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Nonce-loan judgments and impossible-nativization effects in Japanese

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Overview

- The Japanese lexicon is claimed to have a **core-periphery structure** that shows a **hierarchy of foreignness**
- But whether this is productive or not is controversial
- To test this, we collected nonce-loan nativization judgments from native Japanese speakers

Overview

- Research questions
 - Can a core-periphery structure be a **productive** synchronic phonology?
 - Do native Japanese speakers show a **hierarchy of foreignness** that matches the predicted one?
 - Do native Japanese speakers show **impossible-nativization effects**?

Overview

- Results
 - Speakers have a hierarchy of foreignness that is approximately like the predicted one
 - Most participants showed nativization preferences that look like impossible nativization effects
 - Not all participants had a consistent hierarchy across all constraint pairs
- Theoretical implications/future questions

Hierarchy of foreignness

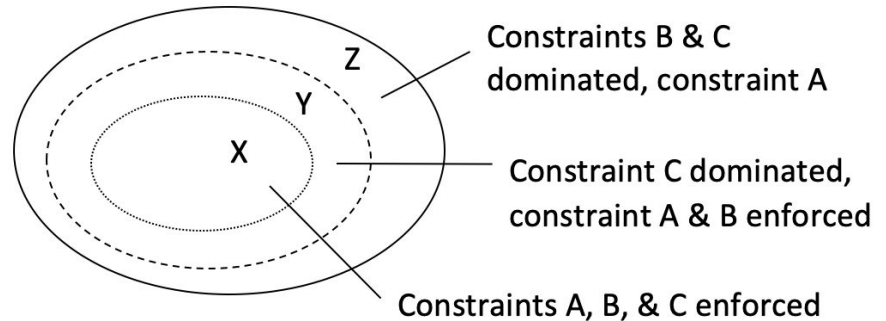
- When words are borrowed, the phonological structure of the words is modified
- The existing loanwords often show that once-nativized foreign properties become more accepted and preserved
- This gradual phonological nativization aspect yields a **“hierarchy of foreignness”** (Kiparsky 1968)
 - Some non-native properties are seen as “more foreign” than others

Hierarchy of foreignness

- A hierarchy of foreignness shows clear **implicational relations**
 - Nativization of the phonological property B implies nativization of the phonological property A, but not vice versa (Kiparsky 1968)
- Ito & Mester (1995ab, 1999) argue that the phonological lexicon is organized in a **core-periphery structure**

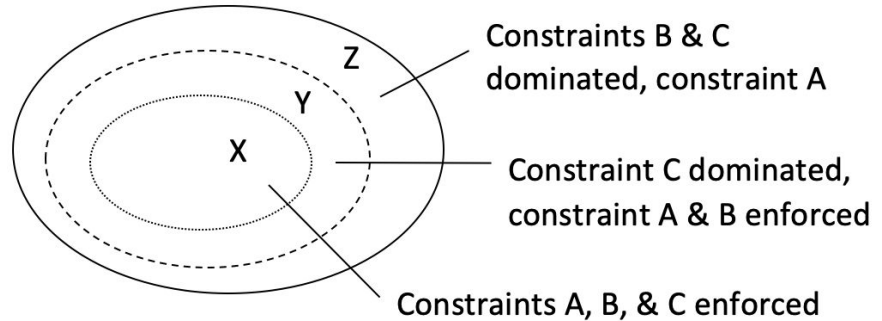
Core-periphery structure

- **Core-periphery structure** has
 - Core stratum = lexical subclass in which the maximum number of markedness constraints are enforced
 - More peripheral strata = these phonological constraints gradually become dominated



Core-periphery structure

- Formal analysis of core-periphery structure (I&M 1999)
 - Markedness constraints form a **single hierarchy**:
 $A \gg B \gg C$
 - Stratum-specific faithfulness constraints model stratum-specific behavior



Productivity of core-periphery structure

- Just a historical record of linguistic change? Or a productive part of the synchronic phonology?
- What kind of evidence would suggest a productive core-periphery structure?

