Catalan nativization patterns in the light of Weighted Scalar Constraints*

GLOW 42

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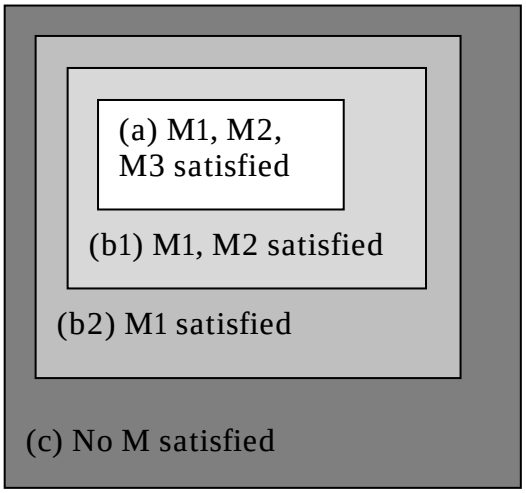
1. INTRODUCTION AND GOALS

- Loanwords usually pattern differently than native words with respect to markedness.

- Loanwords can comply with the markedness constraints satisfied by native words, but usually they comply only with a subset of these markedness constraints, and, in many cases, with none.

- This situation brings about a nested core-periphery structure of the lexicon, with different strata (Itô & Mester 1999, 2008 / 2009): a. the *core stratum*, in which loanwords behave as native words and satisfy all markedness constraints (*nativized loanwords*) (1a); b. *the intermediate strata*, in which loanwords satisfy only a subset of the markedness constraints active in the core strata (*partially nativized loanwords*) (1b1, 1b2); c. the *peripheral stratum*, in which loanwords do not satisfy any of the markedness constraints active in the previous strata (*non-nativized loanwords*) (c).

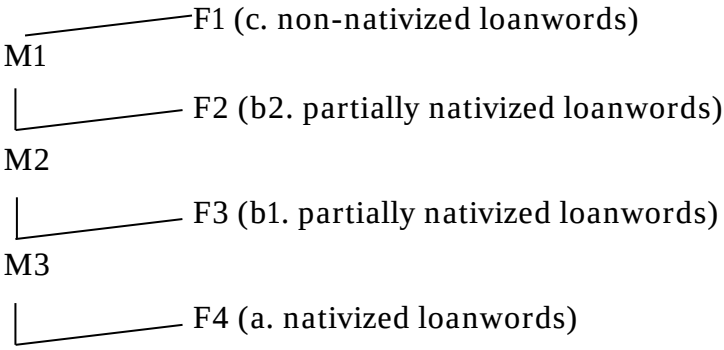
(1) Core-periphery structure of the lexicon (Itô & Mester 1999, 2008 / 2009)



- In Itô & Mester's model, the differences according to each of these strata are explained by the variable position of a block of faithfulness constraints F1, F2, F3..., to which lexical items in each stratum are indexed, with respect to a language-particular fixed hierarchy of markedness constraints (M1 >> M2 >> M3).

* Vlad Martin-Diaconescu has taken care of the the treatment of the data in Excel and Python (§ 3), and did the calculations of the weights depending on the scaling factor variable in Excel (§ 4). This research is supported by the Catalan Government (2014SGR918) and by the project FFI2016-76245-C3-3-P.

(2) Differences across strata



- Such a structure gives rise to asymmetrical implicational patterns in the adaptation of loanwords.

  "Structures [...] are built out of a network of implicational relations involving lexical items and phonological constraints of the following kind: items that are subject to constraint *A* are also always subject to constraint *B*, but not all items subject to *B* are also subject to *A*." (Itô & Mester 2008 / 2009: p. 554).

- In this talk we deal with two cases involving implicational patterns of this sort in the adaptation of loanwords in Catalan (see Pons-Moll 2015).

- The purpose of the talk is to present the results of two surveys supporting quantitatively these kinds of patterns and to attempt a formalization of them under the *Weighted Scalar Constraints* version of *Harmonic Grammar*, following the recent proposals by Hsu & Jesney (2017, 2018).

