

Notes on Clements (2003)

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Introduction

- The purpose of [Clements \(2003\)](#) is to quantify and formalise the old intuition that systems like:

- | | | |
|---|---|---|
| p | t | k |
| b | d | g |

- Are somehow more common/‘natural’ than:

- | | | |
|---|---|---|
| p | | k |
| | d | g |

Introduction

- or:

		k
	d	g
p'	t'	
ɓ		

- The approach taken by Clements is to test a theory of feature economy against the segment inventories in UPSID₄₅₁ (Maddieson & Precoda, 1989)

Feature Economy

- Clements defines an **economy index** as “...the ratio of speech sounds in a system over the smallest number of features to characterize them” (Clements 2003: 289; emphasis mine)
- I.e., $E = S/F$, where S represents the number of (contrastive) speech sounds and F the number of distinctive features

Feature Economy

- Feature economy is distinct from:

Parsimony which simply favours small inventories

Symmetry which refers to simply to the presence of 'gaps' in phonetic inventories (and very abstract analyses concerned with ironing these out)

Representational economy which refers to the practice of employing minimally redundant feature structures (at certain levels of the phonology)

Gestural economy which refers to the fact that articulatory implementation tends to be consistent within phonological classes

Testing economy

- Clements' key prediction is that:
- “A given speech sound will occur more frequently in systems in which all of its features are distinctively present in other sounds” (Clements 2003: 296)
- Section 2 sets out a methodology for testing this prediction
- Sections 3-6 test the prediction against UPSID₄₅₁ and explore the viability of feature economy as a tool in phonological analysis

Testing economy

- Method: Comparing the frequency of a feature or sound x in languages possessing some sound/class of sounds/contrastive feature y to the overall frequency of x in UPSID₄₅₁
- Possible inferences:
 - ◆ If x is more frequent in languages possessing y than in UPSID overall (to a statistically reliable degree) there is a tendency for x and y to cooccur
 - ◆ If the cooccurrence of x and y increases the feature economy index E , such a tendency is consistent with Clements's hypothesis

Testing economy

- An example: segment inventories like to have both [v] and [z] (expected frequencies in brackets):

	[z]	\neg [z]
[v]	110 (57)	37 (90)
\neg [v]	65 (118)	239 (186)

- The fact that more systems than expected have both fricatives is consistent with Clements's hypothesis

Testing economy

- But note that no conclusions can be drawn from the fact that more systems than expected **lack** both [v] and [z] as this does not necessarily increase *E*
- Cf. systems with [\pm voice] plosives but only [-voice] fricatives

Testing economy

- Clements reports a series of feature economy-enhancing cooccurrence biases with regard to the contrastive use of features within and across different classes of consonants, e.g.:
- **Voiceless fricatives with different places of articulation:** if systems have voiceless fricatives at all, there is a bias towards ‘filling out’ the available places of articulation
- **Voicing across obstruents (cross-category economy):** there is a bias for languages that possess an obstruent voicing contrast to generalise it across plosives/affricates, fricatives

Testing economy

- Moreover...
- In obstruent inventories that employ both [spread glottis] and [voice] contrastively, there is a bias towards realising all 4 possible combinations
- In inventories that employ [spread glottis] to distinguish obstruents, there is a bias towards contrastive sonorant devoicing

Discussion points: methodology

- (χ^2 tests on) segment (type) cooccurrences in UPSID have been used to gauge markedness relations among sound types
- For example, the fact that there is a tendency for voiced aspirated sounds to occur in systems that contrast plain voiceless, voiceless aspirated and plain voiced sounds suggest that the presence of the latter is a prerequisite for the presence of the former and that voiced aspirates are relatively marked
- But are cooccurrence biases good indicators of feature economy?

Discussion points: methodology

- This hypothetical sample gives a positive association ($\chi^2(1) = 11.52, p < .001$) between voicing contrast in fricatives and plosives:

	voiced fricatives	¬voiced fricatives
voiced plosives	47	103
¬voiced plosives	3	47

- ... even if over two-thirds of the languages with voiced plosives lack voiced fricatives

Discussion points: methodology

- A more realistic example: $[k^w]$ vs. one or more other plain/aspirated voiceless labialised obstruents $\underset{\circ}{C}^w$ (= $[p^w, p^{wh}, t^w, t^{wh}, t^w, t^{wh}, q^w, q^{wh}] + [\phi^w, f^w, s^w, s^w, j^w, c^w, x^w, \chi^w]$):

	$\underset{\circ}{C}^w$	$\neg \underset{\circ}{C}^w$
k^w	27 (6.0)	41 (62)
$\neg k^w$	13 (34)	370 (349)

- ... which gives another positive association: $\chi^2(1) = 90.38$ $p < .001$ even if less than half the systems with $[k^w]$ have another labialised voiceless obstruent

Discussion points: methodology

- Perhaps a better way to assess the strength of the economy bias is to inspect the frequency distributions of economy indexes
- For example, consider all (sub)inventories that have $[p^{(h)}, t^{(h)}, k^{(h)}]$ and one or more of $[b, d, g]$
- To describe these you need two place features and [voice], i.e. $S \leq 2$

