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1 Introduction

In this paper I present an Optimality-Theoretic account of full and partial identity of forms, i.e., paradigmatic syncretism and cases in which lexemes share the same inflected stem. I propose a constraint-based approach involving both output-to-output correspondence constraints (Benua 1995, McCarthy and Prince 1995, Kager 1999) and constraints matching morphosyntactic feature values with morphophonological forms (Yip 1998, MacBride 2004). I show that this account has advantages over rule-based accounts such as feature impoverishment-plus-feature insertion (Noyer 1998), rules of referral (Zwicky 1985, Stump 1993), and the Right-hand Head Rule (Williams 1981, Pinker 1998), in that the constraint-based approach provides a unified account of both full and partial identity of forms within inflectional morphology.

2 Paradigmatic Syncretism

2.1 Divergent Bidirectional Syncretism

Noyer makes a strong empirical claim that within the impoverishment-plus-insertion theory, systematic syncretisms “will always move from a more marked to a less marked state” (1998:282). Divergent bidirectional syncretism (DBS) (Baerman 2004, Baerman et al. 2005) poses a problem for this empirical claim. Baerman (2004:816) gives the following definition: Under DBS, there is a feature value $x$ that takes the form associated with feature value $y$ in some contexts, while in other contexts $y$ takes the form associated

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Baerman illustrates DBS with cases from the Latin second declension, Classical Arabic declension, and Diyari declension.\(^1\)

Consider the Latin second declension. The suffix \textit{-us} is the exponent of the nominative (nom.) singular (sg.) and marks the nom. sg. of both default masculine nouns and a group of neuter nouns including \textit{vulgus} ‘crowd’, \textit{virus} ‘poison’, and \textit{pelagus} ‘sea’ with \textit{-us} for both the nom. sg. and accusative (acc.) sg. By contrast, \textit{-um} is the exponent of the acc. sg. and marks the acc. sg. of both default neuter and default masculine nouns. See Table 1.

<table>
<thead>
<tr>
<th>NOM SG</th>
<th>DEFAULT NEUTER</th>
<th>DEFAULT MASCULINE</th>
<th>NOM &amp; ACC in -\textit{us}</th>
</tr>
</thead>
<tbody>
<tr>
<td>bell-\textit{um}</td>
<td>‘war’</td>
<td>serv-\textit{us}</td>
<td>vulg-\textit{us}</td>
</tr>
<tr>
<td>bell-\textit{um}</td>
<td>serv-\textit{um}</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: The Latin second declension (Baerman 2004:816)

The acc. sg. of nouns such as \textit{vulgus} ‘crowd’ syncretizes with the nom. sg. by taking \textit{-us} as its exponent. An analysis based on impoverishment-plus-insertion will delete the acc. feature value and add the nom. feature value so that the vocabulary item \textit{-us} \leftrightarrow nom. sg. can be inserted, as in (1).\(^2\) This analysis conforms to the tenet of impoverishment-plus-insertion that the form of a less marked feature value always prevails.

(1) a. acc. sg. \rightarrow sg. \rightarrow nom. sg. (in the environment of nouns like \textit{vulgus})
   b. \textit{-us} \leftrightarrow nom. sg.

The syncretism between the nom. sg. and the acc. sg. of default neuter nouns, however, contradicts the tenet of impoverishment-plus-insertion. The nom. sg. of second declension default neuter nouns takes on the form of the acc. sg. Given that nom. is universally less marked than acc. (see e.g., Comrie 1975, 1976, Woolford 2001), impoverishment-plus-insertion unexpectedly moves from a less marked to a more marked state:

\(^1\)See also Carstairs-McCarthy (1998), Baerman, Brown, and Corbett (2005) for criticisms of the impoverishment theory from a different perspective, i.e., if we reasonably manipulate the morphosyntactic feature values of vocabulary items, impoverishment will make different predictions about syncretic directions.