2. Data

2.1. Word-final posttonic /n/ deletion (ND) and vowel reduction (VR)

Word-final posttonic /n/ deletion and vowel reduction are general processes in the native lexicon of Catalan.

(3) ND (Mascaró 1976, Bonet & Lloret 1998)

pla[n]s ~ pla[n]íssim ~ pla[∅]	'flat PL.' ~ flat SUPERL.' ~ 'flat SG.'
cosi[n]s ~ cosi[n]et ~ cosí[∅]	'cousin PL.' ~ 'cousin DIM.'' ~ 'cousin SG.'

(4) VR (Mascaró 1976, Bonet & Lloret 1998)

c[á]sa ~ c[ə]seta	'house SG.' ~ 'house DIM.'
t[ɛ́]rra ~ t[ə]rrestre	'earth SG.' ~ 'terrestrial'
f[é]ra ~ f[ə]rós	'beast SG.' ~ 'fierce'
p[ɔ́]rta ~ p[u]rtal	'door SG.' ~ 'hallway'
p[ó]ma~ p[u]mera	'apple SG.' ~ 'apple tree'

2.2. Underapplication of ND and VR

- These two processes, though, tend to underapply in loanwords.

(5) Underapplication of ND in loanwords (Pons-Moll *et. al* 2018)

diva[n]	taliba[n]	Pakista[n]
futo[n]	catipe[n]	Afganista[n]
canca[n]	mato[n]	Suda[n]
xama[n]	canto[n]	Vuitto[n]
catamara[n]	pasto[n]	Nissa[n]

(6) Underapplication of VR in loanwords (Mascaró 2002, Cabré 2009, Pons-Moll 2012, Pons-Moll *et. al* 2018)

cutr[e]	Goog[e]l	m[o]jit[o]
gor[e]	pilat[e]s	pest[o]
fly[e]r	típ[e]x	jud[o]
gadg[e]t	clín[e]x	sad[o]
hípst[e]r	ram[e]n	cron[o]
màst[e]r	youtub[e]r	tac[o]
cút[e]r	t[e]mpura	parkins[o]n
blíst[e]r	s[e]rotonina	gastr[o]bar
Twitt[e]r	c[o]ntàin[e]r	c[o]llage

Interestingly enough, loans susceptible to undergo both processes show a consistent behavior in which underapplication of both processes is the most common solution (*t*[o]*b*[o]*ga*[n]), followed closely by just underapplication of ND (*t*[u]*b*[u]*ga*[n]), followed by far by application of both processes (*t*[u]*b*[u]*ga*[Ø]), and in which underapplication of VR and application of ND (**t*[o]*b*[o]*ga*[Ø]) is **unattested**.

(7) Implicational relations between ND and VR, and tendencies

↓	Most common	Underapplication of ND and VR	*t*[o]*b*[o]*ga*[n]	PatA1
	Less common	Underapplication of ND and application of VR	*t*[u]*b*[u]*ga*[n]	PatA2
	Least common	Normal application of ND and VR	*t*[u]*b*[u]*ga*[Ø]	PatA3
	Unattested (impossible nativization)	Underapplication of VR and application of ND	**t*[o]*b*[o]*ga*[Ø]	PatA4

- Underapplication of both processes can co-occur.
- Application of both processes can also co-occur.
- Application of VR and underapplication of ND can also co-occur.
- Underapplication of VR and application of ND cannot co-occur.

If ND applies so does VR, but not viceversa.
If VR is blocked so it is ND, but not viceversa.

2.2. Mid vowel laxing (VL) and VR

In Catalan, there is a notable tendency to prefer [–ATR] mid vowels in stressed position ([ɛ́], [ɔ́]), over the [+ATR] counterparts ([é], [ó]), which is manifested through a wider distribution of the former across the Catalan lexicon (Mascaró 2002) and in loanword adaptation (cf. universal ranking for vowels in stressed position).