Discussion points: methodology

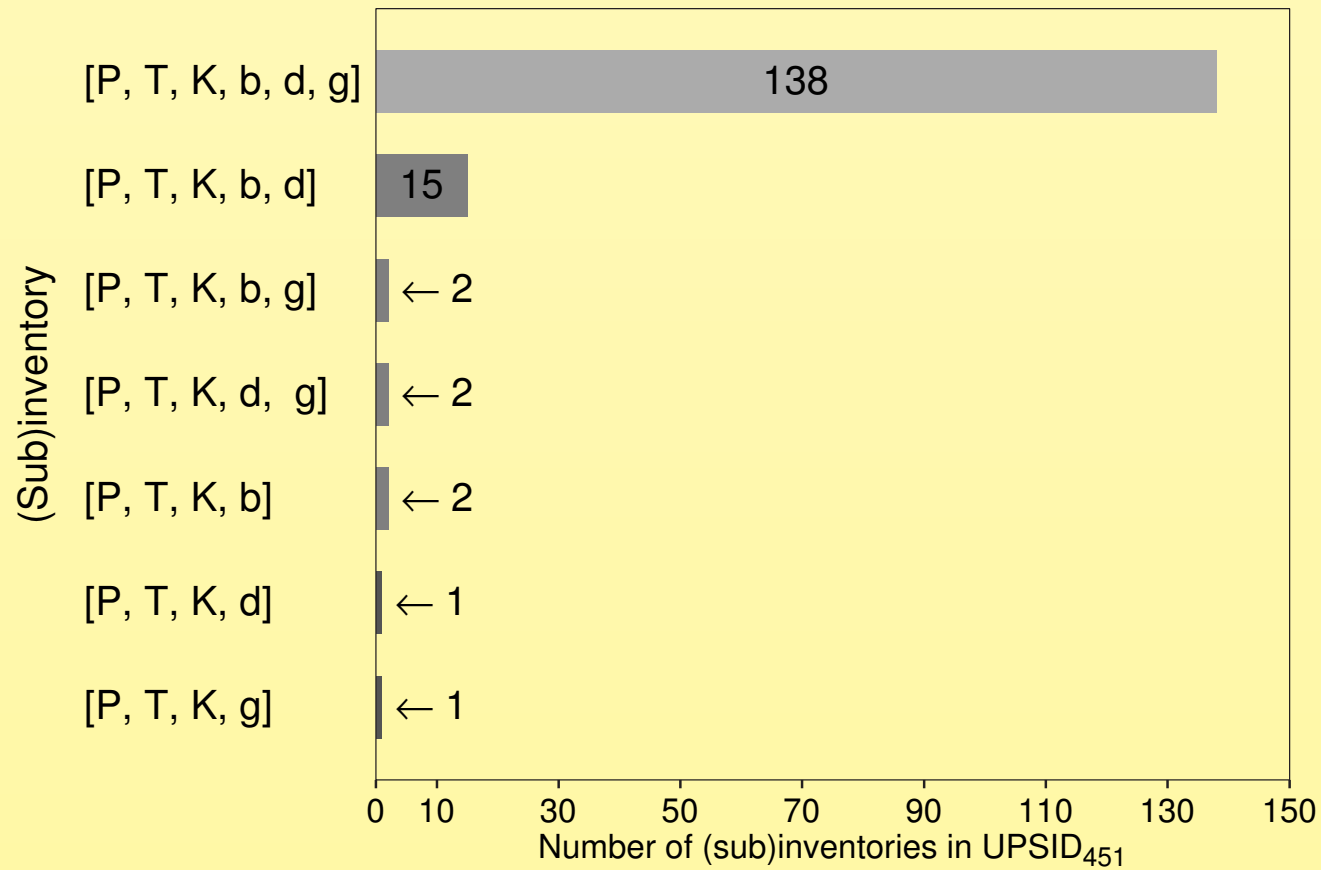
- ... which gives the following economy indexes ($P = p/p^h$, $T = t/t^h$, $K = k/k^h$):

System	S	E
[P, T, K, b, d, g]	6	2
[P, T, K, b, d]	5	1.67
[P, T, K, b, g]	5	1.67
[P, T, K, d, g]	5	1.67
[P, T, K, b]	4	1.33
[P, T, K, d]	4	1.33
[P, T, K, g]	4	1.33

Discussion points: methodology

- If feature economy indeed exerts a force on the shape of segment inventories, you might expect that systems with high values for E are more frequent than those with lower values
- ... which seems to be borne out by the frequency distribution of the (sub)inventories at hand

Discussion points: methodology



Discussion points: methodology

- The choice of feature system and its phonetic abstractness has an impact on the value of E :

1.

p	t	k
b	d	g

2.

p	t	c	k
b	d	j	g

3.

p	t		k
b	d		g
		tʃ	
		dʒ	

Discussion points: methodology

- If you choose to represent major place distinctions using monovalent [labial], ([coronal]) [dorsal]
 - ◆ $E = 2$ for system 1 (6 sounds, 2 place features, [voice])
 - ◆ $E = 2$ for system 2 (8 sounds, 3 place features, [voice])
- But if you choose good old [\pm anterior], [\pm coronal]
 - ◆ $E = 2$ for system 1 (6 sounds, 2 place features, [voice])
 - ◆ $E = 2.67$ for system 2 (8 sounds, 2 place features, [voice])

Discussion points: methodology

- Abstract analysis: $[\widehat{tj}, \widehat{dʒ}]$ are analysed as phonologically equivalent to $[c, ʃ]$, which results in $E_{System3} = E_{System2}$
- ‘Phonetic’ analysis: $[\widehat{tj}, \widehat{dʒ}]$ are analysed as phonologically different from $[c, ʃ]$, which results in $E_{System3} < E_{System2}$, because an extra distinctive feature is required

Discussion points: the origin of economy

- Clements states that:
- “Feature economy . . . reflects a general predisposition to organise linguistic data into a small number of categories and to generalise these categories maximally, consistently with independent constraints on their functioning” (Clements 2003: 329)
- Some of his earlier comments suggest that this predisposition is active (in driving ?) regular language change

Discussion points: the origin of economy

- But is this all there is to it?

References

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