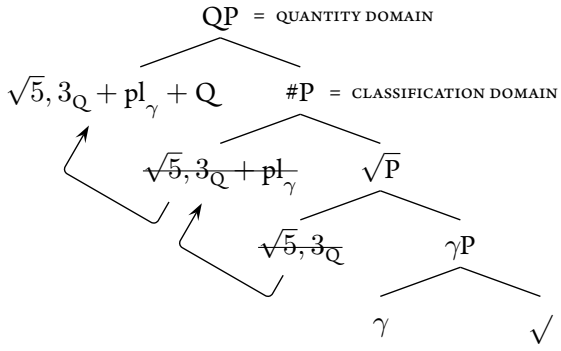
is primarily attributed to the semi-lexical properties of the numeral. This section reviews some aspects of two alternative accounts of Polish. In this review, I highlight certain complexities of the alternatives as well as the challenges they encounter when extended beyond Polish.

6.6.1 *Klockmann 2017*

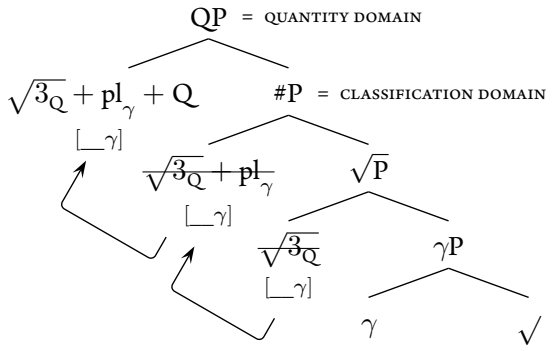
Klockmann's (2017) thesis on Polish numerals provides a useful comparison with the current system of concord because the account is primarily agreement based. Klockmann's theory captures the data and provides valuable insights, particularly in terms of the semi-lexical nature of numerals. The resulting account also does well in preserving the basics of agreement (c-command and one-to-one mapping). However, we will see that this comes at the cost of adding movement, which is avoidable on the concord account. Klockmann's analysis also encounters some complications when we consider the concord patterns of other languages.

Klockmann covers the full range of Polish numerals, including lower, higher, and 1000+, but I will restrict this discussion to the first two classes. She assumes that neither class can project its own number or gender. The lower numerals optionally carry a gender probe (which is obligatory if the numeral quantifies a virile noun). So far, the assumptions are not very different from those in this thesis, though I assume that when the numeral realizes gender, it is determined through concord rather than agreement. As shown in (199) and (200) (adapted from Klockmann 2017, 178, ex. (42), (43)), the numeral is merged between the number projection (#P) and gender projection (γP) of the noun. The numeral subsequently moves to derive the correct word order since it would otherwise surface below any adjectives. Klockmann points out that the low position of the numeral additionally explains the inability of Polish numerals to combine with *pluralia tantum* nouns, which would necessarily project number immediately, below the numeral. While this built-in ability to deal with *pluralia tantum* examples appears to be an added bonus of the account, the low base position of the numeral violates Universal 20 (Cinque 2005). Although the numeral subsequently moves to derive the correct word order, Cinque (2005) argues that in deriving the attested orders of demonstrative, numeral, adjective, and noun, all movements must include the noun (see also Abels and Neeleman 2012). The original low position and subsequent pied-piping of the numeral are required to maintain a one-to-one mapping of features in agreement, as well as preserve consistency in the directionality of agreement, but this is avoided altogether in the concord account.

(199) *Probe-less numeral*



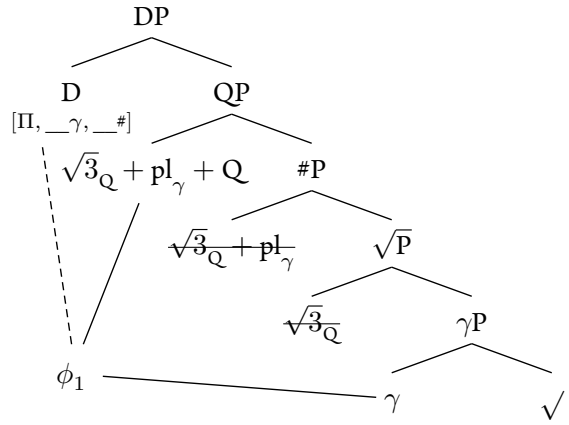
(200) *Gender-probing numeral*



In general, gender-probing numerals result in successful agreement throughout the construction. This derives the downward homogeneous pattern of lower numerals. If no gender probe is present (with higher numerals and lower numerals that quantify a virile noun), verbal agreement is default and the numeral construction is subject to case alternation.

Looking more closely at gender-probing lower numerals, feature sharing occurs as soon as the numeral is merged. This results in the numeral matching the noun's gender. The structure continues to be built, first with the number projection of the noun and then the Q projection, the latter triggering movement of the numeral. Because of the feature sharing triggered by the gender probe, the resulting structure contains only a single ϕ-bundle of number and gender features. The single ϕ-bundle means that the structure does not meet the requirements for genitive case assignment, which requires the presence of two ϕ-bundles. D is then merged to complete the structure and probes for gender and number, as shown in (201) (adapted from Klockmann 2017, 182, ex. (52)).

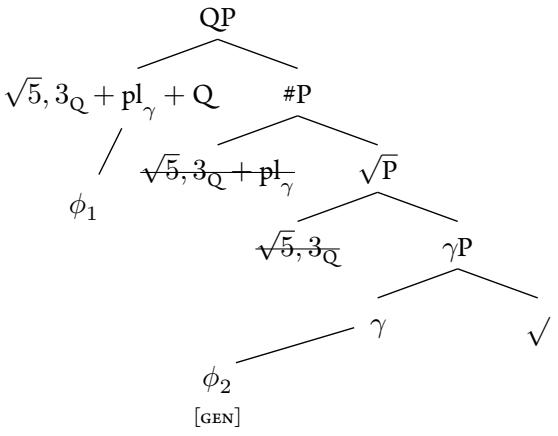
(201) *DP-merger and agreement*



In subject position, the ϕ-completeness of D is sufficient for successful subject-verb agreement. In a lexical case environment, the ϕ-bundle is assigned the appropriate case, which is then realized on associated terminals. In this sense, Klockmann's account resembles the concord approach where local terminals realize case from the dominating node. By contrast, the concord account allows all feature types to be realized on local terminals via the dominating node, which eliminates the need for movement of the numeral.

Turning to the probe-less numerals, structure building is the same except that the numeral lacks a gender probe. Consequently, the gender and number features of the noun are not connected via feature sharing and are not located adjacently in the structure. The result is that these features cannot be unified into a single ϕ-bundle as before. They form two separate deficient bundles, which triggers genitive case assignment as shown in (202) (adapted from Klockmann 2017, 184, ex. (56)).

(202) *Feature sharing in probe-less numerals*



Once the structure merges with D, D probes for either number or gender. If it probes for number, the result is the aligned heterogeneous pattern. If it probes for gender, the result is the interrupted homogeneous pattern. Since both ϕ-bundles are incomplete, subject-verb agreement is necessarily default. In contrast to my account, Klockmann hypothesizes that the non-virile nominative/accusative form of modifiers is default. Lacking stronger evidence, this conclusion is primarily based on examples such as (182) where a 1000+ numeral appears with a virile noun, non-virile nominative/accusative plural demonstrative, and default agreement on the verb. Analyzing the demonstrative's features as default (i.e., suggesting that agreement has failed) appears to be the only that way Klockmann's agreement-based account can explain the pattern. By contrast, the concord account does not have to appeal to this default argument; the form of the modifier follows naturally.[69] In the final stage of Klockmann's account, the numeral receives case through a dependent case mechanism (ϕ_1 is assigned either nominative or accusative depending on the numeral's position in the sentence).

In Klockmann's analysis, we still have yet to fully account for the form of the numeral in probe-less examples, which despite the lack of a gender probe, still realizes alternate forms according to the noun's gender (e.g., *pięć* vs. *pięciu*). This is achieved with the help of a morphological rewrite rule, which changes the nominative case of the numeral to genitive when the numeral combines with virile plural features. However, Klockmann points out that the rewrite rule must target the case value of the numeral's ϕ-bundle rather than the numeral itself. This is because in virile examples, there is no case alternation observed with the demonstrative (i.e., only the interrupted homogeneous pattern results). If the numeral varies its case form, so should an agreeing demonstrative, which incorrectly predicts the availability of two patterns. If the rewrite rule instead targets a ϕ-bundle, then all terminals are affected, predicting the correct distribution of patterns. It is clear that this rule is necessary in Klockmann's account, but it is nonetheless very powerful. By contrast, the concord account does not require case rewrite to accommodate the virile derivations. For higher numerals, the derivation proceeds the same in both virile and non-virile contexts. Although the numeral's feature specification results in two possible derivations for each gender, the concord account avoids additional stipulations by taking advantage of syncretism. With regard to lower numerals,

69 To account for the feature distribution in 1000+ examples like (182), the concord account does require some speculation regarding the transitional status of the 1000+ category, but this is motivated by drawing a parallel to the previous transition of the regular higher numerals from their initial nominal status. The distribution of features then falls out naturally from concord.

variation in the distribution of patterns is again addressed with an assumption about the numeral's properties.

Finally, Klockmann examines probe-less numerals in lexical case contexts. Her analysis incorporates case stacking, drawing on insights from Pesetsky (2013). In the probe-less structure, genitive case is assigned because of the two bundles, but case stacking explains the homogeneous appearance of lexical case. The last-assigned case surfaces and prevents genitive from being realized. While Klockmann's account derives the observed concord patterns, which pose many complications in their own right, there is a certain amount of complexity inherent in an agreement-based analysis. This includes movement of the numeral, assumptions regarding default forms, and added stipulations for virile derivations. These complications disappear under the concord analysis.

