Japan Phonology Forum | 29 August 2020

How productive is core-periphery structure in the Japanese lexicon?

Empirical results and theoretical implications

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Acknowledgements

- *Collaborator:* **Yuka Muratani Tashiro** (Indiana U) on the experiment
- *Support:* Institute for the Arts and Humanities at UNC-CH
- *Statistical consulting:* Chris Wiesen, Odum Institute at UNC-CH
- *Experiment materials and recruiting:* Shigeto Kawahara, Masayuki Tashiro
- *Comments and discussion:*
  - Brian Hsu, Junko Ito, Armin Mester, Jeff Mielke, Elliott Moreton, Katya Pertsova
  - Audiences at OCP 15, LSA 2019, UC Santa Cruz, Georgetown, and UNC-CH

Overview

- **Theoretical background**: Lexical classes and core-periphery structure
  - *Productive* core-periphery structure predicts a **markedness hierarchy**
- Results from a **nonce-loanword nativization experiment** in Japanese
  - **Some—but not all—speakers** show a consistent markedness hierarchy
- Some **theoretical implications**
  - **Faithfulness** relations across lexical strata must be *flexible*

1. Theoretical background and core-periphery structure

(1) What does it mean for the **phonological grammar** when a language has

- distinct **lexical classes** (strata) with
- distinct **phonological patterns**?

(2) **Japanese** is a well-known example

(McCawley 1968; Ito & Mester 1995ab, 1999, 2008; Irwin 2011; etc.)

- Lexical classes are **phonologically** and **morphologically** distinct
  - Long history of *language contact* and *lexical borrowing*
- Lexical classes are **psychologically real**
  - *Experiments* show that native speakers are sensitive to phonological differences between classes
    (Moreton & Amano 1999; Gelbart & Kawahara 2007; Tanaka & Fujita 2020)
- Are the phonological **grammars** of the classes ***synchronically*** different?

(3) Phonological **contrast** and **restrictions** in constraint-based frameworks

(a) **Restriction** → enforced by **markedness** constraints (**M**)
- *predictable* pattern; lack of contrast

(b) **Lack of restriction** → enforced by **faithfulness** constraints (**F**)
- *unpredictable* pattern; presence of **contrast**

(4) What does this mean for **lexical classes**?
- Assuming that phonological differences are **productive**

(a) Suppose some **restriction** is found in lexical class A but not B

(b) We must conclude that <u>**M » F**</u> for A but <u>**F » M**</u> for B

(5) How can we **implement** this M/F ranking difference across classes?

- Phonological models differ on this point

→ As a result, they make different predictions about the **productivity** of **core-periphery structure**

(6) **Core-periphery structure**

(a) Many languages have phonologically distinct lexical classes (strata) (Mathesius 1934; Fries & Pike 1949; Chomsky & Halle 1968; Postal 1968; Saciuk 1969)

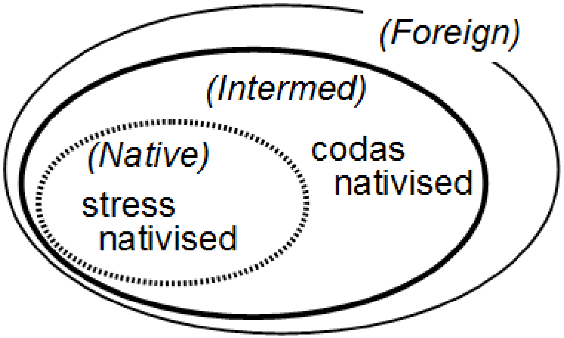
(b) These classes often form a 'hierarchy of foreignness' (Kiparsky 1968; Postal 1968; Saciuk 1969; Holden 1976)

(c) **Core-periphery structure** (Ito & Mester 1995ab, 1999) → The classes form a **subset/superset relation** in their phonological restrictions

(7) The typical core-periphery pattern:

- **Core**: Phonologically restricted subset of the lexicon | more **M » F**
- **Periphery**: Fewer phonological restrictions | more **F » M**

Simple example:



- **Core**, 'Native'
  - *Restriction:* No codas
  - *Restriction:* Only final stress
- 'Intermediate'
  - *Restriction:* No codas
  - *Contrast:* Non-final stress OK
- **Periphery**, 'Foreign'
  - *Contrast:* Codas OK
  - *Contrast:* Non-final stress OK

(8) Work pioneered by Ito & Mester (1995ab, 1999) established a key insight:

- **Productive** core-periphery structure → a **hierarchy of M constraints**

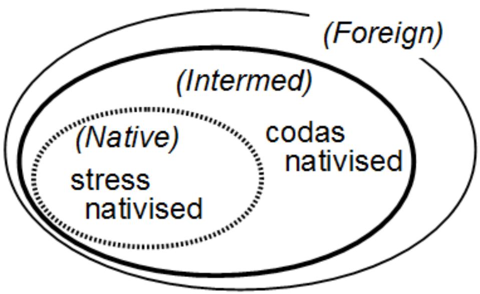
(a) **M** prohibiting *'less foreign'* structures (more CORE) → ***low-ranked***

- Structures that violate them are better **tolerated** in loanwords

(b) **M** prohibiting *'more foreign'* structures (more PERIPHERAL) → ***high-ranked***

- Structures that violate them are more aggressively **nativized**

(9)



- NoCoda — enforced in Intermediate
Native
- FinalStress — enforced in Native only
- M hierarchy: NoCoda » FinalStress

(10) Different **phonological models** of productive lexical classes make different predictions about the **productivity of core-periphery structure**

(a) **Stratified Faithfulness** (with **Ranking Consistency**)
(Ito & Mester 1999: 82; see also Fukazawa et al. 1998)

(b) **Weighted Scalar Constraints** (Hsu & Jesney 2017, 2018)

(c) **Cophonologies** (e.g., Inkelas & Zoll 2007)

(d) *New proposal:* **HG Stratified Faithfulness** (Smith 2018)

→ We will return to these models at the end of the talk

- Key point: Given a **M hierarchy** as seen above,

  a phonological model will **enforce core-periphery structure** only if the **ranking among F constraints remains the same** for all lexical classes

(11) **Empirical test** for productive core-periphery structure:

