



# TOWARDS A FOOTLESS APPROACH OF ENGLISH VOWEL REDUCTION

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# OUR APPROACH

- Our work is not an attempt to model languages.
- Rather, it is an attempt to bring together empirical research and theoretical research conducted independently.
- Doing this avoids circularity:
  - Choosing data to fit a selected theory
  - Developing a theory to fit selected data

# OUTLINE

- Vowel reduction in English
- The “Arab Rule”
- Formal analysis
- Testing the predictions
- Concluding remarks

# VOWEL REDUCTION IN ENGLISH

- In English, many unstressed vowels reduce to schwa:

e.g. *atom* ['æteɪm] vs. *atomic* [ə'tɒmɪk]

- Following Wells (2008), we also treat these cases as reduced:

*fiesta* [fi'estə]

*tuition* [tju'ɪʃən]

*eponymous* [ɪ'pɒnɪməs] (cp. *eponym* ['epənɪm])

# WHAT DETERMINES VOWEL REDUCTION

- Vowels in open syllables are more likely to reduce than vowels in closed syllables (Halle & Keyser 1974; Burzio 1994: 113; Fudge 1984).
- Vowels in syllables closed by obstruents are less likely to reduce than vowels closed by sonorants (Pater 2000).
- Vowels in syllables closed by non-coronals are less likely to reduce than vowels closed by coronals (Dahak 2011; Burzio 1994, 2007; Fudge 1984).

# WHAT DETERMINES VOWEL REDUCTION

- Initial pretonic closed syllables normally do not reduce except if that syllable is a prefix (SPE: 118; Halle & Keyser 1971: 37; Liberman & Prince 1977: 284-285; Guierre 1979: 253; Selkirk, 1980; Hayes 1982; Halle & Vergnaud 1987: 239; Pater 2000; Hammond 2003; Collie 2007: 129, 215, 318-319).
- More frequent words show more reduction than less frequent words (Fidelholtz 1975).
- The existence of a morphological base in which the vowel is stressed can reduce its chances to reduce (SPE: 112, e.g. *reláx* *rèlaxátion*), even more so if that base is more frequent than the derivative (Bermúdez-Otero, 2012: 32, after Kraska-Szlenk 2007: §8.1.2).

# THE “ARAB RULE”

(Collie 2007, Hayes 1980, Pater 1995, 2000, Ross 1972)

- It has been claimed that vowels in syllables closed by non-coronal obstruents do not reduce.
- However, reduction does occur when the preceding syllable is stressed and if it is light (*Arab* ['æɾəb]) but not when it is heavy (*Arab* ['eɪɾəb]).

		Right context	
		[+cor] coda	[-cor] coda
Left context	Heavy $\sigma$	Reduction	No reduction
	Light $\sigma$	Reduction	Reduction

# THE OT ANALYSIS

Pater (1995, 2000)

## (11) FTBIN, PARSE- $\sigma$ , TROCH » WEIGHT-TO-STRESS

Input: <i>Alexander</i>	FTBIN	PARSE- $\sigma$	TROCH	WEIGHT -TO-STRESS
(Àlex) ánder ✓				*
A(lèx) ánder		* !		
(À)(lèx) ánder	* !			
(Alèx) ánder			* !	

## (12) Tableau for H $\sigma_0$

Input: <i>Timbucktoo</i>	FTBIN	PARSE- $\sigma$	TROCH	WEIGHT -TO-STRESS
(Tìmbuck) tóo				* !
Tim(bùck) tóo		* !		*
(Timbùck) tóo			* !	*
(Tìm)(bùck) tóo ✓				



# AIMS

- Evaluating the efficiency of the “Arab Rule” in the final syllable of dissyllables
- Represent (and unify) without metrics within CVCV-phonology
- Extend and test the analysis with word-internal syllables

# THE DATA ON THE ARAB RULE

- All the words with the following properties were taken from Wells (2008):
  - Dissyllabic
  - Main stress on the first syllable
  - One single non-coronal coda
  - No morphological structure

# THE DATA ON THE ARAB RULE

- 7 words for which the weight of the first syllable varies have been left out (e.g. *zineb* ['zineb] ~ ['zaineb])
- Dataset: 210 words
- Token frequencies collected from SUBTLEX-UK (Van Heuven et al. 2014) and log-transformed so as to resemble the way “humans process frequency information” (Hay & Baayen 2002)
- Only the main variant was taken into account for this study.