In considering directions for future research, Klockmann specifically examines some of the differences between Polish and BCS numeral constructions and their associated concord and agreement patterns. In this preliminary investigation, she suggests that the status of genitive must differ between the two languages. The gist of the argument is as follows. The feature distribution in BCS concord patterns suggests that BCS numerals are featureless. However, if the numeral has no ϕ-bundle, then the dependent case mechanism should not be triggered, and genitive case is not assigned. This cannot be, since genitive appears throughout BCS numeral constructions. Moreover, there is the problematic behavior of the BCS genitive in lexical case environments. Klockmann takes this as evidence that the status of genitive or the case mechanism may differ between BCS and Polish. Alternatively, the concord system developed in this thesis allows for universality in the case system, concentrating variation in the properties of the semi-lexical numeral.

6.6.2 *Lyskawa 2020*

Lyskawa's (2020) analysis provides another informative comparison as it is not an agreement-based system. In fact, Lyskawa's account adopts insights from Norris (2018b) and as such bears some resemblance to the theory of concord developed in this thesis. However, our accounts differ with respect to the status of the numeral and case licensing in numeral constructions.

In contrast to the current proposal which analyzes the numeral as a semi-lexical head, Lyskawa argues for a phrasal numeral. She draws upon examples of extraction as well as complex numerals to support the phrasal analysis. However, I will show that these do not pose a problem for the head analysis.

It is widely known that Slavic numeral constructions can undergo left-branch extraction (LBE) (see Bošković 2005; Miechowicz-Mathiasen 2011; Despić 2015; Fanselow and Féry 2013; Bondarenko and Davis, To appear; a.o.). The example below comes from Polish, but the same phenomenon is also found in BCS and Russian.

(203) adapted from Willim 2015 (329, ex. (25))

Jak	*mam*	*mało*	*czasu,*	*nawet*	*dwadzieścia*	*potrafię*	*poprawić*
when	have.1SG	little	time	even	twenty.ACC	can.1SG	mark

~~*<dwadzieścia>*~~	*prac*	*w*	*godzinę.*
twenty.ACC	paper.GEN.F.PL	in	hour

'When I do not have much time, I can mark as many as twenty papers in an hour.'

Following Bošković (2005), Lyskawa maintains that only phrases can undergo LBE, and therefore, numerals must be phrasal. However, while the sub-extraction approach to LBE does require the extracted element to be phrasal (Bošković 2005), two other approaches—scattered deletion and remnant movement—are compatible with a head analysis. In scattered deletion, the full numeral construction would be moved, with deletion of distinct parts of both copies (Fanselow and Féry 2013; Bondarenko and Davis, To appear). Remnant movement, would involve fronting of the numeral construction containing a trace of the constituent that has not been extracted. Neither approach relies on the numeral being phrasal.[70] Lyskawa also demonstrates, however, that a head noun cannot be separated from its complement through LBE, in contrast to numerals; the phrasal status of numerals accounts for this difference in behavior. However, we have seen elsewhere that the semi-lexicality of numerals contributes to differences in behavior between numerals and nouns. In particular, others have independently argued that semi-lexical categories create more transparent boundaries between projections than do nouns (Vos 1999). It therefore seems plausible that the difference in extractability could also be attributed to the numeral's semi-lexical status.

70 Despić (2015) has argued against scattered deletion for BCS on the basis of quantifiers retaining narrow scope after LBE, but Bondarenko and Davis (To appear) demonstrate that parallel examples in Russian may be accounted for based on the availability of a contrastive reading. Similarly, Neeleman and van de Koot (2012) have argued that contrastive fronting does not extend scope. Murphy (2021) ultimately argues against remnant movement as a general approach to LBE because LBE does not conform to Barss's Generalization, which states that a phrase reconstructs only if it overtly c-commands its trace (Barss 1986). These arguments notwithstanding, the analysis of numeral constructions proposed in this thesis does not provide an argument in favor of either scattered deletion or remnant movement over the other.

In further support of the phrasal analysis, Lyskawa refers to complex numerals, such as those below.

(204) adapted from Lyskawa 2020 (12, ex. (29))
pięć-dziesiąt *czarownic*
five-ten.GEN witch.GEN.PL
'fifty witches'

(205) adapted from Lyskawa 2020 (13, ex. (30b))
pięć-dziesiąt *dw-ie* *czarownic-e*
five-ten.GEN two-NOM.F witch-NOM.PL
'fifty-two witches'

These examples are used to show that numerals can be expanded in the same way as phrases. However, I see no reason why the head analysis cannot be compatible with complex numerals. I will assume that multiplicative complex numerals such as (204) are formed through complementation, and additive complex numerals such as (205) are formed via conjunction (Ionin and Matushansky 2006). With regard to multiplicative numerals, we can assume the same structure as the one adopted thus far (see note 18 in Chapter 2 for further discussion). As for examples like (205) containing an additive numeral, I assume a conjoined structure with PF-deletion in the first conjunct (Ionin and Matushansky 2006).[71] Thus, (205) would roughly be represented as [[fifty ~~witches~~] (and) [two witches]].[72] Given this structure, it is therefore not surprising that 'two' does not realize the genitive case assigned by 'fifty,' since the numerals are located in separate conjuncts. Likewise, 'witch' realizes the externally assigned nominative case rather than genitive.

71 Lyskawa also shows that numerals can be coordinated with *coś* 'something' to denote an approximate quantity.

(i) adapted from Lyskawa 2020 (15, ex. (36))
pięć *czy* *coś* *czarownic*
five or something witch-GEN.PL
'five or so witches'

Since **coś czarownic* is ungrammatical, Lyskawa argues that this coordination cannot result from PF-deletion. While this is a valid point, *coś* seems to result in an idiomatic structure when coordinated with the numeral. I therefore do not find it surprising that the syntactic analysis may differ from that of the complex numerals. Lyskawa also considers *coś* to be phrasal and reasons that if the numeral is also a phrase, the fact that it can be coordinated with another phrase is natural. While this is reasonable, she does not motivate the phrasal status of *coś*. There is also independent evidence showing that heads can coordinate with other heads (Borsley 2005).

72 Ionin and Matushansky (2006) assume a binary branching structure for coordination, but for the purposes of the current discussion, I remain agnostic as to whether coordination should be analyzed with a binary branching or a flat structure.

As a result of the phrasal analysis of numerals, case licensing works differently in Lyskawa's account than it does in the current proposal. Following Norris (2018b), Lyskawa relies on the timing of case assignment. Genitive is assigned internally upon completion of the extended projection if no other lexical case has been assigned. Structural cases are assumed to be assigned later (after genitive has already been assigned internally). Given this general behavior of case licensing, it is unclear how the range of patterns in a language like BCS would be derived.

We have also seen that the Polish patterns are complicated in their own right. Lyskawa subscribes to the Accusative Hypothesis, contending that the case in the numeral constructions is accusative to explain the occurrence of default subject-verb agreement. Borrowing insights from Miechowicz-Mathiasen (2012), Lyskawa adopts a null-preposition analysis to explain the source of accusative in aligned heterogeneous examples. The interrupted homogeneous pattern has a different underlying structure and is derived via movement of the higher modifier from its base position below the numeral. Lyskawa motivates this movement through a discussion of differing interpretations between aligned heterogeneous and interrupted homogeneous examples; according to her consultants, a higher genitive modifier in interrupted homogeneous examples is often interpreted as modifying the noun rather than the whole numeral construction. However, this conclusion seems somewhat tenuous. My own consultants indicate that the scope of a high genitive modifier is not necessarily limited to the noun (see also Willim 2015). Moreover, the required movement of the higher modifier from a base position below the numeral violates Universal 20, similar to Klockmann's (2017) analysis.

My concord account avoids these complications with the interrupted homogeneous pattern, as well as those posed by the null preposition in the aligned heterogeneous examples. Genitive of negation data pose a slight challenge for the null-preposition analysis, as the genitive of negation does not appear in regular PPs but does in numeral constructions. However, Lyskawa contends that the genitive of negation data may be explained by arguing that the null preposition is defective and potentially merges with the head it selects (see also Miechowicz-Mathiasen 2011). This allows the genitive of negation to override the accusative assigned by the null preposition. A second challenge is posed by the fact that regular PPs can serve as nominal modifiers, while numeral constructions do not have this capacity. Lyskawa reasons that this may be addressed by making reference to the structure—the numeral, rather than the entire numeral construction, could be a complement of the preposition. This latter option entails assuming the existence of complex prepositions since typical overt prepositions can override the accusative assigned by

the null preposition in numeral constructions. Polish does contain independent examples of complex prepositions in which the genitive-assigning preposition *z* 'from' combines with a subset of accusative- or instrumental-assigning prepositions to result in homogeneous genitive case assignment.

While Lyskawa's analysis is effective and provides ample consideration for the complications posed by the null-preposition analysis, the concord system developed in this thesis offers a way to avoid these complications altogether. Lyskawa reasonably rules out explanations of accusative that rely on defective morphology (e.g., the Polish paradigm simply lacks a nominative form), the analysis of accusative as default case, and accusative as a by-product of diachronic change, but she does not consider the possibility that accusative may simply be an inherent property of the numeral that stems from its categorial status. In this regard, the system developed in this thesis seems to offer a more cohesive, cross-linguistic account. The basic mechanisms of the concord system remain the same across BCS, Polish, and Russian. Variation stems from the feature specification of the semi-lexical numeral as well as language-specific feature co-occurrence restrictions.