Productivity of core-periphery structure

Evidence for productive core-periphery structure

- Stratum-specific phonological alternations (Ito & Mester 1999)
 - Is a phonological constraint that is violated in more-peripheral strata actively enforced in more-core strata?
- Another possible source of evidence is **impossible-nativization effects** (Ito & Mester 1999, 2001)

Impossible-nativization effects

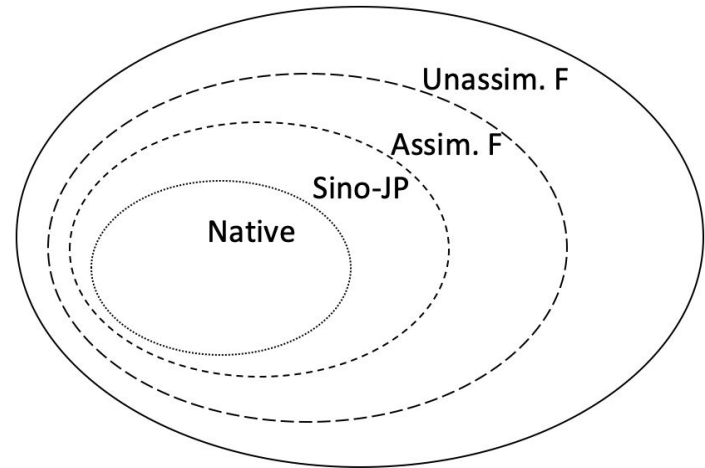
- If the expected markedness constraint hierarchy is NoB » NoA
 - Possible: The nativization of B, but not A
 - Possible: The nativization of both A and B
 - Possible: The nativization of neither A nor B
 - **Impossible: The nativization of A, but not B**
- Given a choice of nativizing *only A* or *only B*, participants should consistently **prefer one option**
 - This is called an **impossible-nativization effect**

Japanese loanword phonology

- Japanese is rich in loanwords
- It is often described as having a stratified structure (e.g., McCawley 1968; Vance 1987; Ito & Mester 1995ab, 1999, Irwin 2011)
 - The lexical strata approximately correspond to etymological classes

Japanese loanword phonology

- We are most concerned with the following strata:
 - Native (the oldest)
 - Sino-Japanese (the second oldest)
 - Assimilated Foreign (the second newest)
 - Unassimilated Foreign (the newest)



Japanese loanword phonology

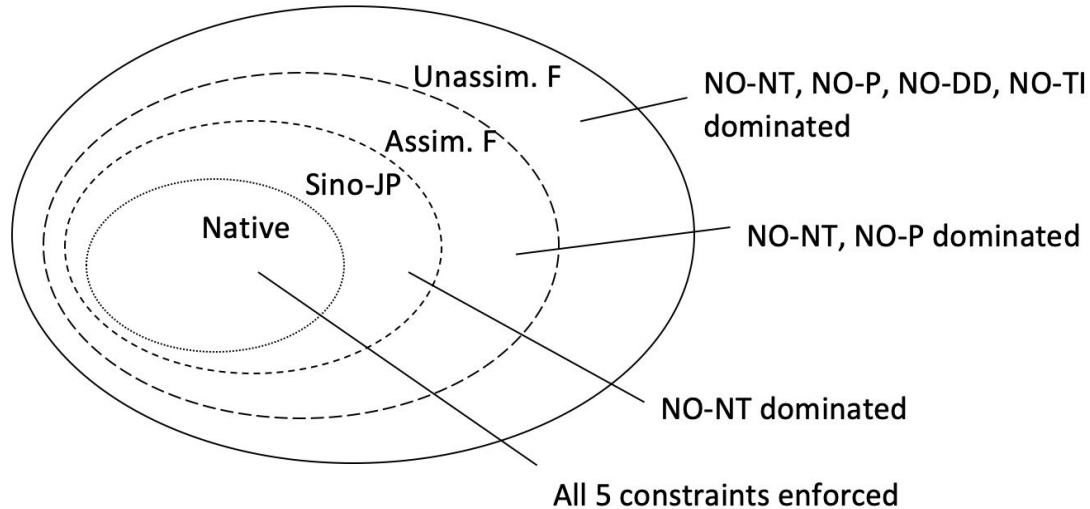
- These strata behave differently in terms of phonological properties
- There are five markedness constraints relevant to our study
 - The four strata can be distinguished by analyzing which of these constraints are dominated

Japanese loanword phonology

Constraints and definitions used here are adapted from the discussion in Ito & Mester (1999)

- NoNT Assign one * for every nasal-vcls obstruent sequence (Hayes 1999; Pater 2001)
- NoP Assign one * for every singleton [p]
- NoDD Assign one * for every voiced geminate obstruent
- NoTI Assign one * for every sequence of coronal plosive-[i]
- NoSI Assign one * for every sequence of coronal fricative-[i]

Japanese loanword phonology



- NoSI » {NoTI, NoDD} » NoP » NoNT
- The enforcement of these constraints is shown by active alternations (see, e.g., Ito & Mester 1999 for examples)

Interim summary

- The Japanese lexicon supports the phonological constraint hierarchy of NoSI » {NoTI, NoDD} » NoP » NoNT
- But do native Japanese speakers also have a productive grammar like this?
 - Do native Japanese speakers show this **hierarchy of foreignness**?
 - Do native Japanese speakers show **impossible-nativization effects**?

