Weighted Scalar Constraints Capture the Typology of Loanword Adaptation
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Introduction Loanwords often obey different phonological restrictions than native vocabulary, and loanwords often differ from one another based on degree of nativization. There are three typical cases. A. Superset at periphery: A marked structure that is banned in native words is permitted in loanwords (Paradis & Lebel 1994, Itô & Mester 1995). B. Subset at periphery: A marked structure that is permitted in native words is banned in loanwords (Kenstowicz 2005). C. Divergent repair: Loanword classes differ in the repairs used to avoid a marked structure (Kenstowicz 2005, Peperkamp et al. 2008).

These patterns are all implicational: If a process or restriction applies at some stratum $s$ of nativization, but fails to apply at stratum $s + 1$, it also fails to apply at all strata beyond $s + 1$. This paper demonstrates that prior Optimality Theoretic approaches overgenerate, and argues that the attested typology is best accounted for through scaling of weighted constraint violations within Harmonic Grammar (Legendre et al. 1990, Smolensky & Legendre 2006).

Overgeneration in OT Sensitivity to loanword class can be modeled in OT by indexing constraints to lexical strata (Itô & Mester 1999). For example, the Korean divergent repair pattern (Kang 1996) in (1) can be captured by ranking $\text{IDENT[sonorant]} \gg \text{DEPV}$ for foreign words, while the opposite holds for constraints indexed to the Sino-Korean and Native strata.

(1) Korean: Obstruent+nasal sequences repaired by obstruent nasalization or V epenthesis.

\[
\begin{array}{c|c|c}
\text{(core)} & \text{Native:} & /\text{kuk-mul}/ \rightarrow [\text{kummul}] \text{ 'soup'} \\
& \text{Sino-Korean:} & /\text{kuk-min}/ \rightarrow [\text{kunmin}] \text{ 'people'} \\
& \text{Foreign:} & /\text{p\text{\textasciicircum}knuk}/ \rightarrow [\text{p\text{\textasciicircum}kinik}] \text{ 'picnic'}
\end{array}
\]

However, indexed constraints also predict unattested languages like Korean’ where repair strategies skip strata – e.g., if $\text{DEPV} \gg \text{IDENT[sonorant]}$ for Foreign and Native words, but $\text{IDENT[sonorant]} \gg \text{DEPV}$ for Sino-Korean words.

(2) Non-implicational Korean’ pattern:

\[
\begin{array}{c|c|c}
\text{*OBSNAS} & \text{DEPF} \gg \text{IDENT[son]}_f \gg \text{IDENT[son]}_{S-K} \gg \text{DEPS}_K \gg \text{DEPS} \gg \text{IDENT[son]}_N
\end{array}
\]

Non-implicational patterns can be eliminated through metaconditions on possible rankings of indexed constraints (Itô & Mester 1995, 1999), but this raises issues of learnability. Loanword strata do not always correspond to well-defined etymological classes, and accounting for each implicational relationship requires the positing of an additional stratum, with no upper bound on the number of strata or indexed constraints.

Scalar constraints in HG The attested typology receives a straightforward account using weighted scalar constraints. Here, the violation cost increases with distance from the core lexicon – i.e., the total penalty for a constraint violation is $w + s(d)$, where $w$ is the base constraint weight and $s$ is a scaling factor that increases based on distance $d$ from the core (cf. Linzen et al. 2013). The full typology is predicted if both Markedness and Faithfulness constraints can be scaled. The figures on page 2 show the basic configurations corresponding to the three attested patterns. Markedness constraints are represented with dashed lines, and Faithfulness constraints with solid lines. The y-axis measures the penalty accrued through violation of the relevant constraints, given the specified values for $w$ and $s$ and assuming that
the core stratum has a value \( d \) of 0. In the case of the Superset at periphery pattern, for instance, Faithfulness \( w = 1 \) and \( s = 3 \), while Markedness \( w = 4 \) and \( s = 1 \). Given these values, marked structures are repaired in the core lexicon and in partially nativized words, but they are rendered faithfully as the periphery is approached and the relative penalties assigned by the constraints flip.

The precise constraint weights and scaling factors are not crucial; any values consistent with the weighting conditions below will generate these patterns.

(3) a. Superset at periphery: \( w(M) > w(F) \) but \( F \) has a greater scaling factor – the Faithfulness penalty exceeds the Markedness penalty beyond some stratum \( s \).

b. Subset at periphery: \( w(F) > w(M) \), but \( M \) has a greater scaling factor – the Markedness penalty exceeds the Faithfulness penalty beyond some stratum \( s \).

c. Divergent repair: \( w(F1) > w(F2) \) but \( F2 \) has a greater scaling factor – relative Faithfulness penalties are reversed beyond some stratum \( s \).

As long as scaling factors are monotonic, the relative penalties assigned by pairs of conflicting constraints can be inverted only once. Each pattern arises through conflict between constraints that favor vs. disfavor repair (superset and subset at periphery), and conflict between constraints that favor different repair types (divergent repair). Multiple strata and indexed constraints need not be learned; \( d \) is a continuous value that individual lexical items can select and that can vary based on context. The basic implicational patterns emerge naturally without weighting metaconditions. The HG approach thus successfully captures a global restriction on the diverse array of loanword adaptation patterns.