# RESULTS

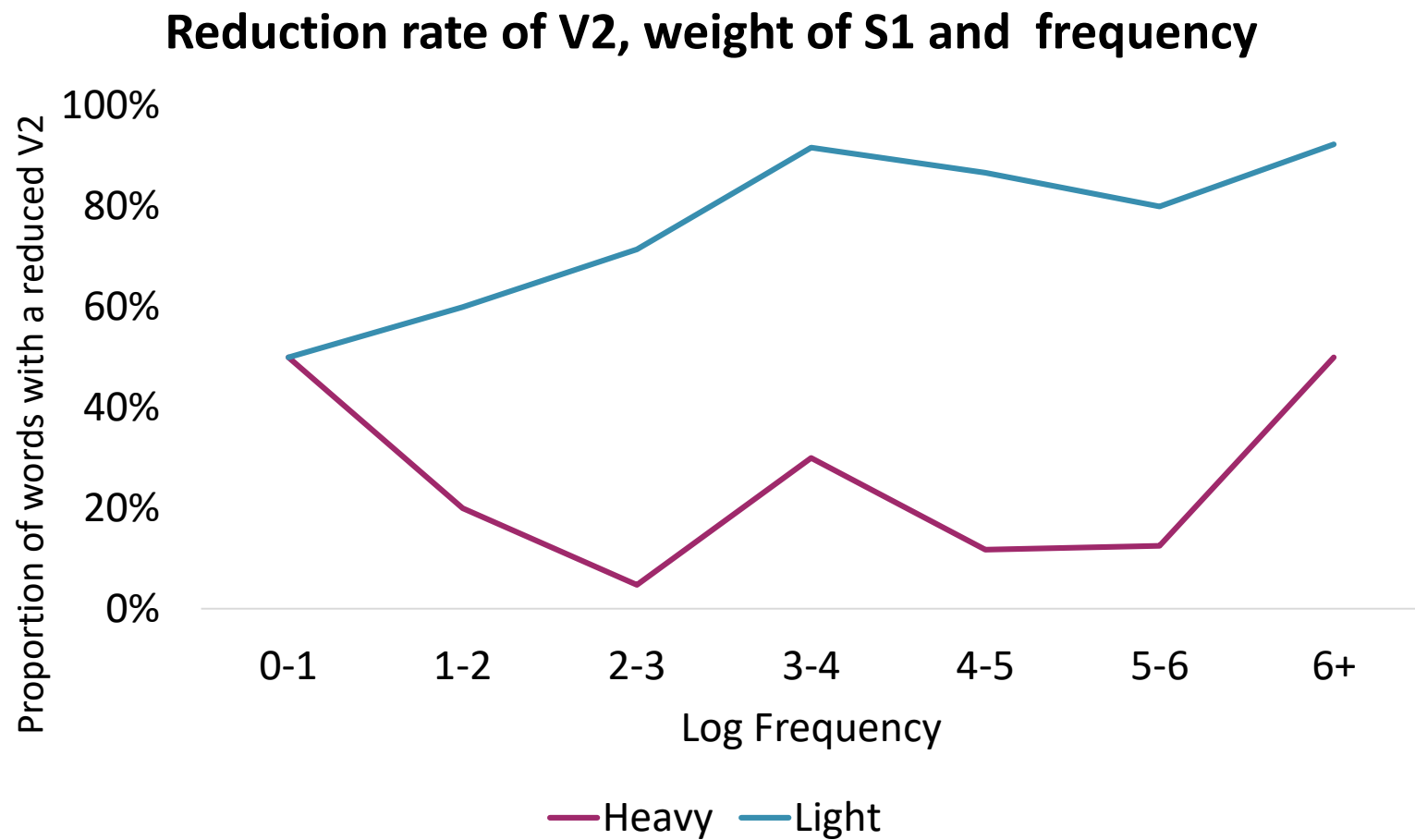
- Binary Logistic Regression was conducted. It shows that both frequency and weight of the first syllable are significant predictors of vowel reduction.

	95% C.I.			p-value
	Lower	OR	Higher	
<b>WeightOfFirstSyllable - Light</b>	8.60	17.15	36.40	8.60 e-15
<b>LogFrequency</b>	1.13	1.34	1.60	0.00105

# RESULTS

		Second syllable	
		Reduction	No reduction
First syllable	Heavy	<b>18 (16%)</b> <i>Joseph</i> <i>ketchup</i> <i>lilac</i>	<b>92 (84%)</b> <i>Murdoch</i> <i>rhubarb</i> <i>tarmac</i>
	Light	<b>77 (75%)</b> <i>Derek</i> <i>stomach</i> <i>havoc</i>	<b>26 (25%)</b> <i>Barack</i> <i>kayak</i> <i>fennec</i>

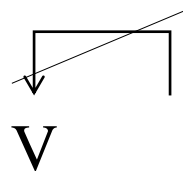
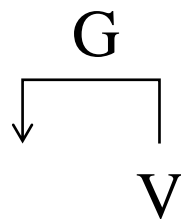
# RESULTS



# THEORETICAL ANALYSIS

## **Reduction and inhibition** Harris (2005), Kaye et al. (1990), Scheer (2000)

- Reduction is an inhibitory process
- Inhibition is prevented if a vowel:
  - governs
  - is ungoverned