\(^2\)Third declension neuter nouns like \textit{tempus} ‘time’ pattern similarly to \textit{vulgus}, in that the form for both nom. and acc. resembles the masc. and fem. nominative (e.g., \textit{dens} ‘tooth’, \textit{miles} ‘soldier’).
Another case of DBS comes from Classical Arabic declension. According to Baerman, “in the so-called sound plurals (formed by suffixation), genitive and accusative are syncretic, marked by the ending -i, which corresponds to the distinct genitive of the default type. Diptotic nouns (certain adjectival stems, some broken plurals, and some personal names) likewise have a syncretic genitive/accusative, but the ending is -a, corresponding to the distinct accusative of the default type” (2004:817). As we can see from Table 2, the genitive (gen.) of diptotic nouns takes on the form of the acc. By contrast, the acc. of sound plurals takes on the form of the gen.

<table>
<thead>
<tr>
<th>NOM</th>
<th>GEN</th>
<th>ACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>'believers.pl.'</td>
<td>'believer'</td>
<td>'black one'</td>
</tr>
<tr>
<td>mu'min-u</td>
<td>mu'min-i</td>
<td>mu'min-a</td>
</tr>
</tbody>
</table>

Table 2: Classical Arabic declension (Fischer 1997:196, Baerman 2004:817)

According to Comrie (1975, 1976), acc. is universally less marked than gen. (See the Case Hierarchy in (3).) Therefore, it is against the tenet of impoverishment-plus-insertion that the acc. of sound plurals takes the form of the gen., a more marked feature value.

(3) The Case Hierarchy (Comrie 1975, 1976)
subject > direct object > indirect object > oblique
(nom.) (acc.) (dative) (gen.)

The third instance of DBS comes from DIYARI declension. In DIYARI, the absolutive (abs.) case has a zero exponent and the suffix -n5a is the exponent of the acc. As we can see from Table 3, the abs. of Type V nouns (male personal names) takes on the marker of the acc.; i.e., a less marked feature

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3I=sg. nouns (n.); II=non-sg. n., non-sg. 3rd pronouns, sg. n.; III=non-sg. 1st and 2nd pronouns; IV=female personal names, sg. pronouns; V=male personal names
value takes on the form of a more marked one, given that Diyari is an ergative language. This again violates the tenet of impoverishment-plus-insertion.

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERG</td>
<td>-(ya)li</td>
<td>-li</td>
<td>-Ø</td>
<td>-ndu</td>
<td>-li</td>
</tr>
<tr>
<td>ABS</td>
<td>-Ø</td>
<td>-Ø</td>
<td>-Ø</td>
<td>-ni</td>
<td>-n5a</td>
</tr>
<tr>
<td>ACC</td>
<td>-Ø</td>
<td>-n5a</td>
<td>-n5a</td>
<td>-n5a</td>
<td>-n5a</td>
</tr>
</tbody>
</table>

Table 3: Diyari declension (Austin 1981:47-50,61, Baerman 2004:818)

In effect, as long as there is a markedness difference between the two feature values x and y in a case of DBS, it will pose a problem for the empirical claim that syncretism obeys markedness.

One may try to save this empirical claim by assuming that the form of a marked feature value acts as a default marker. For example, in Latin, -um may be treated as a default marker which appears elsewhere. To account for the syncretism between the nom. sg. and the acc. sg. of default neuter nouns, impoverishment-plus-insertion will delete the nom. feature value so that the default marker -um can be inserted:

(4) a. nom. → Ø / default neuter
    b. -um ↔ Elsewhere

The same analysis applies to the syncretism between the gen. and the acc. of sound plurals in Classical Arabic. That is, the gen. exponent -i is treated as a default. The acc. feature value is deleted in the environment of sound plurals so that -i can be inserted (ignoring the vowel lengthening of the plural marker for the moment). The syncretism between the abs. and the acc. in Diyari can be analyzed in the same way. The acc. exponent -n5a is a default marker. The abs. feature value is deleted in the environment of male personal names so that -n5a can be inserted.