(8) Preference for [–ATR] mid vowels in loanword adaptation (Mascaró 2002, Pons-Moll et al. 2019)

top t[ɛ́]n	postd[ɔ́]c
tr[ɛ́]ndy	p[ɔ́]st-it
tr[ɛ́]kking	l[ɔ́]ft
s[ɛ́]lfie	Power P[ɔ́]int
l[ɛ́]ggings	
gill[ɛ́]tte	

This tendency, which we interpret as a process of sonority-driven vowel laxing (VL) in stressed position of an underlying /e/ or /o/ also interacts with VR in loanwords (see Pons-Moll 2015).

In these cases, the most common solution is underapplication of both processes ([é]*ur*[o], *p*[ó]*st*[e]*r*),[2] followed by far by the application of both processes ([ɛ́]*ur*[u], *p*[ɔ́]*st*[ə]*r*); on the contrary, mixed patterns with underapplication of VL and application of VR ([é]*ur*[u], *p*[ó]*st*[ə]*r*), or with application of VL and underapplication of VR ([ɛ́]*ur*[o], *p*[ɔ́]*st*[e]*r*) are generally avoided, although they can be found sporadically in some specific words (Cabré 2009).

(9) Implicational relations between VL and VR, and tendencies

↓	Most common	Underapplication of VL and VR	[é]*ur*[o], *p*[ó]*st*[e]*r*	PatB1
	Less common	Application of VL and VR	[ɛ́]*ur*[u], *p*[ɔ́]*st*[ə]*r*	PatB2
	Very infrequent	Application of VR and underapplication of VL	?[é]*ur*[u], ?*p*[ó]*st*[ə]*r*	PatB3
↓	Even more infrequent	Application of VL and underapplication of VR	?[ɛ́]*ur*[o], ?*p*[ɔ́]*st*[e]*r*	PatB4

- Underapplication of both processes can co-occur.
- Application of both processes can also co-occur.
- Application of VR and underapplication of VL can co-occur, at a low frequency.
- Application of VL and underapplication of VR cannot co-occur.

If VL applies so does VR, and viceversa.

[2] See Bonet *et al.* (2007) and Cabré (2009) for an alternative interpretation of this pattern based on vowel harmony.

3. Experimental survey

3.1. Picture-naming production task

- 16 loanwords with word-final posttonic /n/ + unstressed mid vowels (*t**o**bo**o**gan**n***)
- 6 loanwords containing a stressed mid vowel + unstressed mid vowels (***e**uro**,** p**ò**ste**r***)
- 31 Barcelona Catalan speakers aged 18-23 during the period 2017-2018
- Most: Students of the BA degree Comunicació i Indústries Culturals

3.2. Judgment test inquiring the naturality of the four possible patterns

- Presented in an audio file via a Google form available on Internet
- The same 16+6 loanwords (22 x 4 patterns = 88 items)
- Patterns valued along a Likert scale of 1-5 (very unnatural, quite unnatural, natural enough, quite natural, very natural).

Both tests were fulfilled with loanwords with just one of the relevant structures (e.g. *diva**n***, *màst**e**r*, etc.), and were presented in a randomized way.

(10) Results of the picture-naming production task

a. Patterns A

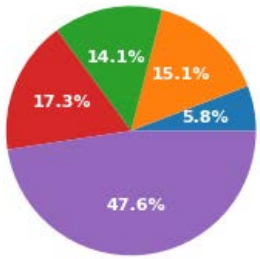
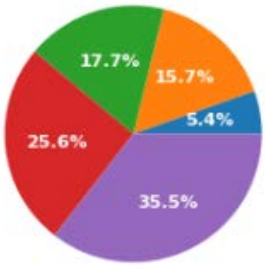
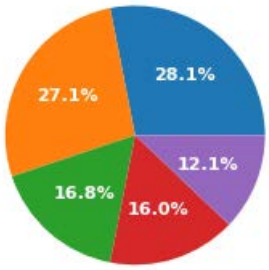
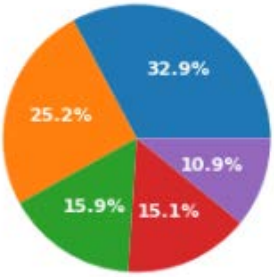
Patterns A	% of answers
a. PATA1 t[o]b[o]ga[n]	65,2%
b. PATA2 t[u]b[u]ga[n]	25%
c. PATA3 t[u]b[u]ga[∅]	9,8%
d. PATA4 t[o]b[o]ga[∅]	0%