# THEORETICAL ANALYSIS

## Reduction and left-hand context [Scheer \(2000\)](#)

- Reduction is blocked in:
  - The initial position when unstressed

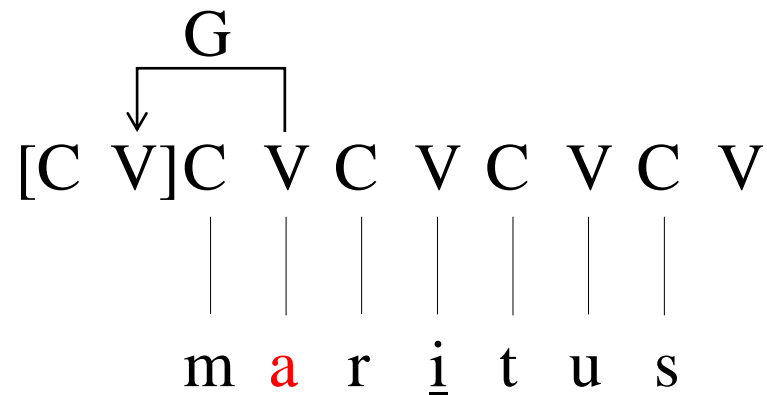
Unstressed initial V		Stressed V	
Latin	French	Latin	French
<i>ma<b>a</b>rítus</i>	<i>ma<b>a</b>ri</i>	<i>Ala<b>a</b>mánia</i>	<i>Alle<b>a</b>magne</i>
<i>va<b>a</b>lére</i>	<i>va<b>a</b>loir</i>	<i>li<b>b</b>eráre</i>	<i>li<b>v</b>rer</i>
<i>la<b>a</b>váre</i>	<i>la<b>a</b>ver</i>	<i>sil<b>v</b>áticus</i>	<i>sau<b>v</b>age</i>



# THEORETICAL ANALYSIS

## Reduction and left-hand context [Scheer \(2000\)](#)

- Explanation: The vowel governs.



> *ma****ri***

# THEORETICAL ANALYSIS

## Reduction and left-hand context [Jacobs \(1989:21\)](#)

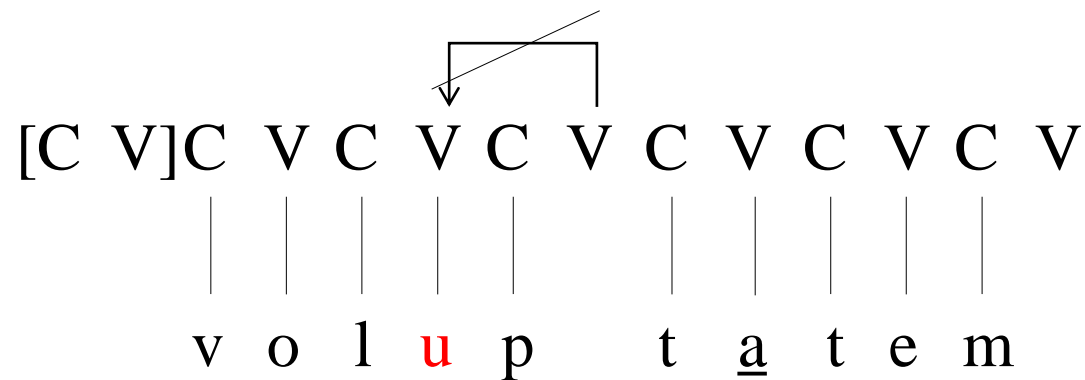
- Reduction is blocked in:
  - closed syllables

CV		CVC	
Latin	French	Latin	French
<i>civ<i>it</i>átem</i>	<i>cit<i>é</i></i>	<i>pap<i>il</i>iónem</i>	<i>pav<i>il</i>lon</i>
<i>bon<i>it</i>átem</i>	<i>bont<i>é</i></i>	<i>tab<i>er</i>nárium</i>	<i>tav<i>er</i>nier</i>
<i>comp<i>ut</i>áre</i>	<i>compt<i>er</i></i>	<i>vol<i>u</i>ptátem</i>	<i>vol<i>u</i>pt<i>é</i></i>

# THEORETICAL ANALYSIS

## Reduction and left-hand context [Jacobs \(1989:21\)](#)

- Explanation: The vowel is ungoverned



> volupté

# THEORETICAL ANALYSIS

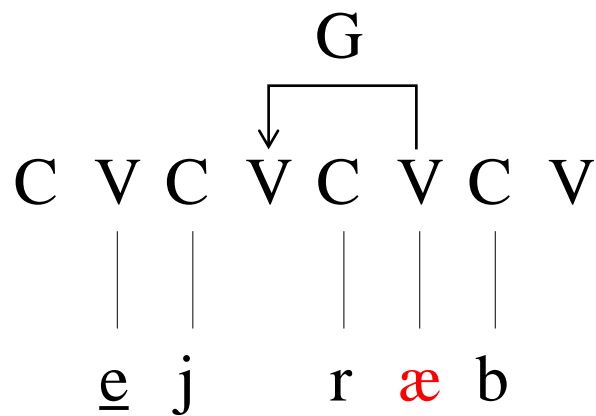
## Summary

	LEFT	RIGHT
REDUCTION BLOCKERS	Govern	Ungoverned

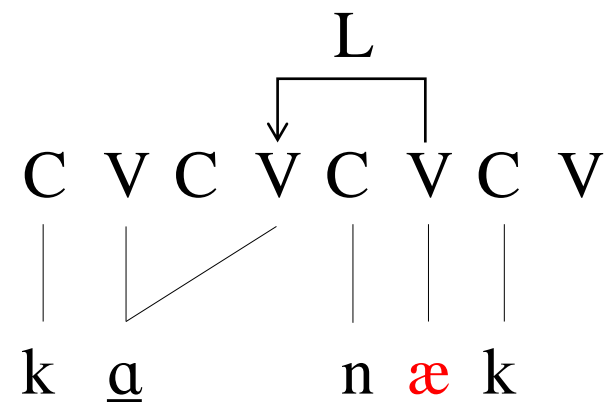
# THE ARAB RULE WITHOUT METRICS

## Left-hand context

- Heavy syllable = governs



‘Arab’