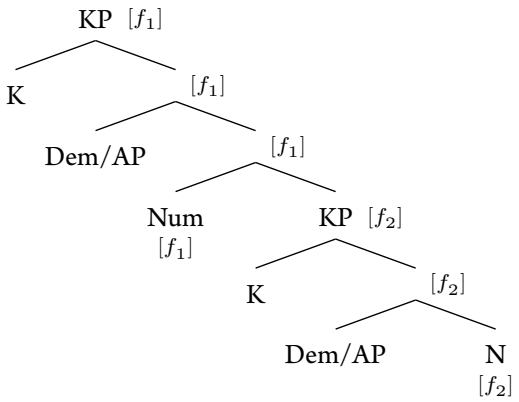
7

CONCLUSION

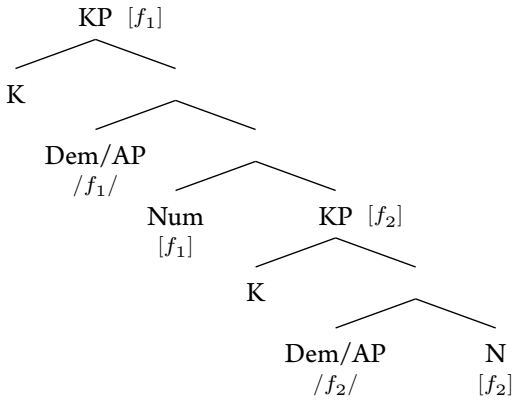
7.1 SUMMARY

This thesis has foremost argued for a theory that derives concord through the spell-out of features from dominating nodes on local terminals. Expanding on Norris's (2014) theory of concord, I contend that the concord system attempts to maximize the ultimate concord domain at various stages throughout the derivation. This domain maximization is achieved first by percolating features as high as possible in the syntax and then by realizing features as low as possible in concord, exemplified in (206). Domain maximization respects locality and is typically restricted to the domain boundaries created by extended projections.

(206) a.

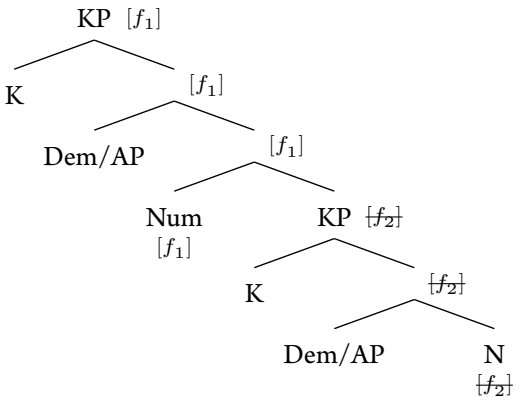


b.

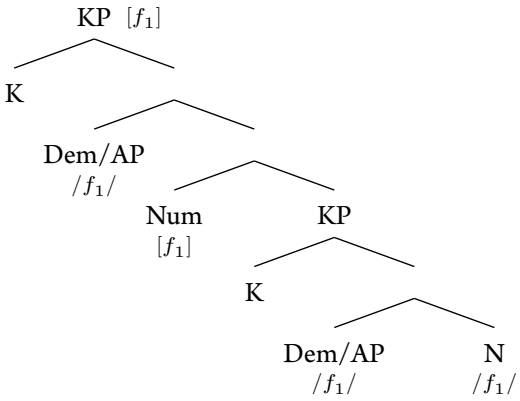


However, domain maximization can at times reach beyond these extended projection boundaries. The derivations have shown that impoverishment is a possible method of domain extension. The trees in (207) demonstrate how the application of particular impoverishment rules eliminates certain features to allow for lower extension of the concord domain. For example, the downward homogeneous derivations showed that impoverishment of case features makes the lower domain available to realize the case features of the higher domain.

(207) a.

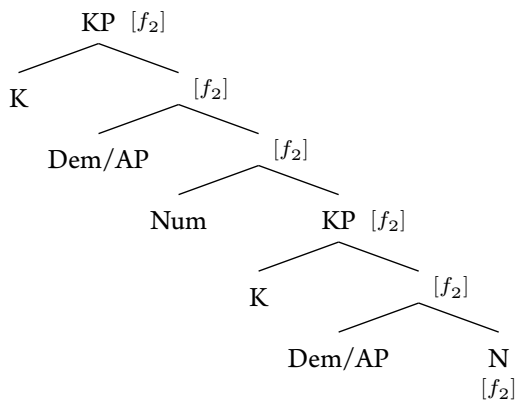


b.

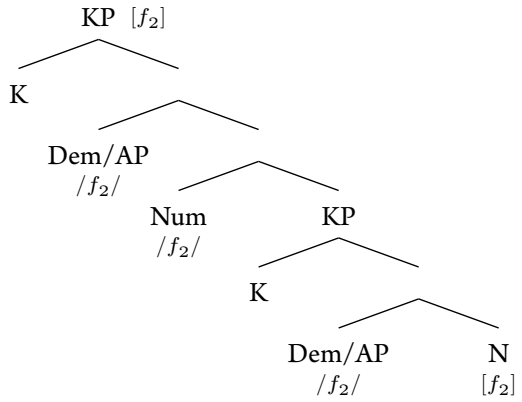


Additionally, feature percolation can sometimes continue higher than expected given the properties of the heads involved. We have seen that numerals, as semi-lexical heads, vary in their feature specification. When the numeral is not specified for a particular type of feature (case, number, or gender), the corresponding feature of the lower domain is able to percolate into the higher domain, as shown in (208). In the upward homogeneous pattern, for example, this high percolation extends the ultimate concord domain of the internally assigned genitive case.

(208) a.



b.



In addition to impoverishment and the semi-lexicality of the numeral, I also introduced hypotheses regarding the complementarity of case assignment and case concord, as well as the hierarchical decomposition of the case system. Together with the general concept of concord as spellout, we have seen that these hypotheses allow the concord system to accommodate a range of complex patterns in a straightforward manner. The patterns covered include aligned heterogeneous, downward homogeneous, upward homogeneous, non-aligned heterogeneous, and interrupted homogeneous concord. In many of these patterns, the system has to contend with a domain mismatch; apart from the aligned heterogeneous pattern, the distribution of concord domains does not correspond to the distribution of syntactic domains.

It has been argued throughout the thesis that the resulting system of concord is simpler than an account based solely on probe-goal agreement mechanisms. While agreement-based accounts have been used in the past to successfully analyze concord phenomena, I have shown that the resulting system turns out to compromise the fundamentals of agreement—in terms of one-to-one mapping or c-command—or becomes unnecessarily complicated—involving modifiers that

function as atypical, non-head probes or requiring multiple directions of agreement. Nevertheless, it would be theoretically desirable to formulate a single account of agreement and concord. To this end, future research could explore whether the concord system developed in this thesis is applicable to standard examples of agreement, though such an analysis does not seem very straightforward upon initial reflection. In subject-verb agreement, for example, the system would require the features of the nominal subject to be projected to the clausal level, thereby raising potential issues in terms of locality and percolation. I leave the specifics of this account to subsequent work.

Beyond providing a simpler theory of general concord, the resulting system offers novel insights into the analysis of Slavic numeral constructions, which as yet do not have a widely accepted resolution.

7.2 IMPLICATIONS

7.2.1 *On semi-lexicality*

In addition to providing a simple analysis of concord and new insights into the derivations of numeral constructions, the theory developed in this thesis entails a number of other important implications. One major implication stems from the semi-lexicality of numerals, apparent in their variable feature specification. The neutral order of elements in the numeral constructions is demonstrative-numeral-adjective-noun, in line with the predictions of Universal 20 (Greenberg 1963; Cinque 2005). We have also seen a number of examples in exception to this, but these are typically marked (although there is no effect on the concord pattern), which is why I appealed to two syntactic domains in the derivations (see Norris 2014; Caha 2015). Most of the concord patterns, however, do not have a simple one-to-one correspondence between the underlying syntactic domains and the concord domains. Here, the semi-lexicality of the numeral plays a key role. Throughout the derivations, we have seen that the feature specification of numerals can differ between classes and between languages. The numeral's variable feature specification has consequences for feature percolation and impoverishment, which in turn affect the expression of the concord pattern. As a result, language variation can primarily be attributed to the properties of the numeral. Such an outcome is advantageous—for decades, it has been widely acknowledged that numerals constitute a fairly flexible category. Their properties and associated concord patterns make numerals appear to fluctuate between adjectival and nominal categories (see

e.g., Hurford 1975; Corbett 1978; Ionin and Matushansky 2018). By attributing the bulk of language variation to the already-variable numeral, we allow for a more cross-linguistically cohesive account.

7.2.2 *Predicted patterns*

Another implication of the system concerns the types of concord patterns that are predicted. In particular, the system predicts that it is impossible for modifiers within a single domain to realize different features, unless these modifiers have different morphological paradigms—for example, if one shows concord for number while the other shows concord for case and gender. Since features percolate through the extended projection, any impoverishment (if not restricted to a head) applies globally within the domain. Modifiers then realize the resulting dominating features in concord. Regarding other impossible patterns, as mentioned in Chapter 6, the interrupted homogeneous pattern should only appear with default case on the numeral. If the numeral assigns case, the complementarity condition of case assignment and case concord requires that the numeral does not realize case in concord. If the numeral instead participated in agreement with K, we would not derive the interrupted homogeneous pattern, since the internally assigned case would be blocked from percolating into the higher domain.[73] Moreover, the interrupted homogeneous pattern should only be 'interrupted' by the numeral, since any modifiers are predicted to realize the dominating case features.

We also do not expect to find something like the reverse of the non-aligned heterogeneous pattern, where the boundary sits between the higher modifier and numeral rather than the lower modifier and noun. The non-aligned heterogeneous pattern is largely a result of impoverishment that discriminates between N as a head and non-terminal nodes. By contrast, the system does not allow impoverishment to target individual modifiers, which must realize their features in concord.