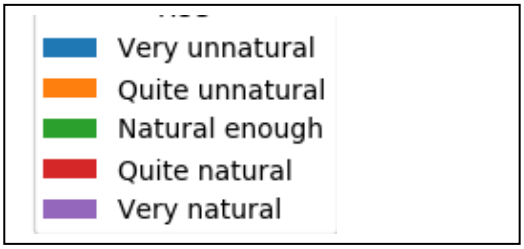
b. Patterns B

Patterns B	% of answers
a. PATB1 p[ó]st[e]r	98,9%
b. PATB2 p[ɔ́]st[ə]r	1,1%
c. PATB3 p[ó]st[ə]r	0%
d. PATB4 p[ɔ́]st[e]r	0%

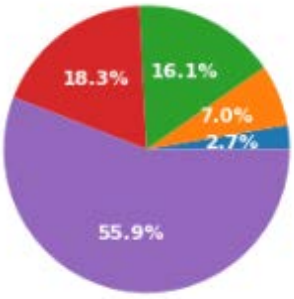
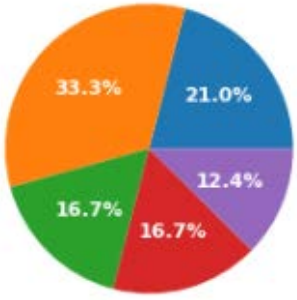
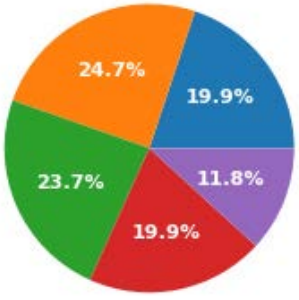
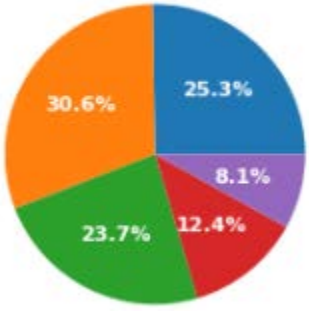
(11) Results of the judgment tests

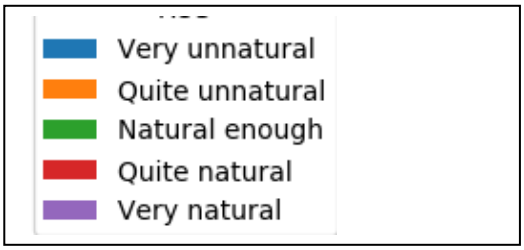
a. *Judgment test. Patterns A*

PATA1 t[o]b[o]ga[n]	PATA2 t[u]b[u]ga[n]
	
PATA3 t[u]b[u]ga[∅]	PATA4 t[o]b[o]ga[∅]
	



b. *Judgment test. Patterns B*

PATB1 p[ó]st[e]r	PATB2 p[ɔ́]st[ə]r
	
PATB3 p[ó]st[ə]r	PATB4 p[ɔ́]st[e]r
	



About these results, which generally fit the gradations exposed in §2, we should comment the following:

(a) Mixed patterns B3 and B4 received a high score for the neutral category "natural enough" (23,7% in both cases), which reveals the hesitation of speakers in front of this type of realizations.

(b) We attribute the low scores for PatA3 *t*[u]*b*[u]*ga*[Ø] and PatB2 [ɛ́]*ur*[u] (*i.e.* nativized patterns), both in the production and in the judgment tests, to the age of the inquired speakers.

(c) Note, finally, that no significant differences were detected in patterns A with respect to the quality of the unstressed vowels (*i.e.* low /a/, as in *or*[a]*ngutan*, *vs.* mid /e/, /o/, as in [o]*rangutan*).

(d) Results are more categorical in the production test than in the judgment test, where there is more variability, and this is expected.

4. Analysis with weighted scalar constraints

- Implicational patterns of the sort exemplified in the previous sections are predicted to exist in a model with weighted constraints as in Harmonic Grammar (Smolensky & Legendre 2006), and more specifically with weighted scalar constraints.