Experiment design

- Nonce loanword nativization experiment:
Japanese loans from English nonce words
 - Methodology based on Pinta's (2013) Guarani experiment
 - We added audio stimuli
- Task: Given...
 - a nonce loan that violates two constraints
 - two response options, each satisfying **one** constraint

Which constraint is satisfied at the expense of the other?

Experiment design

Predictions:

- If the '**hierarchy of foreignness**' supported by alternations in lexical strata is productive:
 - Participant preferences should match
NoSI » {NoTI, NoDD} » NoP » NoNT
- If **core-periphery structure** is productive:
 - Each participant should follow *some* consistent hierarchy (impossible-nativization effects)
 - This need not be the same for all participants

Experiment design

Stimuli

- 5 constraints (NoSI, NoTI, NoDD, NoP, NoNT)
 - All possible pairwise comparisons
→ **10 constraint pairs**
- For each constraint pair
 - Four English-like nonce words
 - Order of constraint violations counterbalanced

Experiment design

Example: Nonce loans and responses for NoP versus NoSI

- The “repairs” /si/→[ɕi] and /p/→[h] occur in existing words

English nonce word	Satisfies only NoSI /si/→[ɕi]	Satisfies only NoP /p/→[h]	
<i>pimsill</i>	[p ɪ m s ɪl]	[pimɯ ɕ iɾɯ]	[h imɯsiɾɯ]
<i>polsift</i>	[p ɔl s ɪft]	[pɔɾɯ ɕ iϕɯto]	[h ɔɾɯsiϕɯto]
<i>sifpem</i>	[s ɪf p ɛm]	[ɕ iϕɯpɛmɯ]	[siϕɯ h ɛmɯ]
<i>silpesk</i>	[s ɪl p ɛsk]	[ɕ iɾɯpɛsɯkɯ]	[siɾɯ h ɛsɯkɯ]

- Epenthesis and vowel nativizations, etc., as required for phonotactics

Experiment design

Three practice items

- For familiarity with the task of choosing one nativization
 - Only one M constraint involved in each practice item
- One real loan, two nonce loans
 - Real loan is controversial (gives task a context)
Twitter [twɪɪrɪ] → [tswɪttɪtə] ~ [twɪttɪtə]
- Other design details
 - Stimuli presented as audio, orthography; audio could be replayed
 - Order of response choices was counterbalanced
 - Sequence of stimuli was randomized for each participant

Experiment design

Example screen from experiment

借用語に関する調査

下の借用（カタカナ語として導入）したい英単語の音声を聞いてください。
音声は何度でも聞くことができます。

pimsill



どちらの借用語（カタカナ語）がより自然な日本語ですか？
より自然な方を選んでください。

ヒムスイル



ピムシル



[次へ進む](#)

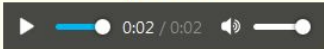
Experiment design

Example screen from
experiment
(translation)

Survey on Loanwords

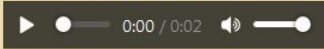
Please listen to the following English word, which we would like to borrow
(import as a *katakana* word).
You may listen to the audio as many times as you like.

pimsill

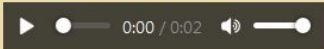


Which loanword (*katakana* word) is more natural in
Japanese?
Please choose the more natural option.

himusiru



pimushiru



Experiment design

- Experiment carried out over the internet
- Preceded by an audio-check question
 - Is participant using audio?
 - Does participant understand Japanese?
- Followed by a brief questionnaire
 - demographic information
 - participant's strategies used in experiment

Experiment design

Participants: $n=40$

- Recruited via Facebook and email
- Self-reported native speakers of Japanese, raised in Japan, over age 18
- Gender: female: 26 | male: 13 | unspecified: 1
- Age: birth year range 1959 (age 58)–1997 (age 20)
 - Median 1985 (age 32)

Experiment design

Participants: $n=40$

- Education:

High school graduate	1
Tech school/junior college	2
4-yr university in progress	7
4-yr university degree	17
MA program in progress	1
MA degree	5
PhD program in progress	3
PhD degree	4