‘Carnac’

# DIPHTHONGS

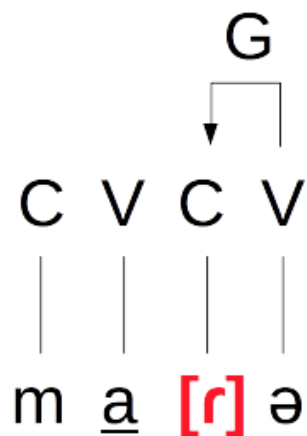
- Following Szigetvári (2016), we analyze raising diphthongs as VC sequences.
- Epenthesis between diphthong and liquid:

C	V	C	V	C	V
			⋮		
f	<u>a</u>	j	(ə)	l	

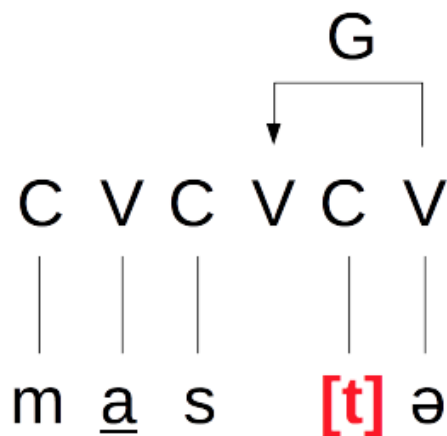
‘File’

# DIPHTHONGS

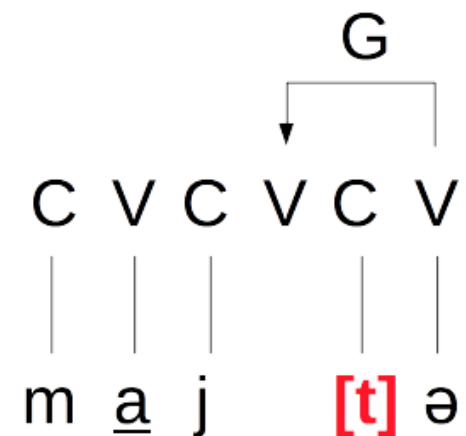
- Diphthongs are VC configurations.
- New Zealand Acrolect English [Bye & De Lacy \(2008:195-197\)](#), Szigetvári (2016).



‘Matter’



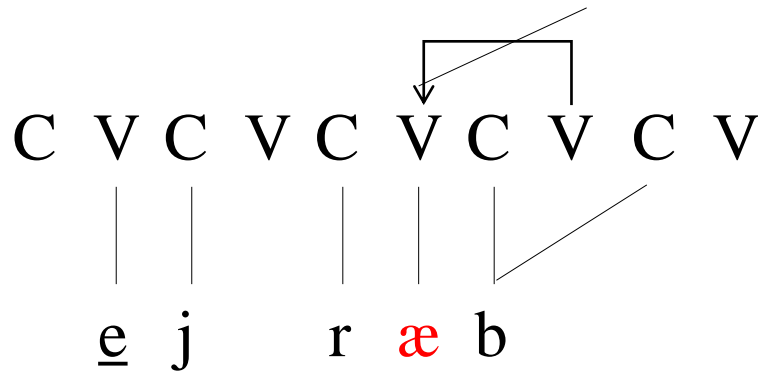
‘Master’



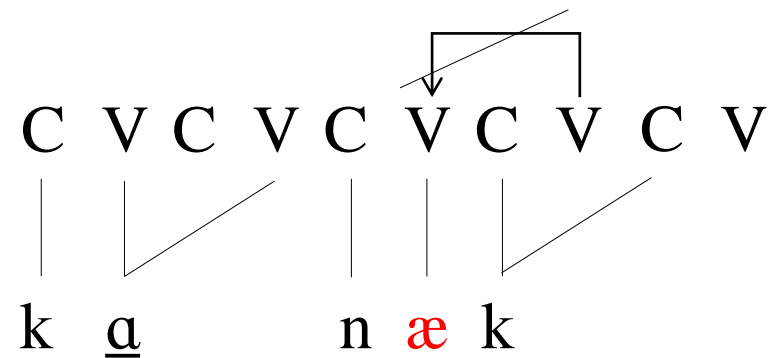
‘Mitre’

# THE ARAB RULE WITHOUT METRICS

- Non-coronal obstruents: is the vowel ungoverned?