4.1. Harmonic Grammar

- *Interlinguistic variation and weights*. According to Harmonic Grammar (Smolensky 1986, Smolensky & Legendre 2006), interlinguistic variation is not explained through different constraint rankings (as in Optimality Theory), but through constraints with different weights.

- *Violations and negative values*. The violation of a constraint implies the assignment of a negative value, and this value is multiplied by the constraint weight: if a constraint has a weight of 6, its violation by a candidate implies the assignment of the negative value –6; if the candidate violates this constraint twice, the assignment, will be –12, and so on.

- *Harmony (H)*. The sum of the negative values obtained depending on the violations of the different constraints constitutes the harmony of a candidate.

- *Highest negative value and winning candidate*. The winning candidate is the one that obtains the highest negative value, *i.e.* the lowest penalty.

(12)

/mez+ɛt/	*e,o$_{\sigma UNSTR}$ w = 5.5	IDENT-V$_{UNSTR}$ w = 2	H
a. [mezɛ́t]	–1		–5.5 (–1*5.5)
☞ b. [məzɛ́t]		–1	–2 (–1*2)

- *Differences between Harmonic Grammar and Optimality Theory*. The main difference between Harmonic Grammar and Optimality Theory is that only the first can model cumulative effects, in which the violation of a constraint with a weight X

can be overcome by the sum of violations of one or more constraints the weight of each one is lower than X.

4.2. Weighted Scalar constraints applied to strata

- The penalty associated to the violation of a markedness or a faithfulness constraint can be scaled in the following way (Hsu & Jesney 2018):

(13) Scaled Faithfulness
Given a basic constraint weight *w*,
a scaling factor *s*, and a distance from the core *d*,
For each input structure that is not realized faithfully in the output,
Assign a weighted violation score of $\boldsymbol{w \times s(d)}$

(14) *Scaled Markedness*
Given a basic constraint weight *w*,
a scaling factor *s*, and a distance from the core *d*,
For each instance of the marked structure
Assign a weighted violation score of $\boldsymbol{w \times s(d)}$

4.3. Proposal

- In the analysis presented here, which follows Hsu & Jesney (2017, 2018), faithfulness violations are scaled according to the definition in (15).

(15) *Scaled Faithfulness Weigthed Constraints* (Hsu & Jesney 2018: 255)

> "Given a basic constraint weight *w*, and a scaling factor *s* corresponding to distance from the core, for any input that is not realized faithfully in the output, assign a weighted violation score of *w* x *s*."

4.3.1. Patterns A (ND & VR)

- For the cases belonging to Pattern A, we assume a triple lexical strata in the Catalan grammar (16; 17):

(*a*) the core one (for those speakers [and loans] with application of VR and ND: *t*[u]*b*[u]*ga*[∅]);
(*b*) the intermediate one (for those speakers [and loans] with just application of VR: *t*[u]*b*[u]*ga*[n]);
(c) the peripheral one (for those speakers [and loans] with underapplication of both VR and ND: *t*[o]*b*[o]*ga*[n]).

- The two M constraints involved are *e,o$_{\sigma UNSTR}$ (against unstressed high-mid vowels) and *n]$_{WD}$ (against word-final posttonic *–n*), which receive respectively a stable weight of 5.5 and 2.5 across all three possible strata. The highest weight for *e,o$_{\sigma UNSTR}$ in relation to *n]$_{WD}$ expresses the higher productivity of vowel reduction in relation to word-final posttonic *–n* deletion in Catalan. (For the constraint definitions, see 14).

- These two markedness constraints interact with the faithfulness constraints IDENT-

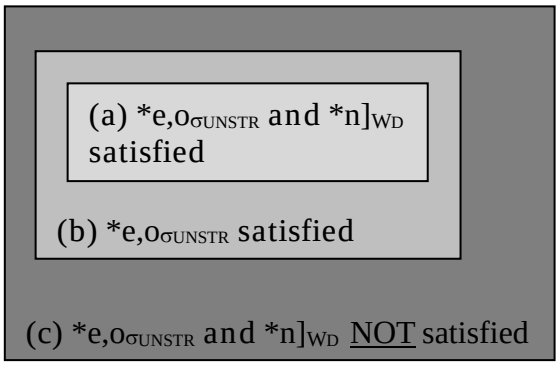
V_{UNSTR} (against featural changes for unstressed vowels) and MAX-IO (against deletion), which receive respectively a stable weight of 2 and 1.5 across all three possible strata.