Predictions—recap

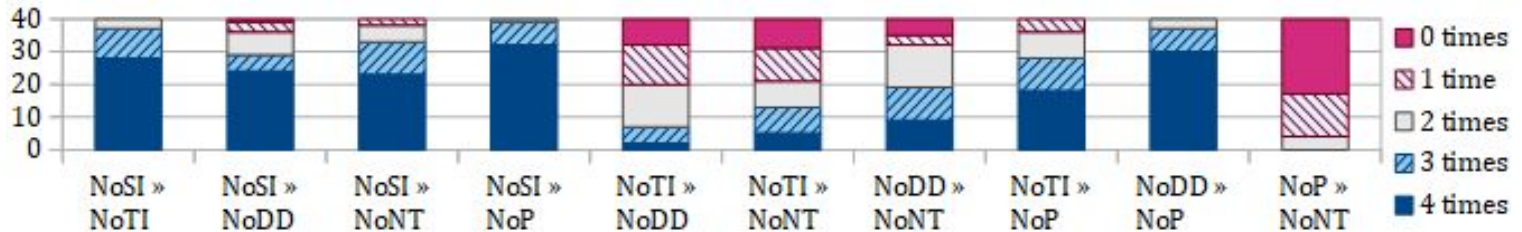
- If the '**hierarchy of foreignness**' supported by alternations in lexical strata is productive:
 - Overall, participant responses should **match**
NoSI » {NoTI, NoDD} » NoP » NoNT
- If **core-periphery structure** is productive:
 - Each participant should have *some* **consistent** hierarchy of preferences (impossible-nativization effects)
 - This need not be the same for all participants

Results (1): Hierarchy of foreignness

- Stratum-specific alternations predict hierarchy as follows:
NoSI » {NoTI, NoDD} » NoP » NoNT
 - Did each constraint pair match the predicted outcome?
- Pooled results approximately support the above hierarchy
- Main differences:
 - One reversal of an expected ranking
 - Additional variability in the middle range

Results (1): Hierarchy of foreignness

Did each constraint pair match the predicted outcome?

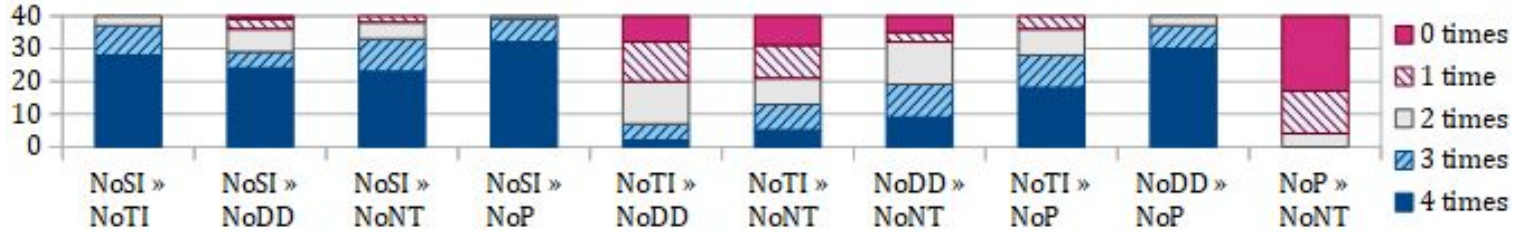


Points of **agreement** | NoSI » {NoTI, NoDD} » NoP » NoNT

- NoSI very highly prioritized
- NoTI and NoDD varied both *between* and *within* participants
- NoSI, NoTI, NoDD all higher than NoP

Results (1): Hierarchy of foreignness

Did each constraint pair match the predicted outcome?



Points of **difference** | NoSI » {NoTI, NoDD} » NoP » NoNT

- NoP was prioritized *below* NoNT: **NoNT » NoP**
- NoNT also varied with NoTI and NoDD: **{NoTI, NoDD, NoNT}**

Results (1): Hierarchy of foreignness

In summary:

- Stratum-specific alternations predict M hierarchy
NoSI » {NoTI, NoDD} » NoP » NoNT
- Pooled results support the following hierarchy
NoSI » { NoTI, NoDD, NoNT } » NoP
 - As predicted: NoSI highest, NoTI ~ NoDD, NoP low(ish)
 - Reversal: NoNT » NoP
 - Variability: NoTI ~ NoDD ~ NoNT

Discussion (1): Hierarchy of foreignness

Consistently **high rank for NoSI** matches predictions

- Almost no evidence in existing loans that it is *ever* violated
- Very small number of (possible) exceptions:

Citibank [s**I**tibæŋk] → [ɔ**i**tibaŋkɯ] ~ ?[s**i**tibaŋkɯ]
Ito & Mester (1999: 77)

season [s**i**ːzən] → [ɔ**i**ːzʌN] ~ [s**i**ːzʌN]
(sports commentators)
Irwin (2011: 84)

Discussion (1): Hierarchy of foreignness

Low rank for **NoP** is surprising: Should be **higher**—?