On the other hand, there are also patterns that the system in principle allows but which do not seem to appear in Slavic. For example, it is possible to derive

73 The upward homogeneous pattern also seems to be limited to caseless or indeclinable numerals. Since this pattern is primarily derived via upward percolation of the case assigned by the numeral, the numeral is not able to realize case in concord. If it attempts to participate in case concord, then the interrupted homogeneous, rather than upward homogeneous, pattern is predicted. A possible exception may be found in BCS with feminine lower numeral constructions. I have categorized these examples as upward homogeneous, where the case that is realized is nominative derived from the internally assigned genitive. As discussed in Chapter 5, BCS lower numerals may be analyzed as either caseless or with a default nominative. Regardless, I categorize the pattern as upward homogeneous since it does not contain a visible break in concord domains as does the Polish interrupted homogeneous pattern with genitive realized above and below a default nominative numeral.

an interrupted, downward homogeneous pattern in lexical case environments. Assuming the numeral does not particpate in agreement, the genitive assigned to the lower domain is allowed to percolate through the higher domain. If we also assume that genitive cannot override the externally assigned case, then genitive stops percolating one node below KP. We may then suppose that impoverishment applies below KP along the spine of the construction, resulting in the deletion of all case features. The dominating case features are then realized throughout. The numeral is either caseless, or realizes a default form given the complementarity condition.

It may also be possible to derive a pattern in which three or even four distinct cases are realized. This is achievable if, for instance, the numeral and noun participate in agreement, but then are both subject to impoverishment. Let us consider how this unfolds. The numeral's participation in agreement blocks genitive percolation, restricting genitive realization to the lower domain and allowing the case assigned to the higher K to be realized in the higher domain. The derivations have shown that features on heads can be directly targeted in impoverishment. Thus, case impoverishment could occur on both the noun and the numeral, while the dominating features in each domain spell out on any modifiers. The complexity of such a concord pattern seems unlikely to survive historically, and I have not come across any such pattern, but future research could thoroughly investigate whether similar patterns exist. If these patterns are truly non-existent, it may then be necessary to revisit certain aspects of the concord system and impose further constraints. For instance, when impoverishment specifically targets a feature located on a particular head, there could be a requirement that this head be the source of the feature.[74] Since K, rather than N or Num, is the source of case in the derivation, impoverishment that directly targets case features on N or Num would not be allowed. Additionally, any impoverishment that specifically targets features on K would have no visible effects since impoverishment occurs after the case features have percolated or have been copied in agreement.

7.2.3 *Universal vs. language-specific aspects of the system*

The derivations introduced a new take on impoverishment, which provides a neat segue into a discussion of the universal and language-specific aspects of the concord

74 Implementation of this requirement would necessitate a revision of the upward homogeneous pattern that is characteristic of feminine lower numeral constructions in BCS. The current derivation of this pattern requires impoverishment of [GEN] specifically on N dominated by [F, PC].

system. In contrast to typical impoverishment rules, this thesis decomposed individual rules into a feature co-occurrence restriction and a general feature-deletion rule. Given two co-occurring features, the system determines which feature to delete by referring to a language-specific hierarchy.

As we saw throughout the derivations, impoverishment driven by the feature co-occurrence restrictions is language-specific. However, some deletions, such as impoverishment of [NOM], [ACC], and [GEN] case features in the downward homogeneous derivation, are found across the three languages investigated here. Each language also contains a distinct feature hierarchy generated by shuffling together the hierarchies of individual feature types (number, gender, case) and ranking feature combinations above simplex features. In reviewing these hierarchies below, certain similarities are apparent.

In particular, the ordering of features within individual feature types (number, gender, case) is held constant across the languages. This means, for example, that [LOC] always outranks [GEN], which outranks [ACC], or [F] outranks [M] (although only partial hierarchies are provided below). Another similarity can be found in the ranking of class features such as [PC] or [MIX]. These features appear to be ranked near the middle to higher end of a given hierarchy and are thus typically used to drive impoverishment.

(209) *Russian feature hierarchy*

[ACC, ANIM]

[F, PC]

[LOC]

[GEN]

[PC]

[PL]

[ACC]

[NOM]

(210) *BCS feature hierarchy*[75]

[PC] ; [MIX]

[PL]

[F]

[M]

[GEN]

[ACC]

[NOM]

(211) *Polish feature hierarchy*

[LOC]

[GEN]

Since the hierarchies are language-specific, certain contrasts are also apparent. Comparing Russian and BCS, the ranking of [PC] with respect to [GEN] differs. This captures the differences in behavior of the two languages in lexical case environments. Russian lower numeral constructions display the downward homogeneous pattern across all lexical case contexts, while BCS lower numeral constructions differ based on the precise case environment involved. Genitive contexts elicit the non-aligned heterogeneous pattern or downward homogeneous with feminine examples, while dative and instrumental contexts are subject to speaker variation.

7.2.4 *A note on the composition of features*

Apart from the decomposition of case into sets of features, this thesis has primarily used simplex features, as evident in the hierarchies above. Nevertheless, the basic mechanisms of the concord system would still be compatible with more articulated decompositions of number and gender features (see e.g., Noyer 1992/1997; Harbour 2011, 2014; Fuchs, Polinsky, and Scontras 2015; Ackema and Neeleman 2018; Adamson and Šereikaitė 2019). This may be a promising direction for future research. A closer look at the composition of ϕ-features could provide insights into syncretism and more generally, the ways in which these features interact within the concord system. A more accurate layout of the feature hierarchies in (209)–(211) is also a likely outcome.

75 [DAT] has been omitted from the BCS hierarchy given the speaker variation that is associated with dative environments (see Chapter 5, §5.3.2).

7.3 PO-PHRASES: AN INDICATION OF SEMI-LEXICALITY?

Distributive *po* 'each' can be found across Russian, BCS, and Polish. *Po* is often referred to as a preposition (Franks 1995, 2002; Bošković 2008; Miechowicz-Mathiasen 2011), but the patterns that accompany it differ from those associated with typical prepositions. Let us first consider Russian, where we have the following paradigm of examples.

(212) *Russian*—adapted from Franks 1995 (141, ex. (27a), (29a))

a. *po* *dva* *rublj-a*
DIST two.ACC ruble-GEN.SG
'two rubles each'

b. **po* *dv-um* *rublj-am*
DIST two.DAT ruble-GEN.SG

(213) adapted from Franks 1995 (140–1, ex. (24d–e), (29b))

a. *po* *pjat'* *rubl-ej*
DIST five.ACC ruble.GEN.PL
'five rubles each'

b. *po* *pjat-i* *rubl-ej*
DIST five-DAT ruble.GEN.PL
'five rubles each'

c. **po* *pjat-i* *rubl-am*
DIST five-DAT ruble.DAT.PL

(214) adapted from Franks 1995 (142, ex. (31a))
po *tysjač-e* *rubl-ej*
DIST thousand-DAT ruble-GEN.PL
'a thousand rubles each'

Here, we see that *po* can alternate between assigning accusative or dative case, though there are some constraints on this alternation. Lower numeral constructions only occur with accusative-assigning *po*, while higher numeral constructions occur with both accusative and dative *po*. 1000+ constructions occur only with dative. Recall that in Russian, the 1000+ category is nominal. Franks (1995) also shows that regular nominal complements realize dative with *po*. Therefore, the distribution of accusative and dative examples in (212)–(214) could be taken to

indicate that *po* is sensitive to the degree of (semi)lexicality of its complement. The accusative-dative alternation of the higher numeral examples suggests that this class falls between the fully lexical, nominal 1000+ category and the less nominal lower numerals. Here, we may be able to draw a general comparison with the form of the Polish lower numerals that selects [VIR] and assigns genitive case. Perhaps *po* either selects for a feature of numerals and assigns accusative or selects for nominals and assigns dative.

Interestingly, even though Russian higher numeral constructions typically exhibit downward homogeneous concord in lexical case environments, (213c) shows that this is not allowed with *po*. Instead, the aligned heterogeneous pattern in (213b) results. It is unclear why the downward homogeneous pattern is blocked in these examples; certainly nothing about the formulation of the concord system predicts this to be so. Franks (2002) suggests that this impossibility is linked to the status of *po* as a light preposition, but further research in this area would be required to better understand the phenomenon.

Polish shows a similar alternation, but with accusative and locative rather than dative. Both higher and lower numeral constructions occur only with accusative-assigning *po*, while the 1000+ numerals can occur with accusative or locative *po*. Again, it seems that *po* is sensitive to the degree of semi-lexicality of its complement, assigning locative to nominals only. If we pursue this line of reasoning, comparing the Polish distribution of *po* to that of Russian suggests that the higher numerals in Polish have a higher degree of semi-lexicality than those in Russian. As we saw above, the Russian higher numerals display a case alternation with *po* and thus share some properties with nouns.

(215) *Polish*—adapted from Miechowicz-Mathiasen 2011 (17, ex. (25b))
po *dwa* *jabłk-a*
DIST two.ACC apple-ACC.PL
two apples each'

(216) adapted from Miechowicz-Mathiasen 2011 (17, ex. (25c))
po *pięć* *jabł-ek*
DIST five.ACC apple-GEN.PL
five apples each'

(217) adapted from Miechowicz-Mathiasen 2011 (8, ex. (26a–b))

a. *po* *tysiac* *złot-ych*
DIST thousand.ACC zloty-GEN.PL
'a thousand zlotys each'

b. *po* *tysiac-u* *złot-ych*
DIST thousand-LOC zloty-GEN.PL
'a thousand zlotys each'

It may be possible to take this observation further. In Russian, higher numerals in structural case environments always display the aligned heterogeneous pattern. I took this as evidence that they always agree for case, which parallels the behavior of nouns. In Polish, higher numerals alternate between the aligned heterogeneous and interrupted homogeneous patterns in structural case environments. Considering the height of genitive percolation in the interrupted homogeneous pattern, I suggested that Polish higher numerals do not agree in structural case environments, in contrast to nouns. Based on these observations, Polish higher numerals seem to have a higher degree of semi-lexicality than Russian higher numerals.