# ‘Arab’



# ‘Carnac’



# THE COMPLEXITY OF NON-CORONALS

- [t] is less complex, because
  - It freely alternates with [ʔ]
  - It never opposes to [ʔ]
- [p, k] are more complex
  - They can oppose to [ʔ]
  - They seldom merge with [ʔ]

(In dialects such as Estuary English, see [Brulard & Carr \(2015:253-254\)](#), [Ward \(1929:§250e\)](#), [Wells \(1982:410\)](#))

# THE COMPLEXITY OF NON-CORONALS

- That complexity can be represented in two ways that are equivalent ([Lowenstamm 1991](#), [Carvalho 1994](#), [Ségéral & Scheer 2008](#))

vertically

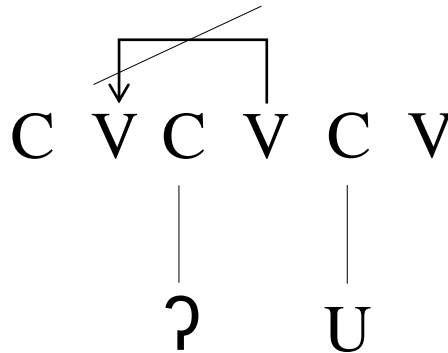
X  
|  
F  
|  
F

horizontally

X    X  
|    /  
F

# THE COMPLEXITY OF NON-CORONALS

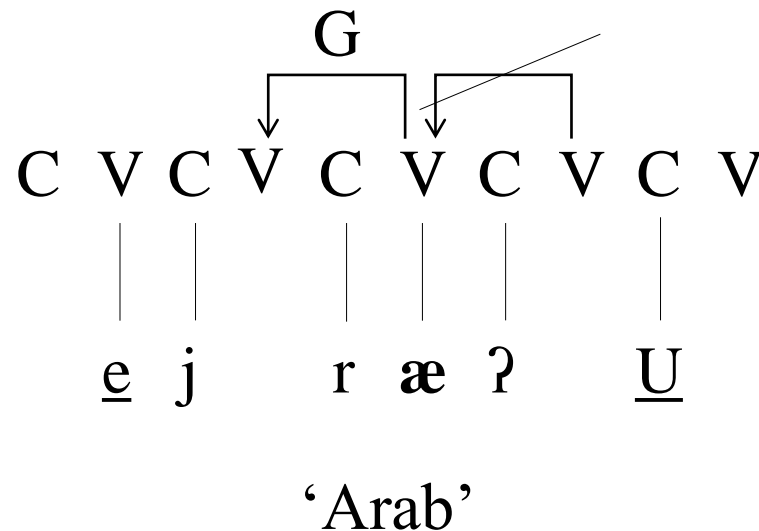
- **Proposal:**
- [p, k] are clusters /ʔʌ, ʔʌ/
- They occupy two CV slots, at least word-finally (horizontal complexity).



# THEORETICAL ANALYSIS

# Generalisation

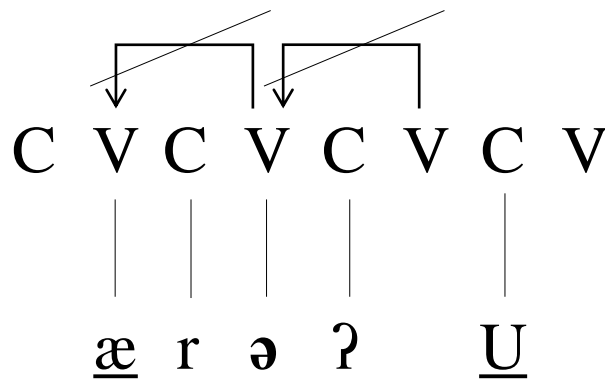
- Reduction is blocked **iff** a vowel governs & is ungoverned



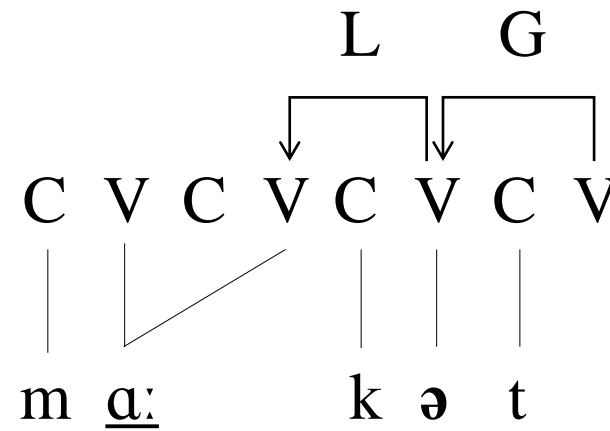
# THEORETICAL ANALYSIS

# Generalisation

- Elsewhere it is not blocked



# ‘Arab’



‘market’

# THEORETICAL ANALYSIS

## Prediction

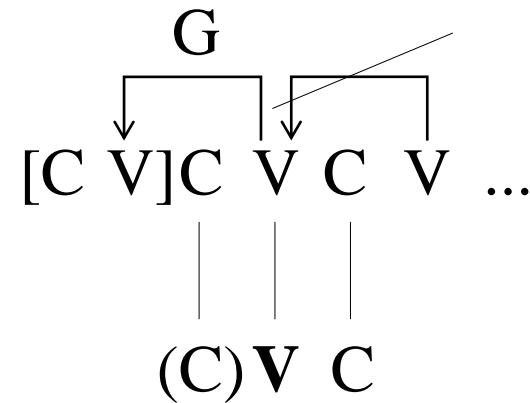
- Reduction is blocked in #(C)VC

[ə]*peritive* but [æ]*pteryges*

[ə]*kimbo* but *b*[æ]*ptize*

c[ə]*lamity* but [æ]*lbino*

c[ə]*sino* but c[æ]*scade*



# TESTING THE PREDICTION

- Data taken from Wells (2008).
- Only monomorphemic words or words derived from bound roots.
- Historical prefixes excluded in the relevant positions.
- Names not included (at this stage)
- The prediction was tested in two environments:
  - initial pretonic syllable (e.g. *a*péritive) – n = 1017
  - intertonic syllable (e.g. pèr*e*vére) – n = 478