- Scaled faithfulness ensures that the weight values for the faithfulness constraints increase from the core stratum (in which s = 1), towards the intermediate stratum (which starts with s = 1.8), until reaching the **peripheral stratum** (which starts with s = 2.8 and which covers the **largest interval**).

- **Faithfulness values** acquire, thus, a **higher relevance** the closer to the peripheral strata.

- Given the constraint weights, no scaling factor can yield the impossible nativization PatA4 **t*[o]*b*[o]*ga*[Ø] (as the strata cross overpoints in 20 show).

(16) Core-periphery grammar



(17) HG with *weighted scalar constraints* tableau for Patterns A

i. /tobogan/	*e,oσUNSTR w = 5.5	*n]WD w = 2.5	Ident-VUNSTR w = 2	Max-IO w = 1.5	H	*Scaling factor for F*	*Strata*
a. [toβoɣán]	–1	–1			–8	1	*Core stratum*
b. [tuβuɣán]		–1	–1		–4.5		
☞c. [tuβuɣá∅]			–1	–1	–3.5		
d. [toβoɣá∅]	–1			–1	–7		
ii. /tobogan/	*e,oσUNSTR w = 5.5	*n]WD w = 2.5	Ident-VUNSTR w = 2	Max-IO w = 1.5	H	*Scaling factor for F*	
a. [toβoɣán]	–1	–1			–8	1.8	*Intermediate stratum*
☞ b. [tuβuɣán]		–1	–1		–6.1		
c. [tuβuɣá∅]			–1	–1	–6.3		
d. [toβoɣá∅]	–1			–1	–8.2		
iii. /tobogan/	*e,oσUNSTR w = 5.5	*n]WD w = 2.5	Ident-VUNSTR w = 2	Max-IO w = 1.5	H	*Scaling factor for F*	
☞ a. [toβoɣán]	–1	–1			–8	2.8	*Peripheral stratum*
b. [tuβuɣán]		–1	–1		–8.1		
c. [tuβuɣá∅]			–1	–1	–9.8		
d. [toβoɣá∅]	–1		–1		–11.1		

Constraint definitions:

- *n]$_{WD}$: Assign one violation for every posttonic nasal in word-final position.
- *e,o$_{\sigma UNSTR}$: Assign one violation mark for every unstressed mid-high vowel.
- MAX-IO: Assign one violation mark for every segment in the input that has no correspondent in the output.
- IDENT-V$_{UNST}$: Assign one violation mark for every unstressed vowel in the output whose input correspondent has a different featural specification.

Tableau explanation:

- At the *core stratum* markedness constraints overweight faithfulness constraints, and this explains that the selected candidate is the one with the application of all "native" processes.

- Note, though, that the higher weight for *e,o$_{\sigma UNSTR}$ with respect to *n]$_{WD}$ expresses the higher productivity of the former.

- At the *intermediate stratum*, the scaling factor of 1.8 is enough for the constraint MAX-IO to overweight the markedness constraint *n]$_{WD}$, with which it interacts, but not for the constraint IDENT-V$_{UNSTR}$ to overweight *e,o$_{\sigma UNSTR}$, and this explains the selection of the candidate with the mixed pattern (with vowel reduction but no word-final *–n* deletion).

- At the *peripheral stratum*, the scaling factor of 2.8 is high enough for both faithfulness constraint to overweight the markedness constraints with which they are in conflict.