- Many [h]~[p](~[b]) alternations in Native and SJ forms, with [p] appearing only when [pp] or [mp]

[nihai] ‘2 cups’ (SJ)
([h] after vowel)

[ippai] ‘1 cup’
(geminate [p] ok)

[sambai] ‘3 cups’
(post-N voicing)

- Plausible analysis as /p/ (e.g., McCawley 1968)
 - There is also a non-alternating /h/!
- Consequence: There should be *many* synchronic examples of NoP enforcement (=alternating [h])

Discussion (1): Hierarchy of foreignness

But the story of [p] is actually more complicated

- Another stratum—Mimetic
 - Similar to Native in many ways
 - But does allow singleton [p] (morpheme-initially)
pittari ‘right on, precisely’, *pikapika* ‘bright, shiny’
- Anecdota: Japanese-speaking phonology students who encounter analysis of [h~p~b] as /p/ often seem surprised
- Is the [h~p~b] alternation now morphophonological?

Discussion (1): Hierarchy of foreignness

But the story of [p] is actually more complicated

- How illegal was singleton [p] before Foreign strata came in?
 - [p] was apparently never nativized even in the earliest ‘Foreign’ borrowings (Irwin 2011: 95–96)
 - for source [p], Irwin lists only Japanese [p] as a possible outcome
 - for loanword [h], Irwin does not list source [p] as a possible origin

Discussion (1): Hierarchy of foreignness

- Speakers may not have much of a productive restriction against [p], despite the [h~p~b] alternations
- Our nonce-loan nativization results support this view
 - NoP is consistently the **lowest** ranked

Discussion (1): Hierarchy of foreignness

NoNT also surprising: Higher, more variable than expected

- NoNT considered active in Native stratum only (I&M 1999)
- Unclear if NoNT is *truly* productive even for Native forms!
 - Alternations primarily occur in verbs (not nouns)
 - A few NoNT *violations* in Native stratum (K. Rice 1997)
But: These forms are typically syncopated, so there may be output-output faithfulness to the unsyncopated variant (I&M 2003)
- On the other hand, some Sino-Japanese forms do exceptionally *undergo* postnasal voicing (Ito & Mester 2003)
 - Might be precedent for exceptional high rank(?) of NoNT

Discussion (1): Hierarchy of foreignness

In summary:

Pooled results across all subjects provide evidence for a **hierarchy of foreignness**

- The hierarchy differs somewhat from that predicted by stratum-specific alternations (as in Ito & Mester 1999)
 - NoSI very high (expected) — [si] is very ‘foreign’
 - NoP very low (unexpected) — [p] is not so ‘foreign’
- NoTI, NoDD, and NoNT are variable between speakers and apparently even within speakers

Discussion (1): Hierarchy of foreignness

In summary:

Pooled results across all subjects provide evidence for a **hierarchy of foreignness**

- Existing stratum-specific alternations may not be the only factor determining this hierarchy
- There are also individual differences among participants

Results (2): Core-periphery structure

If **core-periphery structure** is productive:

- Participants should show **impossible-nativization effects**
 - Given a choice of nativizing *only A* or *only B*, participants should consistently prefer one option
- The implicational relations between multiple pairs of constraints should be **transitive** (if $A \gg B$ and $B \gg C$ then $A \gg C$)
 - Each participant should follow *some* transitive hierarchy of preferences among nativizations
 - The hierarchy may not be the same for all participants

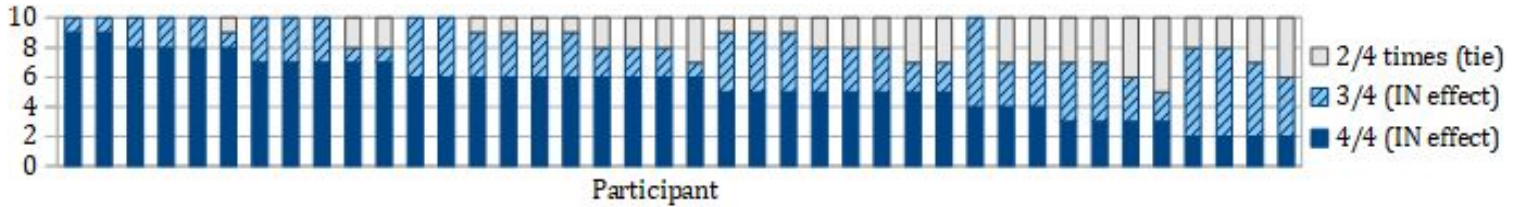
Results (2): Core-periphery structure

Participants should show **impossible-nativization effects** →
Did each participant treat each constraint pair consistently?