It is, however, unmotivated to assume that the form of a marked feature value acts as a default in the cases of DBS in question. Bobaljik (2001) argues in favor of impoverishment theory and implicitly suggests that the form of a universally less marked feature value tends to be a default. Thus, -us ↔
nom. sg. should be a more suitable candidate for a default than -\textit{um} \leftrightarrow \text{acc. sg.} in the Latin second declension; -\textit{a} \leftrightarrow \text{acc.} should be more suitable for a default than -\textit{i} \leftrightarrow \text{gen.} in Classical Arabic; and -\textit{Ø} \leftrightarrow \text{abs.} should be more suitable for a default than -\textit{n}5\textit{a} \leftrightarrow \text{acc.} in Diyari, because the former feature values are universally less marked than the latter ones, respectively. Additionally, within these languages it is not clear why we should choose the forms of the latter feature values as defaults rather than those of the former ones, given that the forms of \textit{both} marked and less marked syncretic feature values occupy equal \textit{numbers} of paradigmatic cells as we can see from Tables 1, 2, and 3.

To briefly summarize, the above cases of DBS pose a problem for the strong claim made in the impoverishment-plus-insertion theory that the form of a less marked feature value always prevails. To account for cases of DBS, impoverishment-plus-insertion needs to introduce the form of a less marked feature value in some cases and the form of a more marked feature value in others, or it sometimes needs to assume an unmotivated default marker.

\subsection*{2.2 An Optimality-Theoretic Account of Paradigmatic Syncretism}

In this section I present an Optimality-Theoretic (OT) account of paradigmatic syncretism and propose the constraint ranking schema in (5) to account for the above cases of divergent bidirectional syncretism.

\begin{equation}
\text{(5) output-to-output (OO) correspondence constraints} >> \text{constraints matching morphosyntactic feature values with morphophonological forms (CFFs)}
\end{equation}


I propose two crucial OO correspondence constraints\(^5\) and two CFFs in (6) for the syncretisms between the nom. sg. and the acc. sg. of both default (def.) neuters (n.) and n. nouns like \textit{vulgus} in the Latin second declension.

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\(^5\) Apart from the feature identity constraints in (6), there are other OO correspondence constraints such as \textsc{Max-OO} which penalizes the deletion of a segment of an output which has a correspondent in the base and \textsc{Dep-OO} which penalizes the appearance of a segment in the output which does not have a correspondent in the base.

He says that by contrast, "[t]he impoverishment rule... [assumes] that third person is a default (either in terms of the rules of exponence in Macedonian or universally)."
a. IDENT (acc. sg. (base), nom. sg. / def. n.) (F): Corresponding segments of both the base acc. sg. and the nom. sg. in the context of a default neuter have identical phonological features. (IDENT AN)

b. IDENT (nom. sg. (base), acc. sg. / nouns like VULG) (F): Corresponding segments of both the base nom. sg. and the acc. sg. in the context of nouns like VULG have identical values for any phonological feature. (IDENT NA)

c. NOM SG-us: nom. sg. is marked by the suffix -us in the output.

d. ACC SG-um: acc. sg. is marked by the suffix -um in the output.

Let us first consider the syncretism between the nom. and the acc. of default neuters. I assume that an input comprises both the lexical stem and the inherent features of a lexeme, and morphosyntactic feature values assigned in syntax, and that the function Gen generates an infinite list of morphophonological forms which spell out the lexeme and the abstract morphosyntactic feature values.6 I assume that, for example, an input comprises both the lexeme BELL whose lexical stem is bell and the morphosyntactic feature values nom. sg.: I assume that acc. sg. -um is a base whose morphophonological form is to be copied.7 Consider the tableau in (7). bell-um is the winning candidate although it violates the lower ranked constraint NOM SG-us. bell-us fatally violates the OO correspondence constraint IDENT AN because /s/ of -us does not correspond to /m/ of -um in the base with respect to a phonological feature (e.g., voicing, nasality).8

With our results unchanged, I sometimes omit the discussion of these constraints for the sake of brevity and simplicity, though they may rank lower than CFFs.


7The notion of a base in this paper is simply a morphosyntactic feature value whose morphophonological form is to be copied. Kager (1999) gives a different definition of a base and proposes that a base should be a free-standing word and contains a subset of the grammatical features of the derived form.