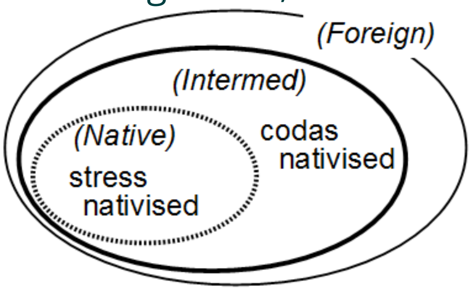
- It should create **impossible-nativization effects** (Ito & Mester 1999, 2001)

(a) If a core-periphery structure with **M(*no-X*) » M(*no-Y*)** is *productive*…

(b) …then it should **not** be possible to nativize X *without* nativizing Y

(c) Prediction: A form that does this is an ***impossible nativization***, rejected or dispreferred by native speakers

- Nativizing stress, not coda → impossible nativization



NoCoda » FinalStress

(12) **Empirical focus** of this project

- Do **Japanese** speakers show **impossible-nativization effects** for the M constraints that distinguish the lexical classes?
- Preview of results: **Sometimes, but not always!**

(13) **Theoretical implications** of these results

(a) Predictions **too strong** ("grammars **must** produce IN effects")
- Stratified Faithfulness *with* Ranking Consistency
- Weighted Scalar Constraints

(b) Predictions **too weak** ("**no** reason to expect IN effects")
- Stratified Faithfulness *without* Ranking Consistency
- Cogrammars

(c) → **Preliminary support for HG Stratified Faithfulness**

2. Japanese: Productive impossible-nativization effects?

2.1 Japanese lexical classes (strata)

(14) **Japanese** is a well-known example of a language with a **stratified lexicon** (e.g., McCawley 1968; Ito & Mester 1995ab, 1999, 2008; Irwin 2011)

- Lexical classes are **phonologically** and **morphologically** distinct
    - Long history of *language contact* and *lexical borrowing*
- Lexical classes are **psychologically real**
    - *Experiments* show that native speakers are sensitive to phonological differences between classes (Moreton & Amano 1999; Gelbart & Kawahara 2007; Tanaka & Fujita 2020)

(15) Do the **observed phonological differences** between lexical classes correspond to **productive impossible-nativization effects**?

→ **Nonce-loan nativization experiment** (Smith & Tashiro 2019)

(16) Strata (classes) in the Japanese lexicon

(a) ‘**Native**’ (**N**) 和語 – the *core*

- Obeys the *most* phonological restrictions

(b) ‘**Sino-Japanese**’ (**SJ**) 漢語 — very old loans, starting ca. 500CE

- Somewhat less restricted (see Kawahara et al. 2003 on complications)

(c) Recent loans 外来語 — typically from European languages (mostly English) and dating largely from the 19th century (see review in Irwin 2011)

- The recent loans form a continuum, but less restricted than N, SJ
- For discussion, useful to distinguish: (Ito & Mester)

  ‘**Assimilated Foreign**’ (**AF**) — more nativized
  ‘**Unassimilated Foreign**’ (**UF**) — less nativized

(17) M constraints that distinguish strata (after Ito & Mester 1995b)

NoSI ‘Coronal fricatives are palatal before [i]’

NoTI ‘Coronal plosives are palatal before [i]’

NoDD ‘No voiced geminate obstruents’

NoP ‘No singleton (non-geminate) [p]’

NoNT ‘No nasal–voiceless obstruent sequences’; Hayes (1999), Pater (2001)

- Formal constraint definitions are in Appendix 2

(18) Observed ***enforcement*** of M constraints in strata — active alternations
(Ito & Mester 1995b, 1999)

- In **UF**: **NoSI**
- In **AF**: NoSI *and* { **NoTI, NoDD** }
- In **SJ**: NoSI *and* { NoTI, NoDD } *and* **NoP**
- In **N**: NoSI *and* { NoTI, NoDD } *and* NoP *and* **NoNT**

- Relevant examples are in Appendix 2

(19) ***Predicted markedness ranking*** for Japanese stratified lexicon

NoSI » { NoTI, NoDD } » NoP » NoNT

- Follows from (18)

2.2 Nonce-loanword experiment: Materials and methodology

(20) From (19) above:

Predicted markedness ranking for Japanese stratified lexicon (from I&M)

NoSI » { NoTI, NoDD } » NoP » NoNT

- Do speakers show impossible-nativization (IN) effects?
- If so, do those IN effects reflect this ranking?

(21) **Nonce-loanword nativization experiment** — loans from "English"

(a) Methodology based on Guarani nonce-loan experiment (Pinta 2013)

(b) Incorporated audio stimuli as well as orthographic representations

(c) Increased the number of M constraints and the number of participants

(22) **Stimuli** — Nonce loanwords

(a) 5 constraints → all possible pairwise comparisons → **10 constraint pairs**

(b) For each constraint pair, **4 English-like nonce words**

- Each **violates both constraints** in the pair, but no others in (20)
- Loci of violation are in the order M*i*–M*j* twice, M*j*–M*i* twice
- All English "words" are disyllabic with initial stress
- Place is alveolar for all voiced geminates ([dd]) and NT clusters ([nt])

(23) Example: Nonce words violating both **NoP** and **NoSI**

English nonce word		Potential faithful Japanese adaptation
pimsill	[<u>**p**</u>ɪm<u>**sɪ**</u>l]	[<u>**p**</u>imɯ<u>**si**</u>ɾɯ]
polsift	[<u>**p**</u>ɔl<u>**sɪ**</u>ft]	[<u>**p**</u>oɾɯ<u>**si**</u>ɸɯto]
sifpem	[<u>**sɪ**</u>f<u>**p**</u>ɛm]	[<u>**si**</u>ɸɯ<u>**p**</u>emɯ]
silpesk	[<u>**sɪ**</u>l<u>**p**</u>ɛsk]	[<u>**si**</u>ɾɯ<u>**p**</u>esɯkɯ]