In contrast, *po* does not assign any specific case in BCS. Instead, the nominal or numeral construction surfaces in the case required by its function in the sentence.

(218) *BCS*—adapted from Franks 1995 (157, ex. (70a))
Svako *razgovara* *sa* *po* *jedn-im* *kandidat-om.*
everyone.NOM speaks with DIST one-INSTR candidate-INSTR.M.SG
'Everyone is speaking with one candidate each.'

(219) adapted from Franks 1995 (158, ex. (72a))
Svak-u *knjig-u* *je* *pročita-l-o* *po* *pet*
each-ACC book-ACC.F.SG AUX3.SG read-PST-N.SG DIST five
ljudi.
people-GEN.PL
'Each book was read by five people.'

By more closely investigating the similarities and differences in the behavior of *po* across these three languages, it may be possible to gain further insights into semi-lexicality, including how it is encoded, its correlation with other properties, and possible constraints.

7.4 THE POTENTIAL ROLE OF KP IN AGREEMENT

Throughout previous chapters, I have made many promises to return to subject-verb agreement. This section provides a closer look at the agreement patterns observed with subject numeral constructions and demonstrates how the features that result on KP, coupled with a two-stage theory of agreement, provide a straightforward analysis of the patterns. To this end, we will also see that impoverishment can be used to feed agreement—a novel idea that allows agreement where it normally would not be available. Since part of agreement is post-syntactic in the two-stage theory, impoverishment can be used to derive nominative on KP.

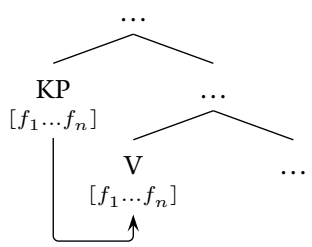
In the preceding derivations, agreement for case on the numeral and the noun has played a prominent role. The full process of agreement, including establishment of the relation and copying of features, has occurred in the syntax. However, the subject-verb agreement data have given me reason to slightly revise this characterization of agreement. In particular, the agreement patterns necessitate a two-stage theory composed of a syntactic and post-syntactic stage (Chung 1998; Benmamoun, Bhatia, and Polinsky 2009; Arregi and Nevins 2012). Unlike existing two-stage analyses that utilize a syntactic stage to establish the agreement relation and a post-syntactic stage for feature-copying, I assume that the second stage of agreement is completed as soon as possible, barring any syntactic constraints. One such constraint is on agreement that crosses extended projection boundaries. In subject-verb agreement, for example, there is a clear crossing of boundaries, so the second stage of agreement is delayed until the derivation moves out of the syntax.[76] With agreement for case on the numeral and the noun, on the other hand, agreement is contained within the extended projection, and the second stage can be completed in the syntax.

The following discussion adopts the Agree-Link and Agree-Copy stages detailed in Arregi and Nevins 2012, though the names of these stages are not as critical as the fact that one stage occurs in the syntax while the other occurs post-syntactically. Agree-Link is the syntactic stage during which the relationship between the probe and goal is established. Based on the agreement patterns associated with the numeral constructions, I suggest that agreement is established between the verb, as the probe, and KP, as the goal. As will be discussed further below, agreement is conditioned by nominative case across Polish, BCS, and Russian, and this nominative

76 Two-stage agreement that involves both syntactic and post-syntactic stages also seems to be a necessary possibility for conjunct agreement (Bhatt and Walkow 2013; Marušič, Nevins, and Badecker 2015).

may be derived on KP through impoverishment. In the final stage, post-syntactic Agree-Copy occurs, copying the features of KP to the verb as in (220).

(220)



Bearing these stages in mind, the following subsections will proceed through a discussion of the numeral classes and their associated agreement patterns across the three languages.

7.4.1 *Agreement in Polish*

The Polish agreement patterns provide much insight into the analysis of concord that has been developed for the numeral constructions. As shown in Lyskawa's (2020) examples in (221), higher numeral constructions always occur with 3N.SG agreement, regardless of whether they surface in the aligned heterogeneous or interrupted homogeneous pattern (see also Swan 2002; Miechowicz-Mathiasen 2011; Klockmann 2017). 3N.SG agreement is default in Polish (Dziwirek 1990; Przepiórkowski 1999; Swan 2002; a.o), and the fact that default agreement occurs with the aligned heterogeneous pattern poses a particular challenge for any analysis of Polish. In part, this default agreement has prompted many to adopt the Accusative Hypothesis (Przepiórkowski 1999), as mentioned in Chapter 6.

(221) adapted from Lyskawa 2020 (2, ex. (3)–(4))

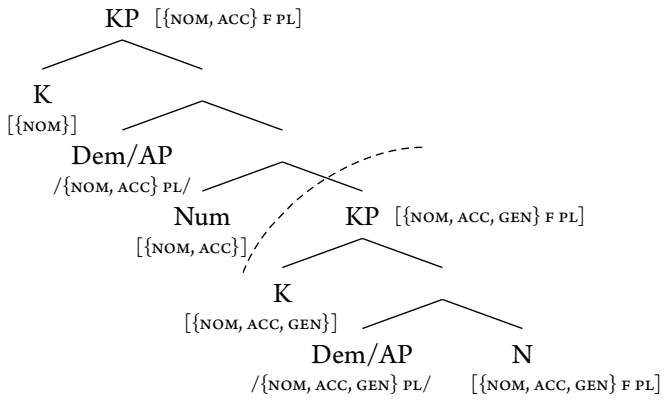
a. *Przyjecha-ł-o* *te* *sześć* *czarownic.*
arrive-PST-3N.SG this.ACC.PL six.ACC witch.GEN.F.PL
'These six witches arrived.'

b. *Przyjecha-ł-o* *t-ych* *sześć* *czarownic.*
arrive-PST-3N.SG this.GEN.PL six.NOM witch.GEN.F.PL
'These six witches arrived.'

Default agreement easily falls out from the current approach. Let us first tackle the aligned heterogeneous example in (221a). In the syntax, Agree-Link establishes a relationship between KP and the verb, while the concord derivation proceeds as in

Chapter 6.[77] Since the resulting dominating features (after impoverishment) in this example are ACC.PL as shown in (222), and agreement in Polish is conditioned by nominative case (Przepiórkowski 1999; Lyskawa 2020), default agreement results on the verb.[78]

(222)



Although the general idea works, it is not necessarily clear why Agree-Copy fails when KP is not nominative. However, agreement failure with non-nominative subjects is not unusual, and agreement is conditioned by nominative in many

77 Given the way two-stage agreement works with the Slavic examples presented in this section, there is a question of how to analyze phenomena such as Icelandic quirky subjects. In such examples, the verb agrees with a nominative object when the subject is not nominative (Zaenen, Maling, and Thráinsson 1985; Sigurðsson 1992; Boeckx 2002). It therefore seems that Agree-Link should be conditioned by case. If Agree-Link were conditioned by case, however, no relation would be established between the verb and accusative KP in the Polish example. Thus, it may be that the sensitivity of Agree-Link to the case of the goal is language-specific.

78 The features that appear on predicative adjectives and participles in Polish often correspond to the features that result on the dominating KP. However, the data are not always as clear cut. For example, Witkoś and Dziubała-Szrejbrowska 2016 (254, ex.(42)) highlight the following examples (see also Przepiórkowski 2001; Willim 2015). Note that I have adapted the gloss to reflect the distribution of features predicted by my analysis.

(i) a. *Te* *pięć* *student-ek* *zostało* *wybran-ych.*
this.ACC.PL. five.ACC student-GEN.M.PL was.3SG.N selected-GEN.PL

b. *T-ych* *pięć* *student-ek* *zostało* *wybran-e.*
this-GEN.PL five.NOM student-GEN.M.PL was.3SG.N selected-NOM/ACC.PL
'These five students were selected.'

In (ia), *wybranych* seems to reflect the features of the noun, while in (ib), the features of *wybrane* appear to correspond to those of the numeral. In an analysis of mixed or hybrid agreement, Weschler (2011) discusses examples in which the target of agreement realizes different feature values with the same controller. This kind of agreement is commonly found with honorifics; for example, a plural second-person pronoun can indicate politeness when it occurs with singular number on certain targets. According to Wechsler, mixed agreement examples often display evidence of both syntactic and semantic agreement, but in their current form, the concord system and analysis of agreement proposed in this thesis do not seem to offer any particular insight into examples like (i).

languages (see Chomsky 2000, 2001; Bobaljik 2008; Preminger 2011; a.o.). As a rather stipulative first pass at an explanation, it could be that the verb contains a filter which blocks the copying of cases larger than nominative. Alternatively, the decomposition of case may differ slightly from how it has been presented. Nominative case may in fact be the absence of features (see Bittner and Hale 1996; Kornfilt and Preminger 2015; McFadden 2018), with the higher cases hierarchically decomposed. A lack of agreement with non-nominative subjects could then be attributed to a verb filter that filters out case features altogether. Thus, agreement succeeds with nominative, as the lack of features, but fails with other cases. At any rate, agreement fails in (222) and default agreement surfaces on the verb. The same analysis can be extended to the interrupted homogeneous pattern in (221b), where genitive rather than nominative case results on KP.

Regarding the lower numeral constructions, examples containing the bare form of the numeral always result in regular agreement. This is again expected under the current approach since the dominating features are nominative plural.