8bell-um-us (nom. sg.) is also an important candidate which satisfies both IDENT AN and NOM SG-us. It is, however, ruled out by the markedness constraint *FEATURE SPLIT (Xu 2006) which favors the universally unmarked simple exponent (Wurzel
The same grammar can account for the syncretism between the nom. sg. and the acc. sg. of nouns like VULG in the Latin second declension. I assume that the input comprises the lexeme VULG and its lexical stem vulg and the morphosyntactic feature values acc. sg.. I also assume that a relevant base is nom. sg. -us. The crucial output candidate vulg-um (acc. sg.) fatally violates the constraint IDENT NA because /m/ of -um does not correspond to /s/ of -us in the base with respect to phonological features such as voicing, nasality. The form vulg-us (acc. sg.) is the winning candidate despite its violation of the lower ranked constraint ACC SG-um.

To account for the syncretism between the gen. and the acc. of sound plurals in Classical Arabic, I propose three crucial constraints in (8).

(8) a. IDENT (gen. (base), acc. / plural) (vowel height): Corresponding segments of both the base gen. and the acc. in the context of a plural have identical values for vowel height. (IDENT GA (VH))

b. PL-LONG VOWEL: plurals are marked by long vowels. (PL-LV)

c. ACC-a: acc. is marked by the suffix -a in the output.

Consider the tableau in (9). I assume that an input, for example, comprises the lexeme MU'MIN whose lexical stem is mu'min and the acc. plural (pl.). I also assume that a relevant base is gen.: -i. Mu'min-i: is the winning candidate although it violates the lower ranked constraint ACC-a which requires the acc. to be marked by the suffix -a. Mu'min-i is ruled out by the grammar 1989 and penalizes a morphosyntactic feature value being realized by more than one inflection. *FEATURE SPLIT should rank higher than the two CFFs in (6).
because it fatally violates the constraint Pl-LV which requires the pl. to be marked by a long vowel. \textit{Mu'min-a} is also ruled out because it fatally violates both the constraints IDENT GA (VH) and Pl-LV in that /a/ is a short vowel and does not correspond to /i/ of the genitive base.

\textbf{(9) MU'MIN (Classical Arabic)}

\begin{table}[h]
\begin{tabular}{|c|c|c|c|}
\hline
Input: & IDENT GA (VH) & Pl-LV & ACC: -\textit{a} \\
\hline
\textit{mu'min} & & & \\
\hline
\textit{mu'min} & & & \\
\hline
\textit{mu'min} & & & \\
\hline
\end{tabular}
\end{table}

To account for the syncretisms between the abs. and the acc. of both MPNs (Type V nouns) and singular nouns (Type I nouns) in Diyari declension, I propose two OO correspondence constraints and two CFFs in (10).

\textbf{(10)}

\begin{itemize}
\item \textbf{a. MAX (acc. (base), abs. / male personal name):} Every segment in the base acc. has a correspondent in the form of the abs. in the environment of a male personal name (MPN). (\textbf{MAX (acc. abs.)})
\item \textbf{b. DEP (abs. (base), acc. / singular noun):} Every segment in the form of the acc. has a correspondent in the base abs. in the environment of a singular noun. (\textbf{DEP (abs. acc.)})
\item \textbf{c. ABS-\textita{O}:} The abs. is marked by a zero suffix in the output.
\item \textbf{d. ACC-n\textit{5a}:} The acc. is marked by the suffix -n\textit{5a} in the output.
\end{itemize}

Let us first consider the syncretism between the acc. and the abs. of male personal names. Assume the input comprises a male personal name and the abs. and a relevant base is acc. -\textit{n5a}. Consider the tableau in (11). -\textit{n5a} is the winning candidate although it violates the lower ranked constraint ABS-\textita{O}. The output candidate -\textita{O} fatally violates the OO correspondence constraint MAX (acc. abs.) because the base form has no correspondent in the output.
(11) Male personal name (Diyari)

<table>
<thead>
<tr>
<th>Input: abs. MPN</th>
<th>MAX (acc. abs.)</th>
<th>DEP (abs. acc.)</th>
<th>Abs-Ø</th>
<th>ACC-Øa</th>
</tr>
</thead>
<tbody>
<tr>
<td>→ abs. MPN</td>
<td>-Ø</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>abs. MPN</td>
<td>-Ø</td>
<td>n5a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The same grammar can account for the syncretism between the acc. and the abs. of singular nouns. Assume the input comprises a singular noun and the acc. and a relevant base is abs.-Ø. The crucial output candidate acc.-n5a fatally violates the OO correspondence constraint DEP (abs. acc.) because the output has no correspondent in the base. Acc.-Ø is the winning candidate although it violates the lower ranked constraint ACC-n5a.