(24) **Response options** — two-alternative forced-choice task

(a) Each nonce word had two 'Japanese' nativization options

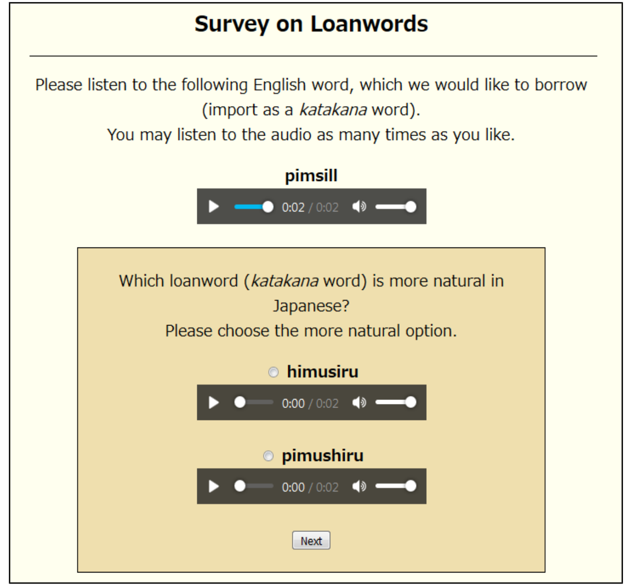
(b) Each option satisfies one constraint, violates the other

- Response options were otherwise identical, including pitch accent

(25) Example: Nativization response options for **NoP** versus **NoSI**

English nonce word		Satisfies only NoSI: /si/→[ɕi]	Satisfies only NoP: /p/→[h]
pimsill	[**p**ɪm**sɪ**l]	[pimɯ**ɕi**ɾɯ]	[**h**imɯsiɾɯ]
polsift	[**p**ɔl**sɪ**ft]	[poɾɯ**ɕi**ɸɯto]	[**h**oɾɯsiɸɯto]
sifpem	[**sɪ**f**p**ɛm]	[**ɕi**ɸɯpemɯ]	[siɸɯ**h**emɯ]
silpesk	[**sɪ**l**p**ɛsk]	[**ɕi**ɾɯpesɯkɯ]	[siɾɯ**h**esɯkɯ]

(26) Example screen from experiment English translation



(27) Stimuli (40 total, + 3 practice) were presented as **audio** and **orthography**

(a) Audio could be replayed by participants

(b) Japanese native-speaker transcribed audio files as an accuracy check

(c) Order of response choices counterbalanced across participants

(d) Sequence of nonce-word stimuli differently randomized each time

(28) Web-based experiment

- Preceded by an audio-check question (using audio? understands Japanese?)
- Followed by a brief questionnaire:
  - demographic information
  - information about participants' strategies

(29) **Participants**: *n*=40

(a) Recruited via Facebook and e-mail

(b) Self-reported native speakers of Japanese, raised in Japan, age ≥18

(c) Gender: 26 *female* | 13 *male* | 1 *unspecified*

(d) Age: born in 1959 (*age 58*)–1997 (*age 20*); median 1985 (*age 32*)

(e) Education:

high school graduate	*tech or jr college grad*	*in 4-yr univ*	*4-yr univ graduate*	*in MA program*	*MA graduate*	*in PhD program*	*PhD graduate*
1	2	7	17	1	5	3	4

2.3 Nonce-loanword experiment: Results and discussion

(30) **Predictions**:
If Japanese speakers have **productive core-periphery phonology**...

(a) They should show **impossible-nativization effects** (preferring to **satisfy certain M** over others)

- *Preview:* **Most** speakers have **preferences** for M pairs

(b) They should have a **M hierarchy** (the 'backbone' of the core-periphery structure)

→ The **pairwise M rankings** from the experiment should all fit together into **one consistent M ranking**

- *Preview:* **Some** speakers have a **consistent M ranking**
  Some do not

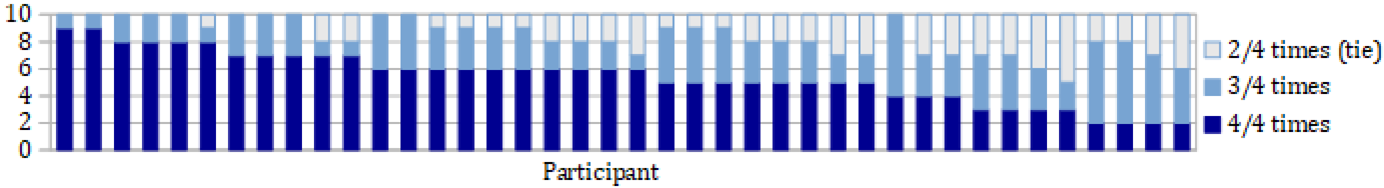
(31) Critical methodology question: How to **interpret** response patterns?

- Each constraint pair tested 4 times
- C_i vs. C_j score could be 4:0, 3:1, 2:2 — **when do we say C_i » C_j** ?

(32) Response strength, **across** participants: C_i vs. C_j treated the same way...

4/4 times	*3/4 times*	*2/4 times*	*Total*
217	118	65	400

(33) Response strength, **by** participant: C_i vs. C_j treated the same way...



(34) Options for **establishing participant constraint rankings** from experiment results

(a) **Hand-ranking**: Score 4:0 and 3:1 pairs as **ranked**, 2:2 pairs as **tied**
Combine pair rankings into full M hierarchy

- *Concern:* Responses are likely to be **probabilistic**, not absolute
  → Can we justify grouping **3:1** with 4:0, rather than with 2:2?

(34) Options for **establishing participant constraint rankings** from experiment results

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Combine pair rankings into full M hierarchy

- *Concern:* Responses are likely to be **probabilistic**, not absolute
→ Can we justify grouping **3:1** with 4:0, rather than with 2:2?

(b) Use the **Gradual Learning Algorithm** (Boersma & Hayes 2001) in Praat
Derive a constraint ranking from each participant's response pattern

- *Concern:* **How far apart** do GLA ranking values need to be for two constraints to qualify as 'ranked'?
- *Concern:* GLA is **unable to detect** actual ranking **contradictions**
→ A » B, B » C, C » A would merely result in A=B=C for GLA

(35) Strategy: Use a **combination** of diagnostics

- Run **GLA** to identify particpants with all 5 ranking values **close together**
- **Hand-check** those grammars—evidence for **contradictory** rankings?