# TESTED VARIABLES

- Open/Closed syllable
  - Nature of the following consonant ((non)coronal, nasal, etc.)
  - Frequency (taken from SUBTLEX-UK, log-transformed)
  - Spelling (monograph/digraph)
  - (Intertonic only: Weight of first syllable)
- 
- Tested in a binary logistic regression with vowel reduction as the dependent variable.



# RESULTS

- In both contexts, only three significant predictors.

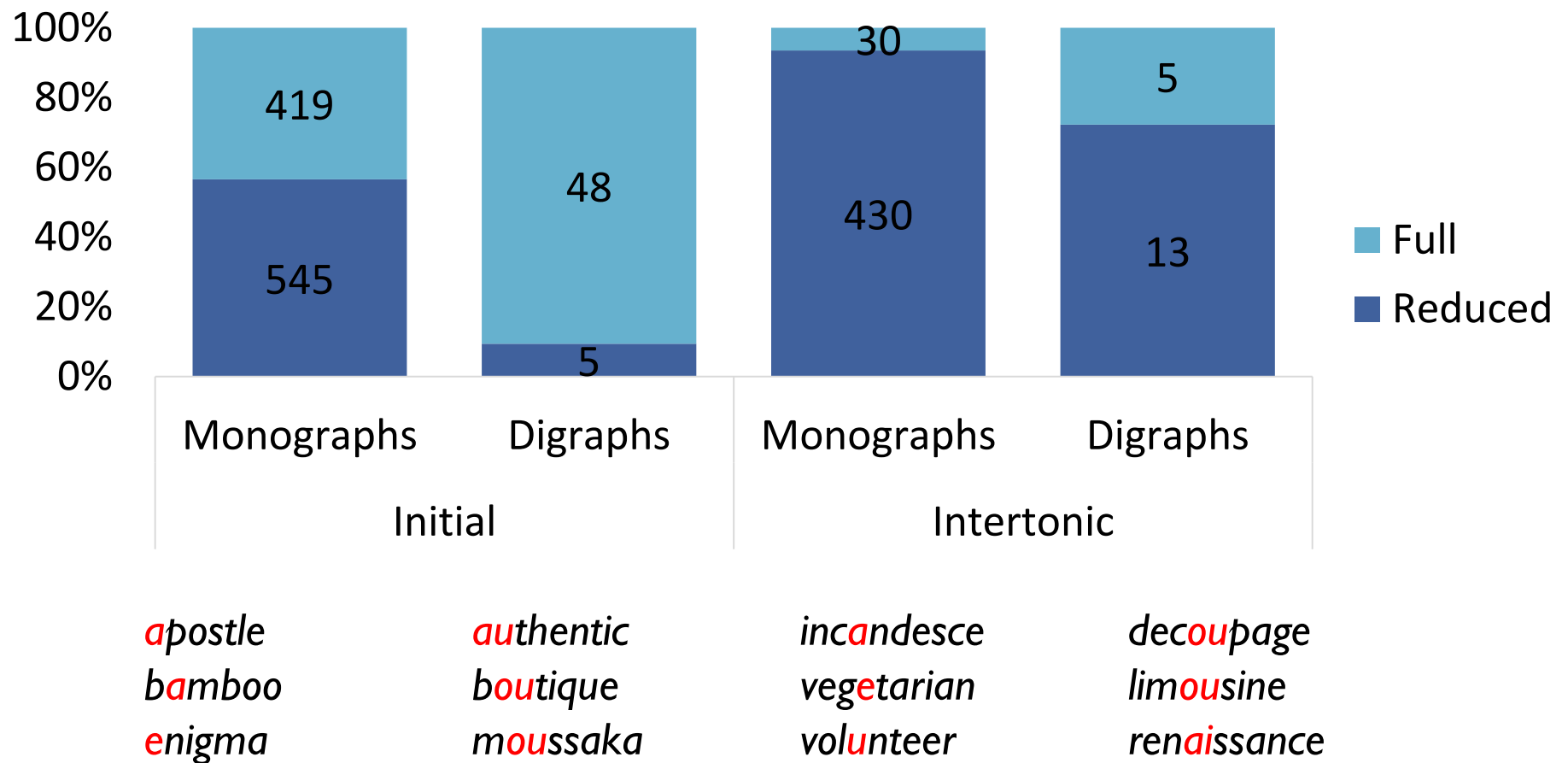
- Initial

	95% C.I.			p-value
	Lower	OR	Higher	
<b>SPELLING-MONO</b>	8.0	19.0	56.1	1.34 e-09
<b>CLOSEDNESS-OPEN</b>	12.2	18.6	29.4	< 2 e-16
<b>LOGFREQUENCY</b>	1.1	1.2	1.3	5.80 e-07