4.3.2. Patterns B (VL & VR)

- For pattern B, we assume also a triple lexical strata (18, 19):

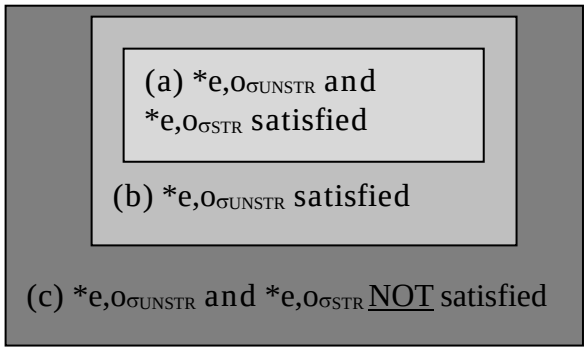
  a) the core one (for speakers [and loans] with application of VR and VL: [ɛ́]*ur*[u], *p*[ɔ́]*st*[ə]*r*);
  b) an intermediate one (for speakers [and loans] with application of VR but underapplication of VL: *p*[ó]*st*[ə]*r*), and
  c) the peripheral one (for speakers [and loans] with underapplication of both VR and VL: [é]*ur*[o], *p*[ó]*st*[e]*r*).

- The two markedness constraints involved are *e,o$_{\sigma UNSTR}$ and *e,o$_{\sigma STR}$ (against stressed mid-high vowels) which receive both a stable weight of 5.5 across all possible strata.

- In this case, the transition *scaling factors* from one strata to the other are 1, 2.3 and 2.8.

- Given the constraint weights, no scaling factor can yield the nativization PastB4 (*p[ɔ́]st[e]r), and a very small scaling factor for the intermediate stratum with PatB3 p[ó]st[ə]r) is predicted.

(18) Core-periphery grammar



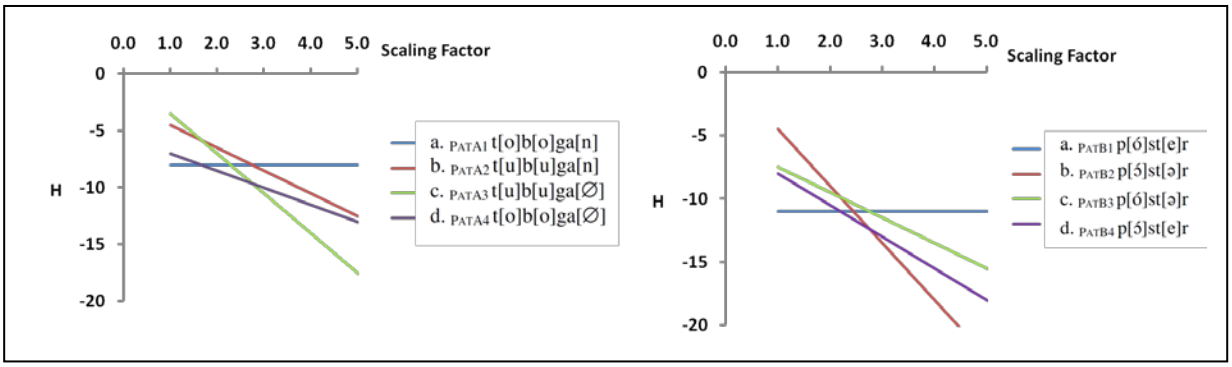
(19) HG with *weighted scalar constraints* tableau for Patterns B

i. /poster/	*e,oσUNSTR w = 5.5	*e,oσSTR w = 5.5	IDENT-VSTR w = 2,5	IDENT-VUNSTR w = 2	H	*Scaling factor for F*	*Strata*
a. [póster]	–1	–1			–11	1	*Core stratum*
☞ b. [póstər]			–1	–1	–4.5		
c. [póster]	–1		–1		–8		
d. [póstər]		–1		–1	–7.5		
ii. /poster/	*e,oσUNSTR w = 5.5	*e,oσSTR w = 5.5	IDENT-VSTR w = 2,5	IDENT-VUNSTR w = 2		*Scaling factor for F*	
a. [póster]	–1	–1			–11	2.3	*Intermediate stratum*
b. [póstər]			–1	–1	–10.35		
c. [póster]	–1		–1		–11.25		
☞ d. [póstər]		–1		–1	–10.1		
iii. /poster/	*e,oσUNSTR w = 5.5	*e,oσSTR w = 5.5	IDENT-VSTR w = 2,5	IDENT-VUNSTR w = 2	H	*Scaling factor for F*	
☞ a. [póster]	–1	–1			–11	2.8	*Peripheral stratum*
b. [pɔ́stər]			–1	–1	–12.6		
c. [pɔ́ster]	–1		–1		–12.5		
d. [póstər]		–1		–1	–11.1		