(36) **GLA analysis** — have the GLA 'learn' each participant's M grammar

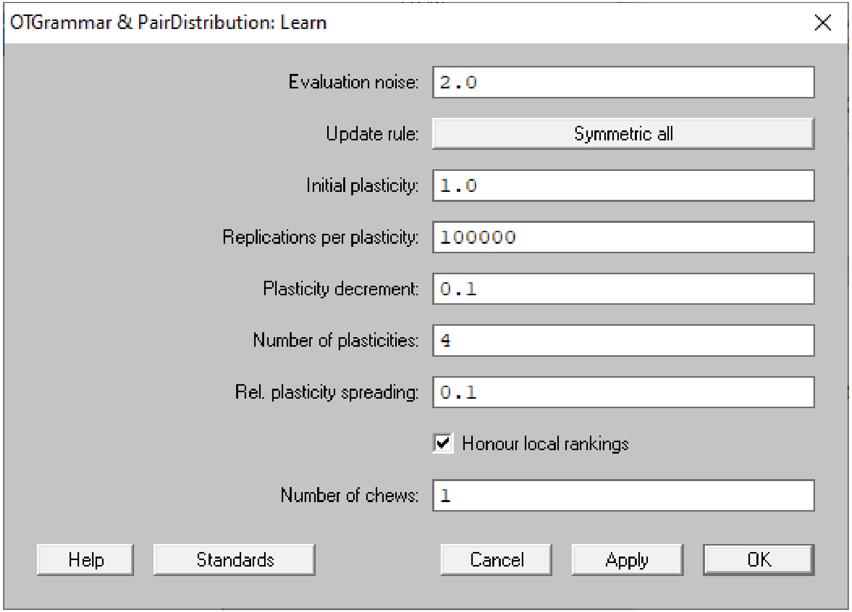
- One Praat *PairDistribution* file representing each participant's responses
- Example (for one participant):

Input		Candidate 1 proportion (satisfies **NoSI**) — 75%		Candidate 2 proportion (satisfies **NoP**) — 25%	
pimsill	[pɪmsɪl]	[pimɯɕiɾɯ]	1	[himɯsiɾɯ]	0
polsift	[pɔlsɪft]	[poɾɯɕiɸɯto]	1	[hoɾɯsiɸɯto]	0
sifpem	[sɪfpɛm]	[ɕiɸɯpemɯ]	0	[siɸɯhemɯ]	1
silpesk	[sɪlpɛsk]	[ɕiɾɯpesɯkɯ]	1	[siɾɯhesɯkɯ]	0

- Then, run the GLA (Boersma & Hayes 2001) to model the learning of an OT grammar with that output distribution

(37) Ran 5 learning simulations for each participant

- Each simulation used standard Praat settings for OT learning



Initial ranking value 100.0

(38) GLA derives ranking values for all 5 constraints (per participant)

- Still need to determine: **How far apart** should the ranking values of two constraints be, for those constraints to count as **ranked**?

(39) Find C_1»C_2 probability in outputs, given C_1>C_2 ranking distance (noise = 2.0)
(calculation from Smith & Moreton 2012: §5.2; see also Boersma & Hayes 2001: 49)

If C_1 > C_2 with distance…	1	**1.9**	2	3	4	**4.6**
Probability of C_1 » C_2 in an output is…	0.638	**0.749**	0.760	0.856	0.921	**0.948**

What is the criterion for C_1 'meaningfully dominates' C_2?

(a) ***Strict*** criterion: Distance **>4.6**, for **95%** probability of domination

(b) ***Generous*** criterion: Distance **>1.9**, for **75%** probability of domination

(40) GLA-OT results, **strict** criterion (C_1 » C_2 **95%**): Constraints ranked in...

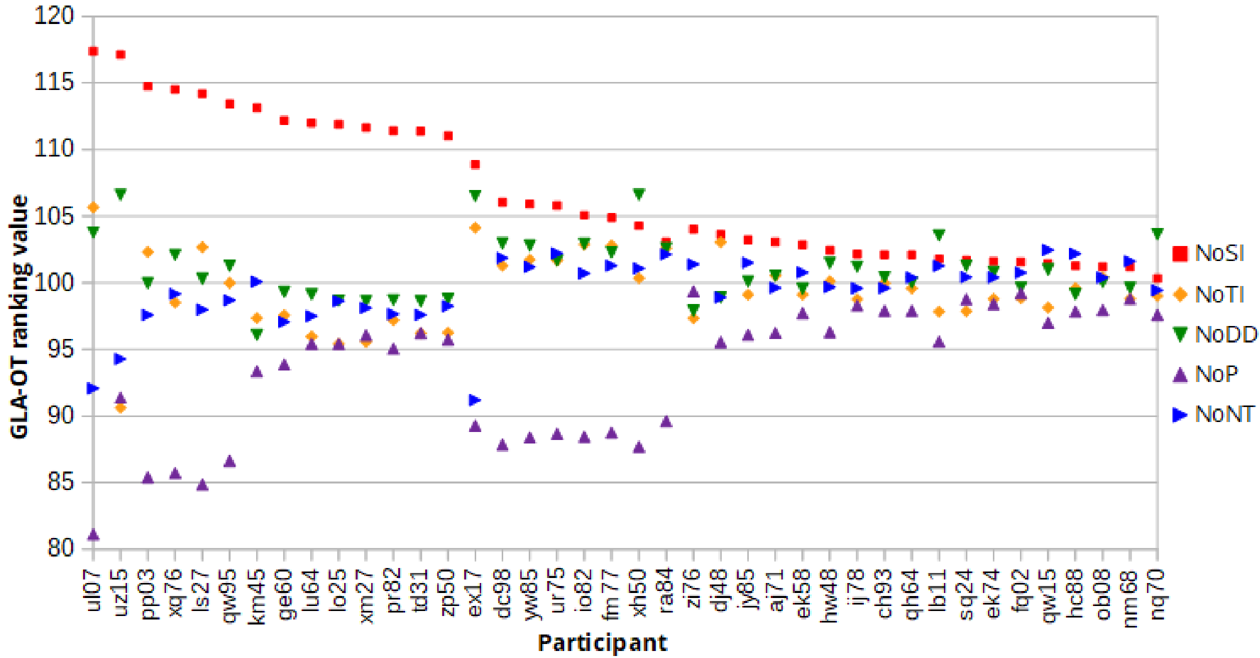
(a) 5 layers	*0*	
(b) 4 layers	*1*	**S** » **TD** » **N** » **P**
(c) 3 layers	*5*	(4) **S** » **TDN** » **P** **S** » **D** » **TNP**

(d) 2 layers	*16*	(8) **S** » **TDNP** (7) **STDN** » **P** **STD** » **NP**
(e) 1 layer	*18*	undifferentiated

Overall trend: **S** » (**D**»**T**»**N**) » **P**

- **P** always lowest (or tied)
- **S** always highest (or tied)
- **D** » **T**: 1 / **T** » **D**: 0
  T » **N**: 2 / **N** » **T**: 0
  D » **N**: 3 / **N** » **D**: 0

(41) GLA-OT results, **strict** criterion (C_1 » C_2 **95%**; distance > 4.6)



(42) GLA-OT results, **generous** criterion (C_1 » C_2 **75%**): Constraints ranked in...