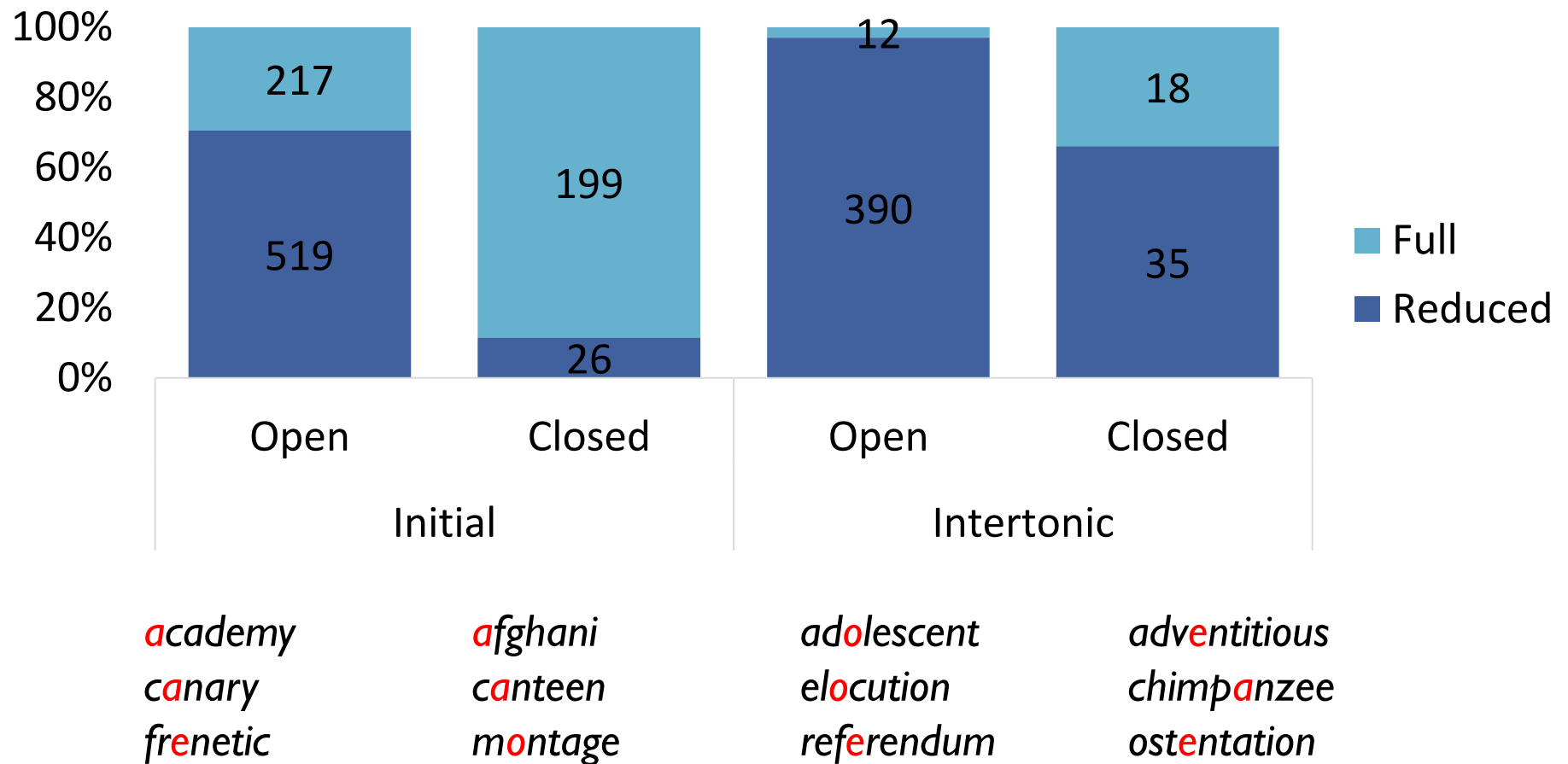
- Intertonic

	95% C.I.			p-value
	Lower	OR	Higher	
<b>SPELLING-MONO</b>	3.1	12.8	28.6	1.55 e-04
<b>CLOSEDNESS-OPEN</b>	5.8	12.3	44.2	2.38 e-10
<b>LOGFREQUENCY</b>	1.1	1.3	1.7	0.011

# THE ROLE OF SPELLING



# CLOSEDNESS OF THE SYLLABLE (MONOGRAPHS ONLY)



# SUMMARY OF RESULTS

- Effect of spelling
- The predictions are verified in the initial position:
  - Almost no reduction in closed syllables
- An effect of the weight of the first syllable would be expected in the intertonic position but is not attested in the data.
- No difference between coronals and non-coronals word-internally
  - Complexity of non-coronals:
    - Horizontal word-finally
    - Vertical word-internally