Constraint definitions:

- *e,oσUNSTR: Assign one violation mark for every unstressed mid-high vowel.
- *e,oσSTR: Assign one violation mark for every stressed mid-high vowel.
- IDENT-VUNSTR: Assign one violation mark for every unstressed vowel in the output whose input correspondent has a different featural specification.
- IDENT-VSTR: Assign one violation mark for every stressed vowel in the output whose input correspondent has a different featural specification.

(20) Strata cross overpoints for Patterns A and Patterns B



5. Alternative analyses

5.1. Ranked constraint alternatives:

- Indexation of constraints that apply to individual lexical strata (Itô & Mester 1999).
- Separate co-phonologies associated with individual lexical strata (Inkelas & Zoll 2007)

5.2. These approaches predict all possible patterns, but nothing prevents *overgeneration* of the impossible ones: given inherent OT constraint reranking (across strata or across phonologies), nothing prevents rankings such as, for instance, *n]$_{WD}$ >> MAX-IO, IDENT-V$_{UNST}$ >> IDENT-V$_{UNST}$, leading to *t[o]b[o]ga[∅].

5.3. This is why Itô & Mester 1999 resort to the metacondition "Ranking consistency":

"Let F and G be two types of I-O Faithfulness constraints [...], there are no strata A, B such that the relative rankings of the indexed versions of F and G are inconsistent with each other. If F/$_A$ >> G/$_A$ for some stratum A, then there is no stratum B such that G/$_B$ >> F/$_B$." (p. 27)

5.4. "There is an underlying unity behind the various stratal incarnations of a given faithfulness" (p. 28)

5.5. Metaconditions are not necessary within Harmonic Grammar with Scalar Constraints, where the weight of the constraints, along with any scaling factor, gives no chance to the impossible patterns *t[o]b[o]ga[∅] and *p[ɔ́]st[e]r.

6. Conclusions

- In this talk we have explored phonological nativization patterns in Catalan loanwords, and we have shown, on the basis of a production and a judgment test, that the three processes under scrutiny (word-final *–n* deletion [ND], vowel reduction of unstressed mid-vowels [VR], and vowel laxing of stressed mid-vowels [VL]) interact in an asymmetrical way.

- Loans susceptible to undergo ND and VR show a consistent behavior, in which underapplication of both processes is the most common solution (*t*[o]*b*[o]*ga*[n]),

followed closely by just underapplication of ND (*t*[u]*b*[u]*ga*[n]), followed by far by application of both processes (*t*[u]*b*[u]*ga*[Ø]), and in which underapplication of VR and application of ND (**t*[o]*b*[o]*ga*[Ø]) is unattested.

- Loans susceptible to undergo VR and VL also show a consistent behavior, in which the most common solution is underapplication of both processes ([é]*ur*[o], *p*[ó]*st*[e]*r*), followed by far by the application of both processes ([ɛ́]*ur*[u], *p*[ɔ́]*st*[ə]*r*), and which mixed patterns with underapplication of VL and application of VR ([é]*ur*[u], *p*[ó]*st*[ə]*r*), or with application of VL and underapplication of VR ([ɛ́]*ur*[o], *p*[ɔ́]*st*[e]*r*) are generally avoided, although the judgment test indicates that the third pattern is slightly more tolerated than the fourth one.

- We have argued that these asymmetrical interactions can be straightforwardly formalized resorting to Harmonic Grammar with Scalar Weighted Constraints (Hsu & Jesney 2017, 2018), in which faithfulness constraints acquire an increasing relevance from the core to the peripheral strata and in which if a process fails to apply in a given stratum it will also fail to apply in more peripheral stratum, but not the other way around.

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