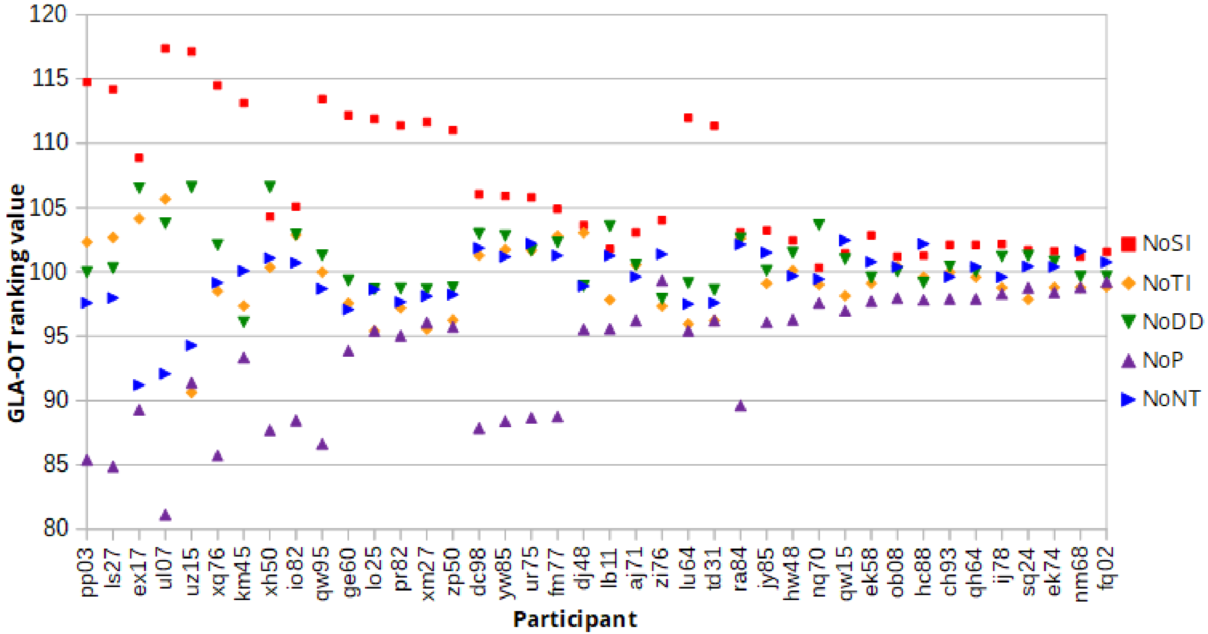
(a) 5 layers	*3*	(2)	**S » T » D » N » P** **S » D » T » N » P**
(b) 4 layers	*6*	(2)	**S » TD » N » P** **S » D » TN » P** **S » D » N » TP** **S » N » TD » P** **D » S » TN » P**
(c) 3 layers	*14*	(8) (3)	**S » TDN » P** **S » DN » TP** **ST » DN » P** **S » N » DTP** **SDN » T » P**

(d) 2 layers	*9*	(4) (3)	**STDN » P** **S » TDNP** **SDN » TP** **D » STNP**
(e) 1 layer	*8*		undifferentiated

Overall trend: **S** » (**D**»{**T**,**N**}) » **P**

- **P** always lowest (or tied)
- **S** nearly always highest (or tied)
- **D** » **T**: 10 / **T** » **D**: 3
  T » **N**: 6 / **N** » **T**: 6
  D » **N**: 9 / **N** » **D**: 2

(43) GLA-OT results, **generous** criterion (C_1 » C_2 **75%**; distance > 1.9)



(44) Key question: “Does **every** participant have a consistent M hierarchy”?

- **How deep should the ranking be** to count as having a hierarchy?

(45) Summary of ranking results according to the GLA analysis

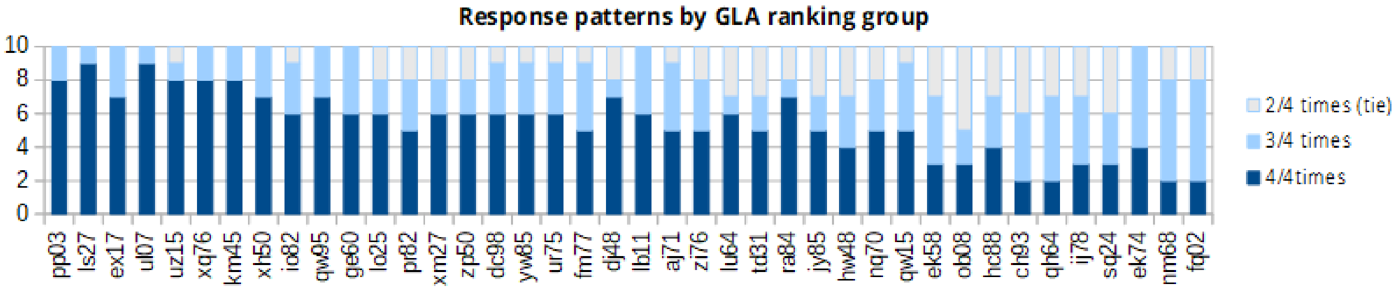
	Number of layers in M hierarchy				
Number of participants	*5*	*4*	*3*	*2*	*1*
GLA/strict (C_1 » C_2 95%):	0	1	5	16	18
GLA/generous (C_1 » C_2 75%):	3	6	14	9	8

(46) More accessible question:
“Do **any** participants have **inconsistent** M hierarchies?”