- Participants were *likely* to have **uniform responses**
 - High proportion of constraint pairs (M_i, M_j) with **4/4** responses supporting $M_i \gg M_j$ or $M_j \gg M_i$
- Participants were *unlikely* to have **constraint ties**
 - Low proportion of constraint pairs (M_i, M_j) with **2/4** responses supporting $M_i \gg M_j$

Results (2): Core-periphery structure

Participants were *likely* to have **uniform responses**

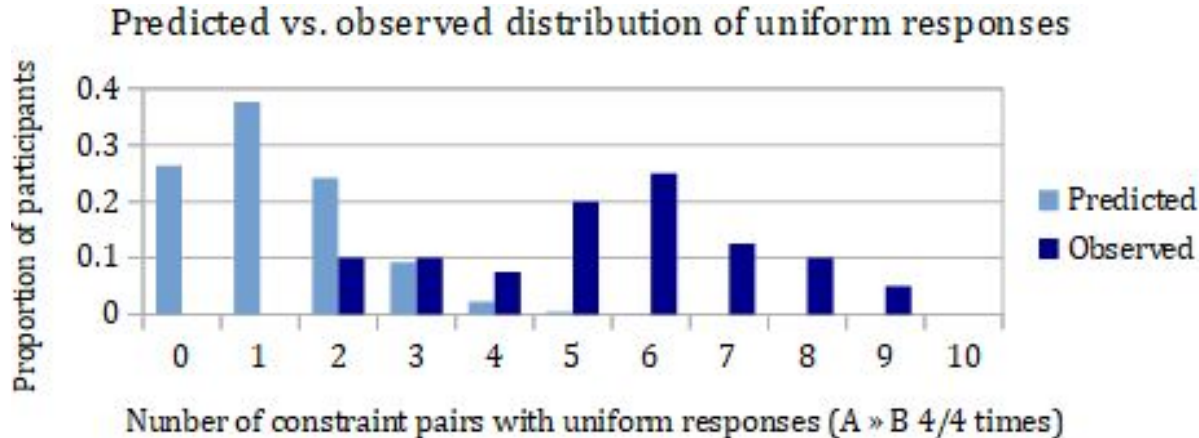


- No participants had 4/4 rankings for all 10 pairs
- 21/40 (52.5%) had 4/4 rankings for 6–9 pairs
 - 2/40 (5%) had 4/4 rankings for 9 pairs
 - 4/40 (10%) had 4/4 rankings for 8 pairs
 - 5/40 (12.5%) had 4/4 rankings for 7 pairs
 - 10/40 (25%) had 4/4 rankings for 6 pairs

Results (2): Core-periphery structure

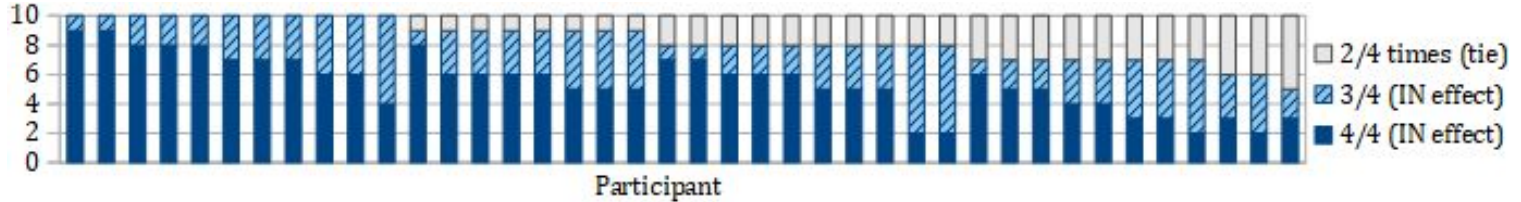
Participants were *likely* to have **uniform responses**

- **More** uniform responses than would be expected if participants were choosing responses randomly
 - “Predicted distribution” is exact binomial probability