(223) adapted from Przepiórkowski 1999 (190–1, ex. (5.317), (5.320))

a. *Trz-y* *kobiet-y* *przysz-ł-y* /**przysz-ł-o.*
three-NOM woman-NOM.F.PL come-PST-3PL / come-PST-3SG.N
'Three women came.'

b. *Trz-ej* *facec-i* *przysz-ł-i*
three-NOM.VIR guy-NOM.VIR.PL come-PST-3PL.VIR
/**przysz-ł-o.*
/ come-PST-3SG.N
'Three guys came.'

With the [VIR]-selecting form of the lower numeral that assigns genitive case and ultimately results in the interrupted homogeneous pattern, we predict default agreement because the dominating features are genitive plural. This prediction is indeed borne out, as shown in (224).

(224) adapted from Przepiórkowski 1999 (191, ex. (5.321))
Trz-ej *facet-ów* *przysz-ł-o* /**przysz-ł-i.*
three-NOM.VIR guy-GEN.VIR.PL come-PST-3SG.N / come-PST-3PL.VIR
'Three guys came.'

7.4.2 *BCS*

As Chapter 5 revealed, BCS lower numeral constructions occur with regular 3.PL agreement. In past tense examples such as (225) and (226), the form of the participle further reflects the dominating number and gender of the numeral construction, either F.PL or N.PL.

(225)

T-e	*dv-(ij)e*	*visok-e*	*žiraf-e*	*su*
that-NOM.F.PL	two-F	tall-NOM.F.PL	giraffe.NOM.F.PL	AUX3.PL

trča-l-e.
run-PST-F.PL
'Those two tall giraffes were running.'

(226)

T-a	*dv-a*	*gladn-a*	*tigr-a*	*su*
that-NOM.N.PL	two-N	hungry-NOM.N.PL	tiger-GEN.M.SG	AUX3.PL

je-l-a.
eat-PST-N.PL
'Those two hungry tigers were eating.'

Continuing with the two-stage approach in which verbal agreement is determined by the features on KP, the process is quite simple. Agree-Link establishes a syntactic relationship between the verb and the higher KP. After impoverishment applies, the features of KP are reduced to either NOM.F.PL or NOM.N.PL, which can then be copied to the verb. Again, we see that in a two-stage approach to agreement, impoverishment can feed agreement. In addition to N.PL agreement, masculine lower numeral constructions may alternatively trigger M.PL agreement on the verb, though this is typically considered to exemplify semantic agreement (Wechsler and Zlatić 2003; Šarić 2014).

Shifting our focus back to the nominal domain, the presence of regular agreement in (225) and (226) provides support for the analysis of the modifiers as nominative, and more generally, for the paucal-class-feature approach adopted in this thesis. The modifiers realize their features from the dominating KP. Agreement in BCS is conditioned by nominative case, and given regular agreement on the verb, KP's resulting features must be nominative. This means that nominative spells out on the modifiers, regardless of whether the noun is GEN.SG or NOM.F.PL. Taking the argument a step further, because of the issues posed by a NOM.PC analysis (discussed in §5.5 of Chapter 5), agreement provides additional motivation for

embracing the feature mismatch between the GEN.SG noun and NOM.PL modifiers that occurs with the paucal-class-feature approach.

BCS higher numeral constructions typically occur with a default 3N.SG verb (and participle) (Zlatić 1997; Wechsler and Zlatić 2003; Hammond 2005; Šarić 2014), as shown below.

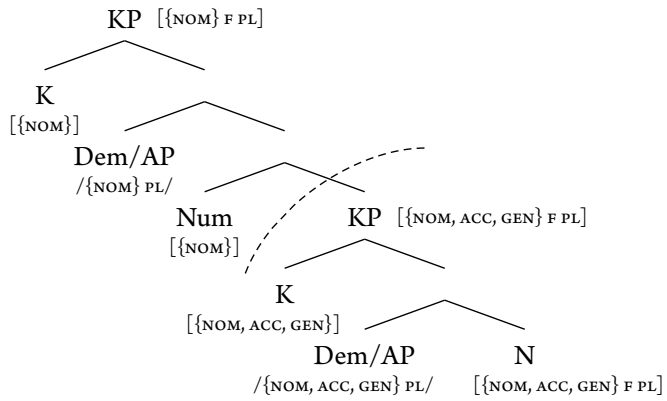
(227) *T-ih* *pet* *visok-ih* *žiraf-a* *je* *trča-l-o.*
that-GEN.PL five tall-GEN.PL giraffe-GEN.F.PL AUX3.SG run-PST-N.SG
'Those five tall giraffes were running.'

Agreement thus proceeds exactly as it did in the Polish examples. Since the dominating case features in the final stage of the upward homogeneous derivation are genitive rather than nominative, agreement fails and default results. Some speakers alternatively display masculine, feminine, or neuter plural agreement with higher numeral constructions according to the gender of the noun (Hammond 2005; Šarić 2014). As with the masculine lower numeral constructions, such examples can be analyzed with semantic agreement.

7.4.3 *Russian*

Agreement in Russian slightly complicates the overall picture. Let us first consider the higher numeral constructions, which display the aligned heterogeneous pattern. The final stage of the aligned heterogeneous derivation is shown in (228).

(228)



Given the nominative plural features that result on KP, we predict normal agreement to occur with a higher-numeral subject. This is indeed possible, as shown in (229).

(229) adapted from Franks 1995 (100, ex. (15))
Èt-i *pjat'* *krasiv-yx* *devušek* *priš-l-i.*
this-NOM.PL five.NOM beautiful-GEN.PL girl.GEN.F.PL arrive-PST-PL
'These five beautiful girls arrived.'

However, higher numeral constructions may also occur with default agreement, as we have seen in BCS and Polish. Example (230) demonstrates this possibility.

(230) adapted from Ionin and Matushansky 2018 (171, ex. (13b))
K nam *priš-l-o* *pjat'* *krasiv-yx* *devušek.*
to us arrive-PST-N.SG five.NOM beautiful-GEN.PL girl.GEN.F.PL
'Five beautiful girls arrived at our place.'

This result is rather unexpected given the way that agreement has worked in the examples thus far. Nonetheless, there are some constraints on the alternation between regular and default agreement. Franks (1995) shows that when a high demonstrative is present, as in (229), agreement must be regular. Given the dominating NOM.PL features in this example, this is consistent with the verb agreeing for the features of KP.

On the other hand, if the example contains no demonstrative, as in (230), both regular and default agreement are possible, though these typically result in interpretive differences (Franks 1995; Titov 2012; Pesetsky 2013; Matushansky and Ruys 2015; Ionin and Matushansky 2018).[79] When default agreement results, Franks (1994) suggests that the construction contains a null expletive subject. Similarly, Titov (2012) indicates that when the verb is default, the subject must be non-referential and is necessarily incompatible with a demonstrative. With regular agreement and no demonstrative (or a low demonstrative), there are no requirements on the referentiality of the subject (Titov 2012). Moreover, the configuration of the example plays an important role. The low subject in (230) is in neutral position. Titov (2012) argues that the raising of the subject to Spec-IP can be used to indicate that the subject is referential; in this position, default agreement is often unacceptable.[80] Comparing a non-numeral subject, a non-referential reading also results when the subject is low, but agreement is regular and there is

79 Franks (1995) states that a demonstrative below the numeral can also trigger an agreement alternation, but Titov (2012 and p.c.) maintains that a low demonstrative can only occur with regular agreement. This has to do with the non-referential reading associated with default agreement discussed above.

80 Animacy has an impact on agreement. Animate subjects typically require regular agreement on the verb (Robblee 1993), while inanimate subjects occur with default agreement about half of the time (Glushan 2013)

no default alternation with non-numeral subjects (Titov 2012; Pesetsky 2013). Altogether, the facts are puzzling.

Pesetsky (1982) attributes the agreement shift to an alternation of the numeral construction between NP and QP, and more recently, to the presence of the numeral in D, which is achieved through movement (Pesetsky 2013). Up to this point, such a distinction has not been necessary for the successful functioning of the concord system, but future iterations of the system could entertain this possibility. While the basic mechanisms of the system would remain the same, introducing potential movement to D would impact the order of operations within the derivations. A full account of agreement is beyond the scope of this thesis, so I leave the precise analysis of the Russian agreement alternation to future work. While the availability of default agreement is unexpected, agreement with KP appears to be a possible analysis for the examples of regular agreement. Given the distribution of the agreement patterns, it seems that any future analysis will have to appeal to information structure and discourse in addition to standard agreement mechanisms.

Regarding the Russian lower numeral constructions, most examples are easy to address because they result in regular agreement. However, it has been observed that feminine lower numeral constructions exhibit an alternation potential, as shown below (Suprun 1959).