- GLA can’t find this → Examine “suspicious” participants by hand

(47) Participants **likely** to have **inconsistencies** (learned as “ties” by GLA)

- Have **only 1 M layer** even by the generous GLA analysis
- Have a **small number** of 2:2 constraint pairs in experiment (≤ 3/10)



- 0 ties: **ek74**
- 2 ties: **nm68**, **fq02**
- 3 ties: **hc88**, **qh64**, **ij78**

3 . 33 . 022

(48) Hand-ranked grammars — they *all* show **inconsistent** rankings

(a) Number of 2:2 pairs = 0

- **ek74** ▼» NoSI » NoDD » NoP » NoTI »▼ | **NoNT** inconsistent

(b) Number of 2:2 pairs = 2

- **fq02** ▼=NoSI » NoNT=▼ » NoDD » NoTI »▼ | **NoP** inconsistent
- **nm68** {NoSI »▼, NoNT=▼ } » NoP » NoTI »▼ | **NoDD** inconsistent

(c) Number of 2:2 pairs = 3

- **hc88** ▼=NoSI » NoNT » NoTI=▼» NoP=▼ | **NoDD** inconsistent
- **qh64** ▼=NoSI » { NoTI=▼, NoNT »▼ } » NoP | **NoDD** inconsistent
- **ij78** ▼=NoSI » NoNT » { NoTI=▼, ▼» NoP } | **NoDD** inconsistent

(49) Typically some constraint "ranked" high *and* low (often NoDD—!)
⇢ This collapses the whole hierarchy for GLA

(50) Summary: These six participants each have an M grammar where

- There is **no single consistent ranking**
  - Ranking relationships are **not transitive**

- **Removing just one constraint** leaves a transitive ranking
  - Does this result extend to other participants?
  - Looks promising for the **HG Stratified Faithfulness** model

    → This model allows F constraints to change their relative rankings across strata when necessary

3. Conclusions and implications

(51) **Not all participants** in the experiment have a **consistent M hierarchy**

- This might mean…

(a) Lexical strata in Japanese are not productive?

- But this contradicts other results about speaker knowledge of stratal differences

(b) Some speakers have **different F rankings** across lexical strata

- Some evidence for this from the Mimetic stratum
- This result would have implications for theoretical models of loanword phonology

(52) **Stratified Faith** + **Ranking Consistency** (Ito & Mester 1999; Fukazawa et al. 1998)

- *Designed* to model core-periphery structure

(a) Lexical strata have **different M/F rankings** because

- One M constraint hierarchy
- **Indexed F constraints** for **each lexical stratum**

(b) Lexical strata must form a **core-periphery structure**

- F-internal ranking fixed (by **stipulation**) across strata

→ **Too strong**
Not all speakers have productive core-periphery phonology

(53) **Weighted Scalar Constraints** (Hsu & Jesney 2017, 2018)

- *Designed* to model core-periphery structure, but more simply

(a) Lexical classes have **different M/F rankings** because

- One M constraint hierarchy
  One F constraint hierarchy — no stratum-specific constraints

- Constraint weights are numerically **scaled**
  - based on the 'distance' a form has from the lexical core

(b) Lexical strata must form a **core-periphery structure**

- This model **guarantees** consistent F ranking across strata
  - as long as certain restrictions are placed on the scaling factor

→ **Too strong**
Not all speakers have productive core-periphery phonology

(54) **Cophonologies** (e.g., Inkelas & Zoll 2007)

- *Designed* **not** to model core-periphery structure

(a) Lexical classes have **different M/F rankings** because

- One M constraint hierarchy
  One F constraint hierarchy — no stratum-specific constraints

- **Each lexical stratum** has its **own ranking** (cophonology)

(b) No predicted **core-periphery structure**

- Potentially unlimited ranking differences across strata

→ **Too weak**

Guarani speakers show IN effects in the **absence** of direct evidence from the lexicon or from alternations
(Pinta 2013; Smith & Pinta 2015)

(55) **Harmonic Grammar (HG) Stratified Faithfulness** (Smith 2018)

- *Designed* to make core-periphery structure a **default preference**, *not a requirement* of the grammar

(a) Lexical strata have **different M/F rankings** because

- One M constraint hierarchy
- **Indexed F constraints** for **each lexical stratum**

(b) **Core-periphery structure** *emerges* if no evidence to the contrary

- **Cumulative constraint weights** in HG allow general F + stratum-specific F to create **default** consistent ranking effects (as in Jesney & Tessier 2011 for positional F)
- But the F hierarchy ***can*** be different across strata, given the appropriate learning data

(56) **Next steps** in this project:

- Can a **faithfulness** ranking that **differs by stratum** account for the inconsistent M behavior in some experiment participants?
- If so, can the **HG Stratified Faithfulness** model produce the necessary rankings?

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Appendix 1: Why the StratFaith model needs "Ranking Consistency"

(57) The classic approach: the **OT Stratified Faithfulness** model
(Fukazawa 1997; Fukazawa, Kitahara, & Ota 1998; Ito & Mester 1999b, 2008)

- If a stratified phonological grammar is productive:

(a) There is a markedness hierarchy M_1 » M_2 » M_3 » ...

(b) Faithfulness constraints are stratum-specific, and are ranked low for core strata and increasingly higher toward the periphery

(c) F effects "move up" through the M hierarchy in peripheral strata
M_1 » F-*periph* » M_2 » F-*intermediate* » M_3 » F-*core*

- Core stratum satisfies M_1, M_2, M_3
- Intermediate stratum satisfies M_1, M_2 | M_3 can be violated
- Peripheral stratum satisfies M_1 | M_2, M_3 can be violated

(58) IN effects and M domination patterns (Ito & Mester 1999, 2001)

(a) In a language with productive stratified phonology, with M_1 » M_2 » M_3

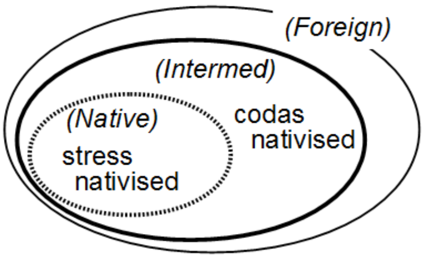
(b) …there is no stratum where M_3 is enforced but M_2 is not

(c) For a loan that violates both M_2 and M_3, a nativization that is *unfaithful* in order to satisfy M_3 but still *violates* M_2 is predicted to be ungrammatical