Results (2): Core-periphery structure

Participants were *unlikely* to have **constraint ties**



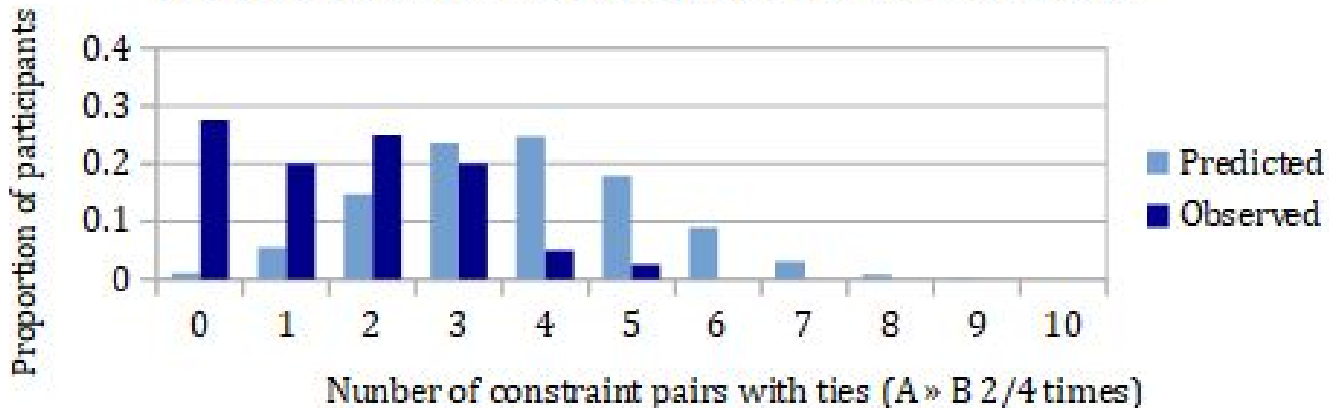
- 29/40 participants (72.5%) had at most 2 ties
 - 11/40 participants (27.5%) had no ties
 - 18/40 participants (45%) had ties for 1–2 pairs
- 11/40 participants (27.5%) had ties for 2–5 pairs
- No participants had ties for more than 5 pairs

Results (2): Core-periphery structure

Participants were *unlikely* to have **constraint ties**

- **Fewer** tied responses than would be expected if participants were choosing responses randomly
 - “Predicted distribution” is exact binomial probability

Predicted vs. observed distribution of constraint ties



Results (2): Core-periphery structure

Interim summary:

- We found that participant responses are **more consistent** than would be predicted by chance
- Thus, participants do often show **impossible-nativization effects**

Results (2): Core-periphery structure

If **core-periphery structure** is productive:

- The implicational relations between multiple pairs of constraints should be **transitive** (if $A \gg B$ and $B \gg C$ then $A \gg C$)
 - Each participant should follow *some* transitive hierarchy of preferences among nativizations
 - The hierarchy may not be the same for all participants
- We found that some, but not all, participants have a transitive hierarchy

Results (2): Core-periphery structure

Did each participant have a **transitive** hierarchy?

- Each participant has 4 responses for a given constraint pair
- Criteria for this analysis:
 - 4 or 3 “A » B” responses means A » B
 - 0 or 1 “A » B” responses means B » A
 - 2 “A » B” responses means A=B (tied; variable)
- Are all 10 pairs’ rankings **transitive** for each participant?
 - No *inconsistencies*, where A » B and B » C, but C » A

Results (2): Core-periphery structure

Only about half the participants have a transitive hierarchy

● constraint hierarchy is transitive (may include tied rankings)		17
● tied ranking(s); at least one is transitive, but at least one is inconsistent	8	
● no transitive ranking	4	23
● more than two pairs of tied constraints (transitivity status unknown)	11	

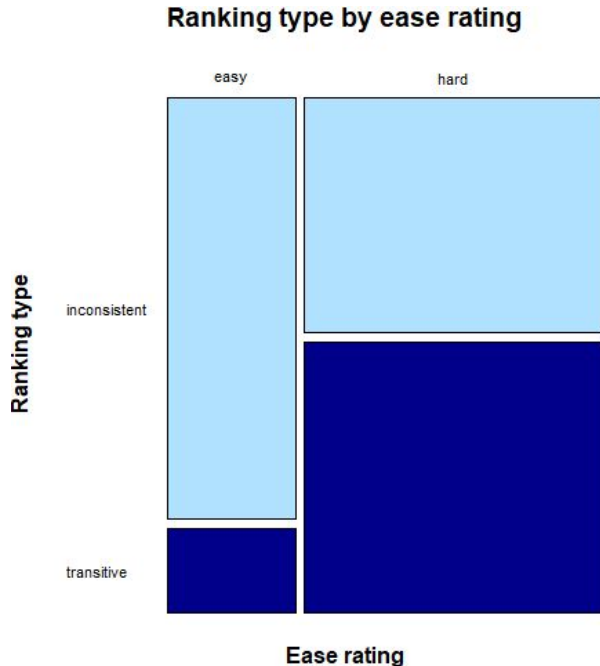
Discussion (2): Core-periphery structure

What **factors** predict transitive vs. inconsistent hierarchies?