(231) adapted from Pesetsky 2013 (121–2, ex. (147)–(148))

a. *Na stole leža-l-o dv-e bol'š-ix knig-i.*
on table lie-PST-N.SG two-NOM.F large-GEN.PL book-GEN.SG
'Two large books were lying on the table.'

b. *Na stole leža-l-i dv-e bol'š-ix knig-i.*
on table lie-PST-PL two-NOM.F large-GEN.PL book-GEN.SG
'(The) two large books were lying on the table.'

c. *Na stole leža-l-i dv-e bol'š-ie knig-i.*
on table lie-PST-PL two-NOM.F large-NOM.PL book-GEN.SG
'(The) two large books were lying on the table.'

d. **Na stole leža-l-o dve bol'š-ie knig-i.*

Curiously, agreement in these examples seems to be dependent on the form of the lower modifier, which as discussed in Chapter 3, can realize either nominative or genitive case. When the lower modifier is nominative, agreement must be regular. This is consistent with agreement for the features of KP. If the lower modifier

is instead genitive, agreement can alternate between regular and default. With regular agreement, the features of the verb are simple enough to explain; in (231b), the features of the dominating KP are NOM.PL, so regular agreement is predicted. The default example in (231a) is less easily explained. Like the higher numeral examples, it is interpreted as non-referential (Titov 2012), so a successful analysis will likely have to consider information structure. The greater puzzle lies in why the agreement alternation seems to be conditioned by the form of the lower modifier. Pesetsky (2013, 119–24) mentions that the answer may depend on one's analysis of the noun and whether it should be regarded as GEN.F.SG or NOM.F.PL given the prevalent syncretism between the two forms. The form of the noun would then determine how the rest of the concord pattern is analyzed. However, he points out that "the evidence is annoyingly equivocal" in favor of both possible analyses (Pesetsky 2013, 122). Speakers tend to avoid constructions that could prove helpful in the analysis, so the examples in (231) remain subject to future investigation.

7.5 FUTURE DIRECTIONS

7.5.1 *Finno-Ugric*

An investigation of the relevant literature suggests that many Slavic numeral constructions have already been addressed by the patterns covered in this thesis. Future research could of course analyze other Slavic languages more closely, but in addition to Slavic, more support for the system may be found in Finno-Ugric. The two language families are historically unrelated, so analyzing Finno-Ugric within the current system has the potential to provide independent support for some of the conclusions reached in this thesis regarding Slavic. Brattico (2011) points out that numeral constructions in the Finno-Ugric languages display patterns similar to those in Slavic. In structural case environments such as (232), the aligned heterogeneous pattern appears, while in lexical case environments such as (233), the downward homogeneous pattern emerges. The primary difference is that the numeral appears to assign partitive rather than the genitive case observed in Slavic. Additionally, the division in numeral classes (higher vs. lower) differs from Slavic and even within the Finno-Ugric languages.

(232) *Finnish*—adapted from Brattico 2011 (1043, ex. (3a))[81]

Kaksi	*mies-tä*	*nukkui.*
two.NOM	man-PRT.SG	slept

'Two men slept.'

(233) adapted from Brattico 2011 (1046, ex. (11b))
Minä asuin kahde-ssa talo-ssa.
I lived two-INE.SG house-INE.SG
'I lived in two houses.'

Norris's (2014) theory of concord takes Estonian numeral constructions into consideration, it has already been shown that the basics of the system are applicable. However, it would be useful to more closely revisit the Estonian data, along with numeral constructions from other Finno-Ugric languages to evaluate how well the hypotheses introduced in this thesis fare. Two hypotheses that particularly stand out are the hierarchical decomposition of case and the underlying syntax of numeral constructions. Additionally, it would be informative to investigate the degree of semi-lexicality of Finno-Ugric numerals as compared to their Slavic counterparts. This could provide greater insight into the status of numerals in general, and perhaps a better understanding of their behavior in terms of learnability and acquisition.

This thesis introduced the hierarchical decomposition of case to accommodate the syncretism and case priority relations exhibited by the Slavic numeral constructions. The Finno-Ugric languages boast a very complex case system that would at least require a closer look at the current case system, if not a partial revision of it. Whereas Norris (2014) relies on the timing of case assignment to capture the Estonian patterns, Caha (2009) shows that the decomposition of nominative, accusative, and genitive cases appears to be on track for Finno-Ugric. Following an examination of data from Estonian, Finnish, and Russian, Caha also concludes that partitive case should be located between genitive and dative. However, it would be interesting to take a more comprehensive view with the range of locatives found in Finno-Ugric. Caha indicates that there appear to be multiple layers for locative case in the functional projection, but it would be informative to examine how this plays out within a single language. This could provide more insight into the 'cut-off' points in the case hierarchy. For example, we have seen that Polish numerals agree for case from the level of genitive and above, which appears to correspond to a lexical/structural divide in the case hierarchy. In light of evidence from case syncretism and case priority, Grabovac (2022) provides some motivation for why the case hierarchy may plausibly be divided between the lexical and structural cases, but support from additional languages would strengthen the account. The

81 Brattico (2011) actually glosses 'two' in this example with ∅ rather than nominative case but mentions that nominative is the zero-suffixed case.

interactions between these cases could provide further insight for the movement of case within the concord system as well as case theory more generally.

Additionally, it would be necessary to investigate the syntax of numeral constructions in Finno-Ugric. Norris (2014, 2018b) provides evidence that Estonian numeral constructions do not form two extended projections because a low demonstrative is not allowed. Brattico (2011) further shows that a low demonstrative is marginal in Finnish. Therefore, it seems that the structure of at least some Finno-Ugric numeral constructions may consist of only one syntactic domain, in contrast to the two domains of Slavic. Nonetheless, the languages display the aligned heterogeneous pattern, which suggests two concord domains. We have dealt with domain mismatches in Slavic, but in the opposite direction—two syntactic domains with one domain of concord—so a potential challenge is posed by the need to derive two domains of concord from a single underlying syntactic domain. On the surface, the distribution of patterns in Finno-Ugric is easily derived if we assume that the numeral assigns partitive to its complement and always agrees for case, with the application of impoverishment in lexical case environments. Considering the implications of these assumptions more deeply, however, raises certain questions. This thesis assumed that case is represented by KP, which would suggest that the Finno-Ugric numeral constructions are also composed of two KPs. But then we must ask: how is this possible given that the distribution of demonstratives suggests one syntactic domain? The answer may be linked to interpretive differences between Slavic and Finno-Ugric. In Slavic, the low demonstrative typically results in a partitive reading, but this appears to be altogether unavailable for the same configuration in Finno-Ugric.

Regarding the movement of features between domains, this thesis utilized upward percolation of case features to account for the realization of genitive above the numeral in the upward homogeneous and interrupted homogeneous patterns. By contrast, Norris (2014) adopts downward percolation of case for Estonian following previous work (e.g., Babby 1987; Matushansky 2008; Richards 2013; Pesetsky 2013).[82] Since the Finno-Ugric patterns bear some resemblance to those in Slavic, it seems that upward percolation of case should be possible. Unlike Slavic, however, Finno-Ugric does not seem to have either the upward homogeneous or interrupted homogeneous pattern, as the partitive case assigned by the numeral does

82 As mentioned in Chapter 2, an independent argument for the upward percolation of features in the syntax can be found in Neeleman and van de Koot (2002), where downward percolation results in a violation of Inclusiveness. Inclusiveness, as discussed in Chomsky (1995, 228), roughly states that the properties of nodes are recoverable from dominated structure.

not appear on elements in the higher domain. This suggests that the Finno-Ugric numerals typically agree for case, as hypothesized above.

An additional puzzle arises with the distribution of number in Finno-Ugric examples. Citing Erelt et al. (1993), Norris (2018a) provides the Estonian examples in (234) (and mentions that Finnish shows a similar distribution of features). In examples where partitive case is assigned and singular number appears on the numeral and lower elements, plural must be realized on any demonstratives and adjectives above the numeral.

(234) *Estonian*—adapted from Norris 2018a (11, ex. (21))

a. *nee-d* *viis* *ilusa-t* *maja*
this-NOM.PL five.NOM.SG beautiful-PRT.SG house.PRT.SG
'these five beautiful houses'

b. *nee-d* *ilusa-d* *viis* *maja*
this-NOM.PL beautiful-NOM.PL five.NOM.SG house.PRT.SG
'these beautiful five houses'

The distribution of case in (234) is easily derived assuming that the numeral agrees and assigns partitive, but it is not immediately clear how to account for the distribution of number. Following work by Mathieu (2014), Norris (2018a) tentatively suggests that a number-head bearing [PL] is merged above the numeral but mentions that this should be subject to future investigation. However, this solution seems to pose a number of questions, including the motivation for this additional head and whether it is present in Slavic, as well how [SG] results in the lower domain. This head also seems problematic from a semantic standpoint. If [PL] is introduced above the numeral in (234), then we would expect the example to reflect the plurality of 'five (beautiful) houses,' but this is not the correct reading. Thus, it seems that [PL] should be introduced below the numeral (see Landau 2016 for a similar conclusion regarding Finnish).

Borrowing insight from the Slavic derivations, a potentially more promising analysis is that the noun is initially specified with [PL], which percolates through the construction to be realized on the higher modifiers in concord. The [PL] feature could be subject to impoverishment to derive [SG] on the noun, as we saw in the non-aligned heterogeneous derivation of Chapter 5. Deriving the singular forms of the numeral and lower modifier is slightly less straightforward. Considering first the numeral, Landau (2016) suggests that its number feature must be inter-

preted because singular and plural numerals give rise to different readings. This is illustrated in (235).[83]

(235) *Finnish*—adapted from Brattico 2011 (1045, ex. (9))

a. *Minä näin ne kolme auto-a.*
I saw that.ACC.PL three.ACC.SG car-PRT.SG
'I saw those three cars.'

b. *Minä näin ne kolme-t auto-t.*
I saw that.ACC.PL three-ACC.PL car-ACC.PL
'I saw those three aggregates of cars.'

A similar observation was made for the numeral form of Polish 1000+ in Chapter 6, and the suggested analysis may have some bearing on Finno-Ugric. In §6.3.3 of Chapter 6, I proposed that 1000+ is specified with either [SG] or [PL] features that cannot percolate because of its status as a numeral. This allows the number feature introduced in the lower domain to percolate into the higher domain. If the same analysis is extended to Finno-Ugric, the [PL] feature that originates below the numeral, presumably from the noun, is predicted to be realized above the numeral. This is borne out in (234) and (235). The singular form of the noun can be derived through impoverishment, which means that only the singular form of the lower modifier remains to be addressed. Perhaps this results from impoverishment of [PL] on nodes dominated by the [PRT] feature of partitive case.[84]

7.5.2 *Concord in the verbal domain*

Another logical extension of the research would be to investigate concord in the verbal domain. The analysis in this thesis has been restricted to the nominal domain because of the focus on numeral constructions, but both Norris (2014) and Ackema and Neeleman (2020) highlight languages in which elements of the verbal domain participate in concord. In the Archi example below, the IV feature of the absolutive argument is realized on the adverb.