The constraint-based grammar in which OO correspondence constraints are ranked higher than CFFs performs as well as rules of referral (Zwicky 1985, Stump 1993) in accounting for DBS. Take the syncretism between the nom. sg. and the acc. sg. of default neuters in the Latin second declension as an example. Consider the rules in (12) (Baerman 2004:816). The rule of referral (12a) says that in the environment of a default neuter, the nom. sg. refers to the acc. sg. for its form. This rule of referral feeds the rule of exp

(12) a. nom. sg. in default neuter = acc. sg.
b. acc. sg. = stem + -um

Additionally, the constraint-based grammar more clearly shows that cases of syncretism in which a direction has to be specified involve a copying process. The constraint-based grammar also captures the two functions of a rule of exp

A related question is what can act as a base whose form is to be copied when we need to specify the direction of syncretism. First, a feature value whose corresponding form occupies more paradigmatic cells of this feature
value may act as a base (e.g., in the Latin second declension, the acc. sg. acts as a base for the nom. sg. of a default neuter since -um, the corresponding form of the acc. sg., occupies more accusative paradigmatic cells than nominative ones). Second, a universally less marked feature value tends to be a base (Noyer 1998, Bobaljik 2001).

3 Partial Identity of Forms

3.1 Pinker (1998)

Pinker (1998) observes that English words such as workman and snowman have the irregular inflection X-men while Walkman ‘a personal stereo’ doesn’t. Based on the Right-hand Head Rule (Williams 1981), Pinker argues that the plural form of Walkman is Walkmans instead of *Walkmen because something (let’s say X) prevents Walkman from inheriting its manner of inflection from its rightmost morpheme -man. Pinker assumes the structure for Walkman is \([N \{v \text{Walk} \} \{x \{N \text{man} \}\}]\). Pinker’s account leaves two questions unaddressed: (i) It is not clear what this “something” or X refers to. (ii) It is not clear why this X stands in between N’s in cases like Walkman.

3.2 An Optimality-Theoretic Account of Partial Identity of Forms

I show that the ranking schema in which OO correspondence constraints are ranked higher than CFFs can account for the distinction between snowmen and Walkmans. I organize nouns including workman and snowman with both the morpheme -man (/mən/) and the sense of “human appearance” into one inflectional class (Aronoff 1994) in that they decline in the same way to denote the plural feature value. Let us call this the “man-class.” I propose a crucial OO correspondence constraint and a CFF in (13).

(13) a. IDENT ([MAN, man-class, pl.], [N, man-class, pl.]) (F): Corresponding segments of the plural form of the lexeme MAN and the plural form of a man-class noun have identical values for any phonological feature. (IDENT (MAN, man-class))

b. PL-\(z\): pl. is marked by the suffix -z in the output.

Let us first consider snowmen. I assume that the input comprises the lexeme SNOWMAN and its stem snowman and the pl. feature value, and that a relevant base is MAN plus the pl whose corresponding morphophonological form is men. Consider the tableau in (14). Snowmen is the winning candidate
Although it violates the lower ranked constraint Pl-z. Snowmen satisfies IDENT (MAN, man-class) because corresponding segments of both men and snowmen have identical phonological feature values.\(^9\) (I assume that vowel reduction does not take place at this level.) The form snowmans fatally violates the OO correspondence constraint because /E/ of men does not correspond to /æ/ of snowmans with respect to vowel height.\(^10\)

Next, let us consider Walkmans. I assume that the input comprises the lexeme WALKMAN and its stem Walkman and the pl., and that the base is still MAN plus the pl.\(^11\) The constraint IDENT (MAN, man-class) does not apply to Walkmen or Walkmans because WALKMAN is not a man-class noun, since WALKMAN does not denote the sense of "human appearance." Walkmen is ruled out by the constraint Pl-z. Walkmans is the winning candidate which satisfies both the constraints IDENT (MAN, man-class) and Pl-z.