- More likely to have transitive rankings
 - Participants who rated the task as ‘hard’
 - Participants who used more-implicit strategies—?
- No effect was found for...
 - Age
 - Dialect region
 - Education level or amount of English exposure
 - Self-reported use of audio vs. orthography in task

Discussion (2): Core-periphery structure

Significant effect of 'ease' rating



	'easy'	'hard'
inconsistent	10	13
transitive	2	15

Fisher's exact test: $p=0.041$

- Participants who found the task 'hard' were more likely to have transitive rankings

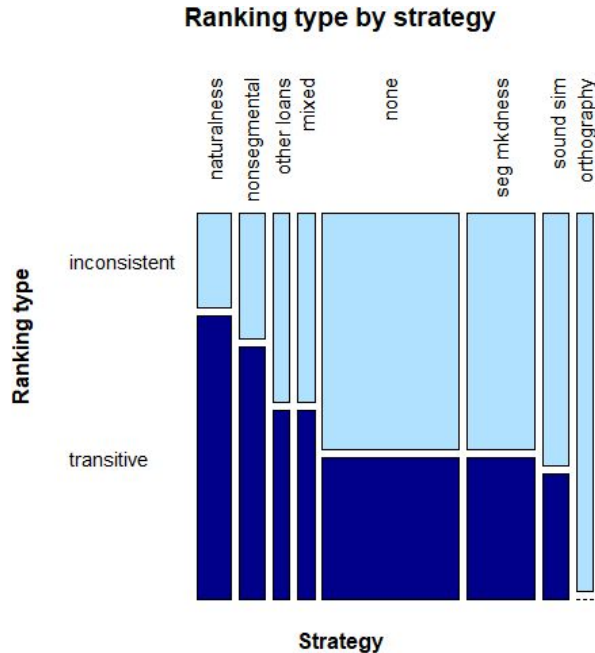
Discussion (2): Core-periphery structure

Possible effect of implicit vs. explicit strategies

- Implicit vs. explicit processing of experiment tasks can produce qualitatively different response patterns (Moreton & Pertsova 2016)
 - Implicit processing — \cong intuition
 - Explicit processing — \cong problem-solving
- Participants who respond on the basis of “intuition” might be more likely to be accessing their phonological grammar

Discussion (2): Core-periphery structure

Possible effect of **implicit**/**explicit** strategies



Strategies: Made reference to...

- **Sounding natural** [4]
- **Nonsegmental factors** [3]
(note: these were actually **controlled!**)
- Similarity to existing loans [2]
- Multiple strategies mentioned [2]
- “None” [8] or no response [8]
- **Avoiding specific segments** [8]
- Sound similarity [3]
- **Orthography** [2]

Discussion (2): Core-periphery structure

- Caveat: Numbers of participants in these categories are small
- Strategies with *high* proportions of “transitive” rankings seem likely to be **implicit**
 - “Sounding natural” — looks like intuition
 - Nonsegmental factors, such as pitch accent, were controlled — participants who *thought* they were using these probably weren’t really doing so
- Some of the strategies with *low* proportions of “transitive” rankings seem likely to be **explicit**
 - Orthography
 - Avoiding specific segments

Discussion (2): Core-periphery structure

In summary:

- Participants show **impossible-nativization effects**
 - Responses to constraint pairs are largely consistent
 - ∴ Participants prefer some nativizations over others
- But: Only about half of the participants had **transitive** implicational relations across constraint pairs
 - Use of explicit strategies in the experiment may have masked participants' true grammars (needs further study)
- Some (not all) participants have **core-periphery structure**

Conclusions and implications

- *Result (1)*: Pooled results across all subjects provide evidence for a **hierarchy of foreignness** — *but*:
 - Existing alternations do not entirely predict the hierarchy
 - There are individual differences among participants
- Future directions: Why a **different hierarchy**?
 - Reexamine the true productivity of alternations?
 - Role for surface frequency of ‘foreign’ structures?
- Future directions: Why **individual differences**?
 - Role for sociolinguistic factors in what feels ‘foreign’?

Conclusions and implications

- *Result (2)*: Some (but not all) participants have **productive core-periphery structure**
 - Participants do show **impossible-nativization effects**
 - But: Only **transitive** for about half of the participants
- Future directions: Why non-transitive results?
 - True transitivity masked by use of **explicit strategies**?
- What if the lack of transitivity is really in the **grammar**?
 - Implications for theoretical analysis of stratal phonology
 - **Faithfulness ranking** that *changes* across strata?
(contra Ranking Consistency; Ito & Mester 1999)

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