83 The distribution of accusative case in (235b) may provide evidence that the Finno-Ugric numerals do not always assign partitive case. Since this homogeneous case distribution arises in structural case environments only when the numeral and noun are not singular, a possible explanation is that [PL]-specified numerals do not assign case.

84 This hypothetical feature co-occurrence restriction would likely have to make reference to the inherent [SG] number of the numeral. This is because examples like (235b) exist in lexical case environments, where [PL] impoverishment would not be desirable.

(236) *Archi*—adapted from Bond and Chumakina 2016 (70, ex. (56))

Tu-w-mi	*is*	*mišin*	*allej<t'>u*	
that-I.SG-SG.ERG	[IV.SG]1SG.GEN	car(IV)[SG.ABS]	[IV.SG]for.free<IV.SG>	
mu	*a-r-ši*	*i.*		
be.good	[IV.SG]do-IPFV-CVB	[IV.SG]be.PRES		

'He is repairing my car for free.'

The respective overviews of Norris (2014) and Ackema and Neeleman (2020) suggest that a concord-as-spellout approach is viable in this domain, but in general verbal concord appears to be a relatively understudied topic. Based on the behavior of nominal concord, Norris outlines several characteristics that one would expect to find in verbal concord. These include the appearance of concord features on many elements in one CP as well as on elements in a variety of syntactic positions, and expression of verbal features such as voice, aspect, mood, and tense (in addition to ϕ-features) (Norris 2014, 241). In his brief overview of potential examples of verbal concord, Norris does not find any examples that display all three characteristics, and he further points out that examples of verbal concord appear to be less common than examples of nominal concord. Partly addressing this confound, Ackema and Neeleman (2020) suggest that the data fall out more readily if agreement feeds verbal concord. Thus, additional research may shed light on this dichotomy and could also prove useful in developing a better understanding of the distinction between concord and agreement.

7.6 CONCLUDING REMARKS

By expanding on the system developed by Norris (2014), this thesis has offered support for analyzing concord as the result of the spellout of dominating features. It was demonstrated that the system fares well in dealing with a variety of complex patterns, particularly those displayed by Slavic numeral constructions. This chapter outlined a number of possible extensions of the research started in this thesis, with implications for further development of the current system. On a broader scale, the system developed here provides insight into the distinction between concord and agreement, the movement of features within the nominal domain, and the interaction of features at the interfaces.

APPENDIX

APPENDIX A — RUSSIAN

A.1 OVERVIEW OF CONCORD PATTERNS

CLASS	GENDER	CASE	PATTERN
Higher		*Structural*	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ GENITIVE … $]]$
		Lexical	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ EXTERNAL CASE … $]]$
Lower	M/N	*Structural*	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ GENITIVE … $]]$
	F		$[_{KP}$ NOMINATIVE … $[_{KP}$ NOMINATIVE … $N_{GEN}]]$
		Lexical	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ EXTERNAL CASE … $]]$

A.2 FEATURE CO-OCCURENCE RESTRICTIONS[85]

[PC] cannot occur on nodes dominated by [ACC, ANIM]

[PC] cannot occur on nodes dominated by [GEN]

[NOM], [ACC], [GEN] cannot occur on nodes dominated by [LOC]

[GEN] cannot occur on non-terminal nodes dominated by [F, PC]

[ACC] cannot occur on non-terminal nodes dominated by [F, PC]

[PL] cannot occur on N dominated by [PC]

A.3 FEATURE HIERARCHY[86]

[ACC, ANIM]

85 As detailed in §3.2.3 of Chapter 3, the first two feature co-occurrence restrictions should be ordered before the rest.

86 The feature hierarchies displayed in these appendices are only partial hierarchies that contain the features mentioned in a language's feature co-occurrence restrictions (see Chapter 1, §1.4.2). I assume that the features not mentioned are ordered with respect to the corresponding features of their type.

[F, PC]

[LOC]

[GEN]

[PC]

[PL]

[ACC]

[NOM]

B

APPENDIX B — POLISH

B.1 OVERVIEW OF CONCORD PATTERNS

CLASS	GENDER	CASE	PATTERN
Higher	Non-Vir	*Structural*	$[_{KP}$ ACCUSATIVE … $[_{KP}$ GENITIVE …]]
			$[_{KP}$ GENITIVE … Num_{DEF} $[_{KP}$ GENITIVE …]]
		Lexical	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ EXTERNAL CASE …]]
	Vir	*Structural*	$[_{KP}$ GENITIVE … Num_{DEF} $[_{KP}$ GENITIVE …]]
		Lexical	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ EXTERNAL CASE …]]
1000+ (numeral)	Non-Vir/ Vir	*Structural*	$[_{KP}$ ACCUSATIVE … $[_{KP}$ GENITIVE …]]
			$[_{KP}$ GENITIVE … Num_{DEF} $[_{KP}$ GENITIVE …]]
1000+ (nominal)	Non-Vir/ Vir	*Structural/ Lexical*	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ GENITIVE …]]
Lower	Non-Vir	*Structural/ Lexical*	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ EXTERNAL CASE …]]
	Vir	*Structural*	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ EXTERNAL CASE …]]
			$[_{KP}$ GENITIVE … Num_{DEF} $[_{KP}$ GENITIVE …]]
		Lexical	$[_{KP}$ EXTERNAL CASE … $[_{KP}$ EXTERNAL CASE …]]

B.2 FEATURE CO-OCCURENCE RESTRICTION

[NOM], [ACC], [GEN] cannot occur on nodes dominated by [LOC]

B.3 FEATURE HIERARCHY

[LOC]

[GEN]

B.4 POLISH PARADIGMS

Higher numerals

	VIR	NON-VIR
NOM	-iu	-∅
ACC	-iu	-∅
GEN	-iu	-iu
LOC	-iu	-iu
DAT	-iu	-iu
INSTR	-iu/-iu	-ioma/-iu

'thousand'

	SG	PL
NOM	tysiąc	tysiąc-e
ACC	tysiąc	tysiąc-e
GEN	tysiąc-a	tysiąc-y
LOC	tysiąc-u	tysiąc-ach
DAT	tysiąc-owi	tysiąc-om
INSTR	tysiąc-em	tysiąc-ami

'two'

	VIR	NON-VIR	FEM
NOM	dwaj/dwóch	dwa	dwie
ACC	dwóch	dwa	dwie
GEN	dwóch	dwóch	dwóch
LOC	dwóch	dwóch	dwóch
DAT	dwom	dwom	dwom
INSTR	dwoma	dwoma	dwiema

'three' and 'four'

	VIR	NON-VIR
NOM	-ej/-ech	-y
ACC	-ech	-y
GEN	-ech	-ech
LOC	-ech	-ech
DAT	-em	-em
INSTR	-ema	-ema

'this'

	VIR	NON-VIR
NOM	ci	te
ACC	tych	te
GEN	tych	tych
LOC	tych	tych
DAT	tym	tym
INSTR	tymi	tymi

Plural adjectives

	VIR	NON-VIR
NOM	-y/-i	-e
ACC	-ych/-ich	-e
GEN	-ych/-ich	-ych/-ich
LOC	-ych/-ich	-ych/-ich
DAT	-ym/-im	-ym/-im
INSTR	-ymi/-imi	-ymi/-imi

C

APPENDIX C — BCS

C.1 OVERVIEW OF CONCORD PATTERNS

CLASS	GENDER	CASE	PATTERN
Higher		*Structural*	$[_{KP}$ GENITIVE … $[_{KP}$ GENITIVE … $]]$
		Lexical	$*[_{KP}$ GENITIVE … $[_{KP}$ GENITIVE … $]]$
Lower	M/N	*Structural*	$[_{KP}$ NOMINATIVE … $[_{KP}$ NOMINATIVE … $N_{GEN}]]$
	F		$[_{KP}$ NOMINATIVE … $[_{KP}$ NOMINATIVE … $]]$
		Lexical	$*[_{KP}$ NOMINATIVE … $[_{KP}$ NOMINATIVE … $N_{GEN}]]$

C.2 FEATURE CO-OCCURENCE RESTRICTIONS[87]

[GEN] cannot occur on the same node as [MIX]

[GEN] cannot occur on non-terminal nodes dominated by [PC]

[GEN] cannot occur on N dominated by [F, PC]

[ACC] cannot occur on nodes dominated by [PC]

[M] cannot occur on non-terminal nodes dominated by [PC]

[PL] cannot occur on a non-feminine N dominated by [PC]

87 As discussed in Chapters 4 and 5, numeral constructions in verb-governed dative case environments are subject to speaker variation in BCS. For this reason, the feature co-occurrence restrictions that include [DAT] have been omitted here since they are not assumed to be part of the main grammar. [DAT] has also been left out of the feature hierarchy because its position varies depending on the speaker's preferences.

C.3 FEATURE HIERARCHY[88]

[PC] ; [MIX]

[PL]

[F]

[M]

[GEN]

[ACC]

[NOM]

88 Since [PC] and [MIX] are both numeral-class features, they never occur in the same derivation. As a result, it is impossible to determine whether one outranks the other, so I have placed them at the same level in the hierarchy. They should not be regarded as a feature combination, such as [ACC, ANIM] or [F, PC] in the Russian hierarchy.

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