- Such a form is therefore called an ***impossible nativization***

(59) But!! It turns out that the Stratified Faithfulness model **can't exclude** a grammar that allows the 'impossible nativization' ranking (Ito & Mester 1999)

- Our schematic example would have:



(60) Markedness constraints

(a) NoCoda — Assign * for every syllable with a coda (Prince & Smolensky 1993)

(b) FinalStress — Assign * for every word that does not have stress on the final syllable (Align-R(PrWd, head syll); McCarthy & Prince 1993)

(61) Faithfulness constraints

(a) Max — No deletion: Assign * for every input segment that has no output correspondent (McCarthy & Prince 1995)

(b) StressFaith — No stress shift; NoFlop (Alderete 1999); HeadMatch (McCarthy 2000)

(62) Markedness/faithfulness rankings for the schematic language *nativized?*

(a)	NoCoda » Max*Native*	FinalStress » StressFaith*Native*	| *both*
(b)	NoCoda » Max*Intermed*	StressFaith*Intermed* » FinalStress	| *only codas*
(c)	Max*Foreign* » NoCoda	StressFaith*Foreign* » FinalStress	| *neither*

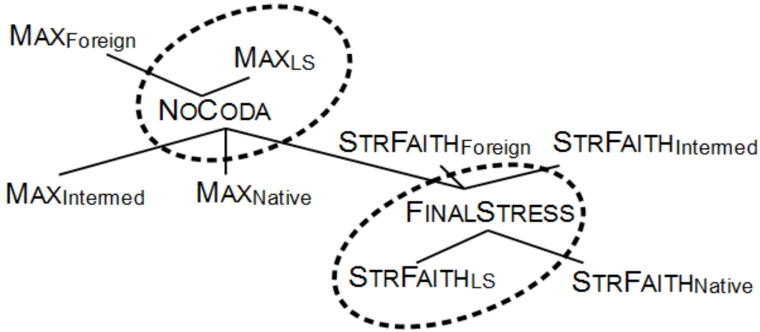
(63) What it means to have an impossible-nativization effect here:

- There must be no stratum *LS* where only stress is nativized

(64) Problem: Even with NoCoda » FinalStress, we ***can*** generate this stratum *LS*

MaxLS » <u>NoCoda</u> <u>FinalStress</u> » StressFaith*LS* | *only stress nativized*

- Does not contradict any rankings from (62)



(65) Demonstration of problem: Winner violates NoCoda, satisfies FinalStress

/pálti/*LS*	Max*LS*	NoCoda	FinalStress	StrFaith*LS*
→ a. pal.tí		*		*
b. pa.tí	*W	L		*
c. pál.ti		*	*W	L
d. pá.ti	*W	L	*(W)	L

(66) Conceptually, the solution is to ensure that there can be no stratum *LS* with the ranking Max*LS* » StressFaith*LS*

(67) **Ranking Consistency** (Ito & Mester 1999: 82; see also Fukazawa et al. 1998)

- Let F and G be two types of IO-faithfulness constraints [MAX, STRESSFAITH].
- Then the relative rankings of the indexed versions of F and G are the same across all strata: $\forall AB\ (F_{A} \gg G_{A}) \Rightarrow (F_{B} \gg G_{B})$

Appendix 2: Constraint defnitions and stratum-specific alternations

(after Ito & Mester 1995b)

(68) NoNT Assign one * for every sequence of [+nasal] [–voice] (‘No nasal–voiceless obstruent sequences’); Hayes (1999), Pater (2001)

- Satisfied in N; violations found in SJ, AF, UF

(a) Constraint satisfied (I&M 1999: 68)			(b) Violations tolerated (I&M 1999: 69)			
/si**n**+**t**a/NAT ‘die-PAST’	→	[ɕi**nd**a]	*computer*	[kə**mp**jutɹ]	→	[ko**mp**jɯɯtaa]
/hɯ**m**+**k**ir-ɯ/NAT ‘step-cut-NONPAST’	→	[ɸɯ**ŋg**irɯ] ‘make up one’s mind’	*Santa*	[sæ**nt**ə]	→	[sa**nt**a]

(69) NoP Assign one * for every singleton (non-geminate) [p]

- Satisfied in N, SJ; violations found in AF, UF

(a) Constraint satisfied (I&M 1999: 67,75)			(b) Violations tolerated (I&M 1999: 74,75)			
/**p**aɴ/$_{SJ}$ ‘group’; cf. /it+**p**aɴ/ ‘group one’	→	[**h**aɴ]; cf. [i**pp**an]	*pan* ‘bread’ (<Portuguese)	[**p**ão]	→	[**p**aɴ]
/ja**(p)p**ari/$_{NAT}$ ‘after all’	→	[ja**pp**ari] ~[ja**h**ari]	*pet*	[**p**ɛt]	→	[**p**etto]

(70) NoDD Assign one * for every voiced geminate obstruent

- Satisfied in N, SJ, AF; violations found in in UF

(a) Constraint satisfied (I&M 1999: 67)

/o**w+d**as+ɯ/NAT → [o**nd**asɯ]
'chase-put.out-NONPAST'; 'drive out';

cf. /o**w+k**ake+ɾɯ/NAT cf. [o**kk**akeɾɯ]
'chase-run-NONPAST' 'run after'

bag [bæ**g**] → [ba**kk**ɯ]

(b) Violations tolerated (I&M 1995b: 819)

dog [dɔ**g**] → [do**gg**ɯ]

bed [bɛ**d**] → [be**dd**o]

(71) NoTI — Assign one * for every sequence of [COR, –son, –cont] [i]
(‘Coronal plosives are palatal before [i]’)

- Ito & Mester’s (1995b) NoTI (*TI) penalizes *all* coronal obstruents + [i]

- Satisfied in N, SJ, AF; violations found in UF

(a) Constraint satisfied (I&M 1995b: 828)

team	[**ti**m]	→	[**tɕii**mɯ]
ticket	[**tɪ**kət]	→	[**tɕi**ketto]

(b) Violations tolerated (I&M 1995b: 828)

teen	[**ti**n]	→	[**tii**ɴ]
party	[pɑ(ɹ)**ti**]	→	[paa**tii**]

(72) NoSI — Assign one * for every sequence of [COR, –son, +cont] [i]
(‘Coronal fricatives are palatal before [i]’)