This analysis captures the observation that the plural form of MAN is unpredictable\(^12\) while there is a productive process in which the plural forms of

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\(^{9}\) Snowmen violates the constraint DEP-OO which requires the appearance of no additional segment compared to the base men. DEP-OO should therefore rank lower than MAX-IO which requires no deletion of the input segments of snowman. The output candidate men fatally violates MAX-IO and is therefore ruled out.

\(^{10}\) Snowmens is also an important candidate which satisfies both IDENT (MAN, man-class) and Pl-z. It is, however, ruled out by the markedness constraint *FEATURE SPLIT which ranks higher than Pl-z. See footnote 8.

\(^{11}\) Another possibility is that there is no base for WALKMAN because by contrast all man-class nouns are free-standing words and have the semantic structure "something that looks like a man." This assumption, however, encounters a problem when we account for, for example, the past tense forms of UNDERGO, FORGO, etc. which have went as their base. Verbs like UNDERGO, FORGO are semantically unrelated to GO.

\(^{12}\) Following Pinker (1998), I assume the irregular form men is listed in the lexicon. Cf. Distributed Morphology, which would assume that -Ø marks the pl. of the
man-class nouns copy the plural form of man. Similar analyses apply to other inflectional classes in English such as the go-class including go, forgo, undergo, etc. and the stand-class including stand, understand, withstand, etc.

Additionally, this approach circumvents the problems for Pinker's (1998) analysis of Walkmans. It straightforwardly shows that the plural form of WALKMAN does not copy men because the meaning of the whole lexeme prevents WALKMAN from joining the man-class.

3.3 Rules of Referral

OO correspondence constraints have a wider scope of application than rules of referral (Zwicky 1985, Stump 1993) which would encounter problems to account for partial identity of forms. In the spirit of Zwicky (1985), who uses rules of exponence to realize German suppletive determiners, we can propose a rule of exponence in (15) to realize the plural of the lexeme MAN. We cannot, however, use a rule of referral like (16) to realize the plural form of the lexeme SNOWMAN because otherwise the plural form of SNOWMAN would be men instead of snowmen. Rule (16) says that the plural form of SNOWMAN is identical to the plural form of MAN which is men.

(15) [MAN, pl.] = men
(16) [SNOWMAN, pl.] = [MAN, pl.]

4 Conclusions

I have shown that an OT approach based on both OO correspondence constraints and constraints matching morphosyntactic feature values with morphophonological forms can account for both paradigmatic syncretism and cases in which lexemes share the same inflected stem. Divergent bidirectional syncretism poses a problem for the tenet of impoverishment-plus-insertion that the form of a less marked feature value always prevails. Compared to both impoverishment-plus-insertion and referral, the constraint-based approach shows that directional syncretism involves a copying process in which the form of one set of morphosyntactic feature values copies that of root MAN, which is followed by a readjustment rule triggering a root-internal vowel change.

13Zwicky's rule of exponence is formalized as, for example, “[INDEX: 15, CASE: nom., GEND: n., NUM: sg.] is realized as /das/” (Zwicky 1985:383).

14The Head Application Principle (Stump 2001) accounts for the plural form of SNOWMAN, though it is not clear how it accounts for the plural form of WALKMAN.
An approach based on the Right-hand Head Rule has problems accounting for nouns like WALKMAN and SNOWMAN which contain the same inflectional stem but do not undergo the same inflectional process because it is not clear what prevents WALKMAN from being inflected in the same way as SNOWMAN. OO correspondence constraints have a wider scope of application than rules of referral, which have problems accounting for partial identity of forms because they connect two fully identical forms. Finally, note that in all the cases discussed here, the higher ranked OO correspondence constraints are more specific than the CFFs with respect to the context whereby a constraint applies. Whether specificity always predicts order for such constraints is a question worth exploring.

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