# CONCLUDING REMARKS

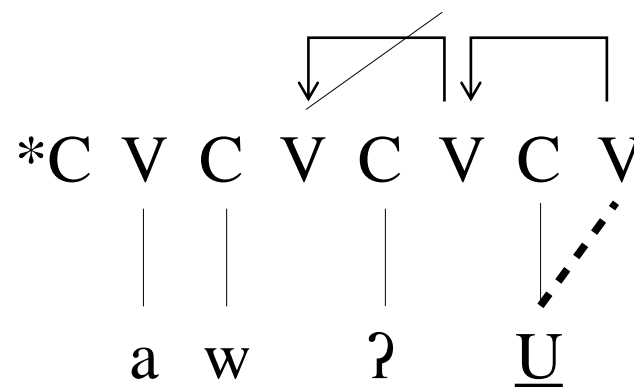
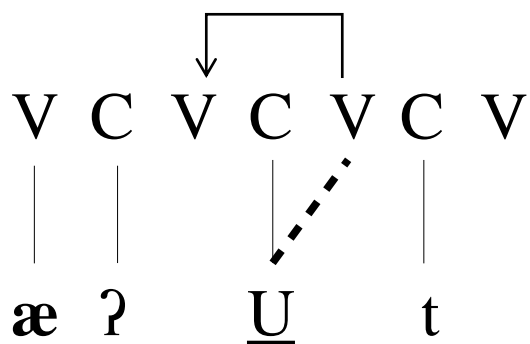
- The Arab Rule can be verified empirically and can be accounted for without feet
- Key proposal: reduction is blocked when the vowel governs and is ungoverned
- Non-coronal obstruents are complex and behave as
  - Monopositional word-internally
  - Bipositional word-finally
- The predictions are borne out word-initially but not in the intertonic position when the first syllable is heavy
- **Future work:** measure the impact of morphology (e.g. prefixation, *condensation* cases), the actual behaviour of coronals, integrate proper names



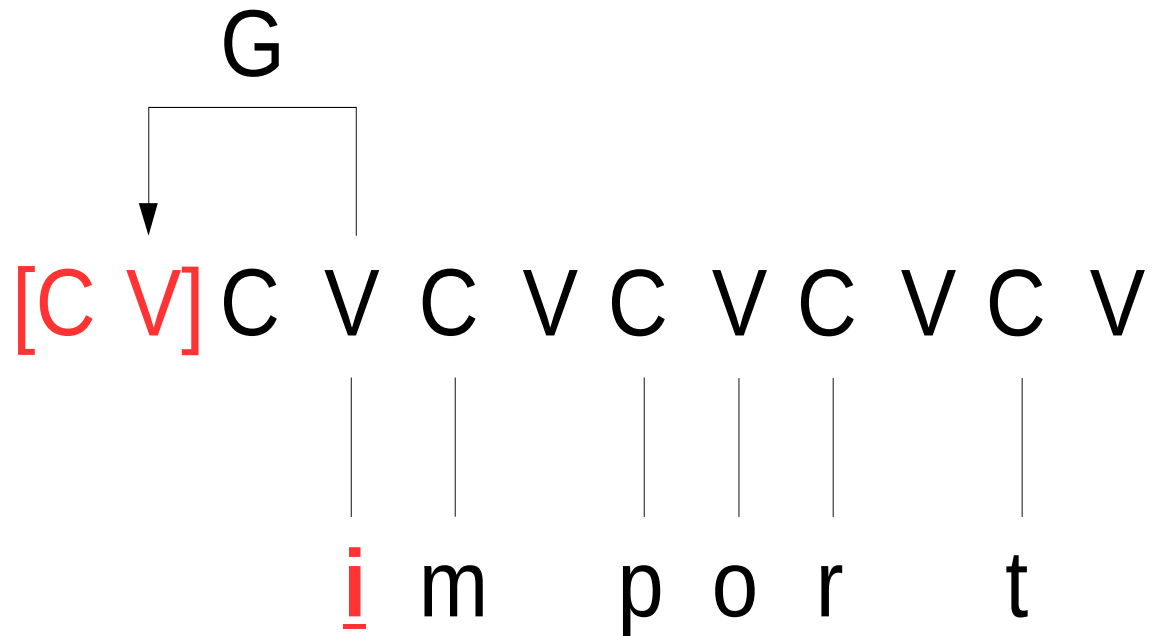
THANK YOU FOR YOUR ATTENTION!



## REPRESENTATION OF NON-CORONALS



# STRESS WITHOUT FEET?





# STRESS WITHOUT FEET?

[C V] C V C V C V C V C V [C V] C V C V C V C V  
| | | | | | |  
i m p o r t e j ʃ ə n

[C V] C V C V C V C V C V [C V]  
| | | | | | |  
i m p o r t

# [PARALLEL ISSUE]

## PROPOSITION

- [p, k] are clusters /ʔU, ʔU/
  - They can be realized as [ʔp, ʔk]
  - They cannot cooccur with /aw, ɔj/

• **awt#** : out, about, ablaut, devout, doubt, drought, flout...

• **awd#** : cloud, crowd, shroud, loud, proud...

• **ojt#** : adroit, coit, dacoit, doit, exploit, entroit, quoit...

• **ojd#** : avoid, android, void, adenoid, alkaloid...

• \*awp#, \*awb#, \*awk#, \*awg#...

• \*ojp#, \*ojb#, \*ojk#, \*ojg#...