- Satisfied in nearly all forms, including UF

(a) Constraint satisfied (I&M 1995b: 828)				(b) Violations tolerated? (I&M 1999: 77; Irwin 2011: 84)			
cinema	[**sɪ**nəmə]	→	[**ɕi**nema]	*Citibank*	[**sɪ**tibæŋk]	→	[**ɕi**tibaŋkɯ] ~ ?[**si**tibaŋkɯ]
dressing	[dɹɛ**sɪ**ŋ]	→	[dore**ɕi**ngɯ]	*season*	[**si**ːzən]	→	[**ɕi**ːzɯɴ] ~ [**si**ːzɯɴ] (sports commentators)

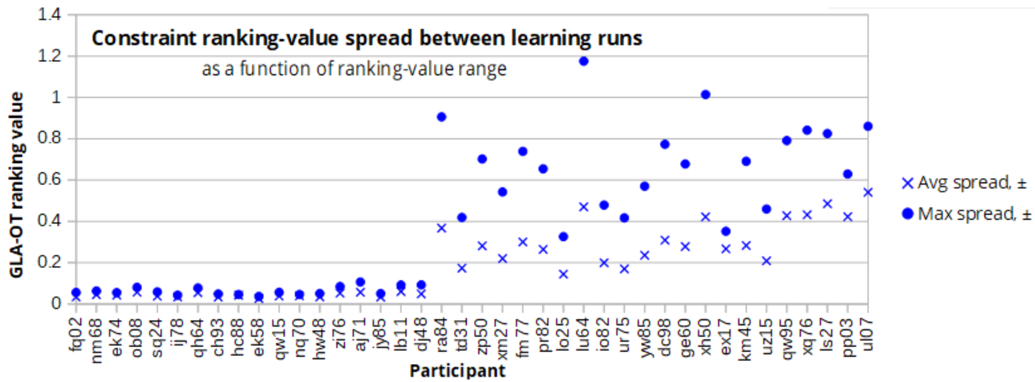
  - Ito & Mester (1999: 77) and Irwin (2011: 84) observe that potential violations of NoSI in even very recent loans are nearly always nativized

Appendix 3: GLA results are consistent over the 5 runs

(73) Confirm: Ranking values per participant **consistent**?

- Two groups: low vs. high *ranking-value spread* per constraint across the 5 runs
- Low vs. high spread reflects *range* of ranking values across constraints

Range 2.72–8.08, *low* max spread ≤0.106 | Range ≥13.45, *high* max spread 0.326–1.18



- Re: generous ‘domination’ criterion: Only 3 participants had max spread > 0.85 (interval >1.9)

Appendix 4: Hand-ranked grammars

(74) Hand-ranked grammar for participant **ek74** (number of 2:2 pairs = 0)

NoSI » NoTI/4	NoSI » NoDD/4	NoSI » NoP/3	NoNT » NoSI/3
	NoDD » NoTI/3	NoP » NoTI/3	NoTI » NoNT/3
		NoDD » NoP/4	NoDD » NoNT/3
			NoNT » NoP/4

- Consistent: NoSI » NoDD » NoP » NoTI
- NoNT inconsistent: - High? NoNT » NoSI (and NoNT » NoP)
  - Low? NoTI » NoNT (and NoDD » NoNT)

(75) Hand-ranked grammar for participant **fq02** (number of 2:2 pairs = 2)

NoSI » NoTI/3	NoSI » NoDD/4	NoSI=NoP/2	NoSI » NoNT/3
	NoDD » NoTI/3	NoTI » NoP/3	NoNT » NoTI/4
		NoDD » NoP/3	NoNT » NoDD/3
			NoP=NoNT/2

- Consistent: NoSI » NoNT » NoDD » NoTI
- NoP inconsistent:
  - High? NoSI=NoP (and NoP=NoNT)
  - Low? NoTI » NoP (and NoDD » NoP)

(76) Hand-ranked grammar for participant **nm68** (number of 2:2 pairs = 2)

NoSI » NoTI/3	NoSI » NoDD/3	NoSI » NoP/3	NoSI=NoNT/2
	NoTI » NoDD/3	NoP » NoTI/3	NoNT » NoTI/4
		NoDD » NoP/3	NoDD=NoNT/2
			NoNT » NoP/4

- Consistent (with tie): {NoSI, NoNT} » NoP » NoTI
- NoDD inconsistent: - High? NoDD=NoNT and NoDD » NoP
  - Low? NoTI » NoDD (and NoSI » NoDD)

(77) Hand-ranked grammar for participant **hc88** (number of 2:2 pairs = 3)

NoSI » NoTI/3	NoSI=NoDD	NoSI » NoP/3	NoSI » NoNT/3
	NoTI=NoDD	NoTI » NoP/4	NoNT » NoTI /4
		NoDD=NoP	NoNT » NoDD/4
			NoNT » NoP/4

- Consistent: NoSI » NoNT » NoTI » NoP
- NoDD inconsistent: - High? NoSI=NoDD (and NoTI=NoDD)
  - Low? NoDD=NoP (and NoNT » NoDD)

(78) Hand-ranked grammar for participant **qh64** (number of 2:2 pairs = 3)

NoSI » NoTI/4	NoSI=NoDD	NoSI » NoP/4	NoSI » NoNT/3
	NoTI=NoDD	NoTI » NoP/3	NoTI=NoNT
		NoDD » NoP/3	NoNT » NoDD/3
			NoNT » NoP/3

- Consistent (with tie): NoSI » { NoTI, NoNT } » NoP
- NoDD inconsistent: - High? NoSI=NoDD (and NoTI=NoDD)
  - Low? NoNT » NoDD

(79) Hand-ranked grammar for participant **ij78** (number of 2:2 pairs = 3)

NoSI » NoTI/4	NoSI=NoDD	NoSI » NoP/4	NoSI » NoNT/3
	NoTI=NoDD	NoTI=NoP	NoNT » NoTI/3
		NoDD » NoP/3	NoDD » NoNT/4
			NoNT » NoP/3

- Consistent (with tie): NoSI » NoNT » { NoTI, NoP }
- NoDD inconsistent: - High? NoSI=NoDD (and NoDD » NoNT)
  - Low? NoTI=NoDD