

# Differential Substitution: A Contrastive Hierarchy Account

Multilingual Theories and Practices

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# Differential Substitution

- L1 Japanese speakers tend to substitute [s] for L2 English /θ/
- L1 Russian speakers tend to substitute [t] for L2 English /θ/
- Term coined in Weinberger (1997) though the concept goes back to (at least) Weinreich (1953)

These are both production and perception effects.

- L1 European French tends to substitute [s] for L2 English /θ/
- L1 Quebec French tends to substitute [t] for L2 English /θ/
- Consonant inventories are the same (Picard, 2002)
- Why the differential substitution?

- Traditional approaches:

“learners substitute the closest sound in their L1 inventory”

- But how do we define/measure ‘closest’?

# Many Have Tried.....

- SLM (Flege, 1995; Flege & Bohn, 2021)
- PAM-L2 (Best & Tyler, 2007)
- But why is Russian [t] more similar to /θ/ than Japanese [t] is?

- We need to invoke more than physics, we need a *grammar*
- Differential substitution affects *inventories* not just local comparisons
- Differential substitution affects both production and perception

# Previous Phonological Accounts

- Brown (2000), Brannen (2002), Teasdale (1997), Hancin-Bhatt (1994), Weinberger (1997), Smith (1997), Picard (2002)
- With some variation, most of these were adopting a local, feature-geometric type of comparison between segments in different languages
- No one was able to predict and explain the cross-linguistic patterns

# Lombardi (2003)

- A more systems-based approach
- [t]-substitution languages have a high-ranked Markedness constraint
- [s]-substitution languages have a high-ranked Faithfulness constraint
- Unclear why this account should affect perception as well as production (assuming Richness of the Base)



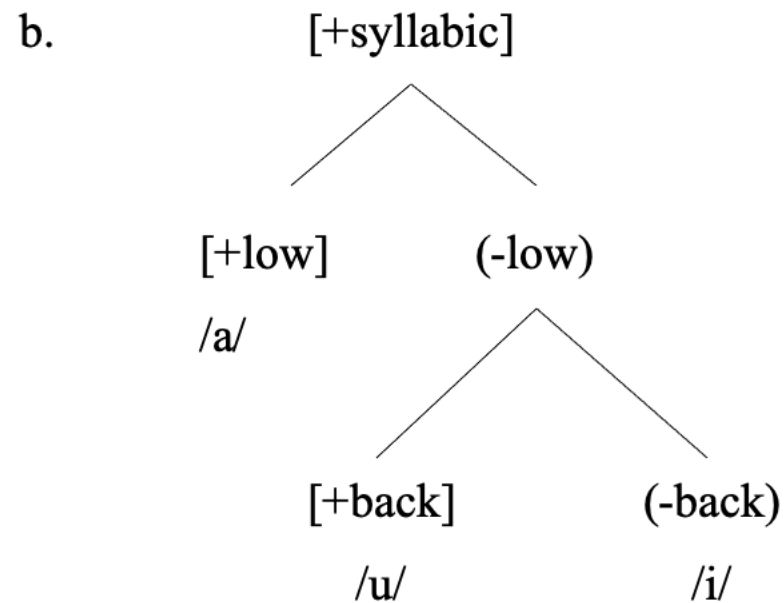
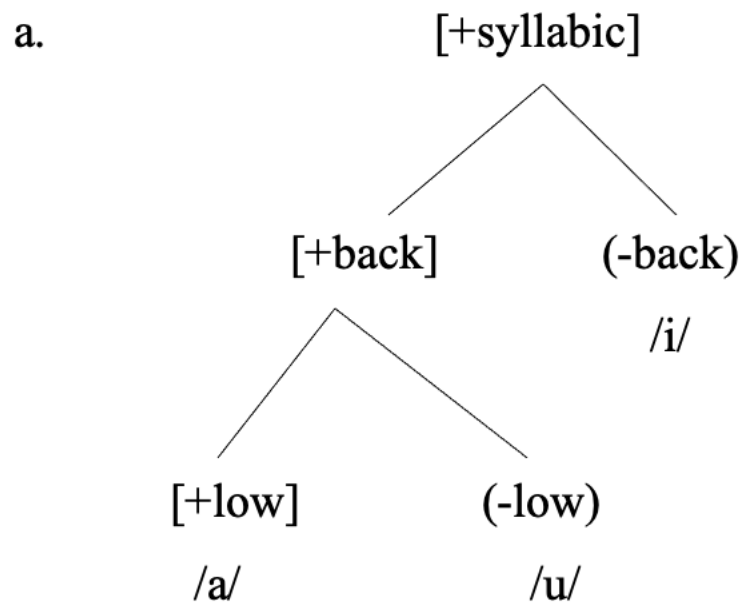
# Kwon (2021)

- Not explicitly about differential substitution but more on perceptual similarity
- Yet invokes Lahiri & Reetz's (2002, 2010) Featurally-Underspecified Lexicon (FUL) model combined with Drescher's (2009) Contrastive Hierarchy model

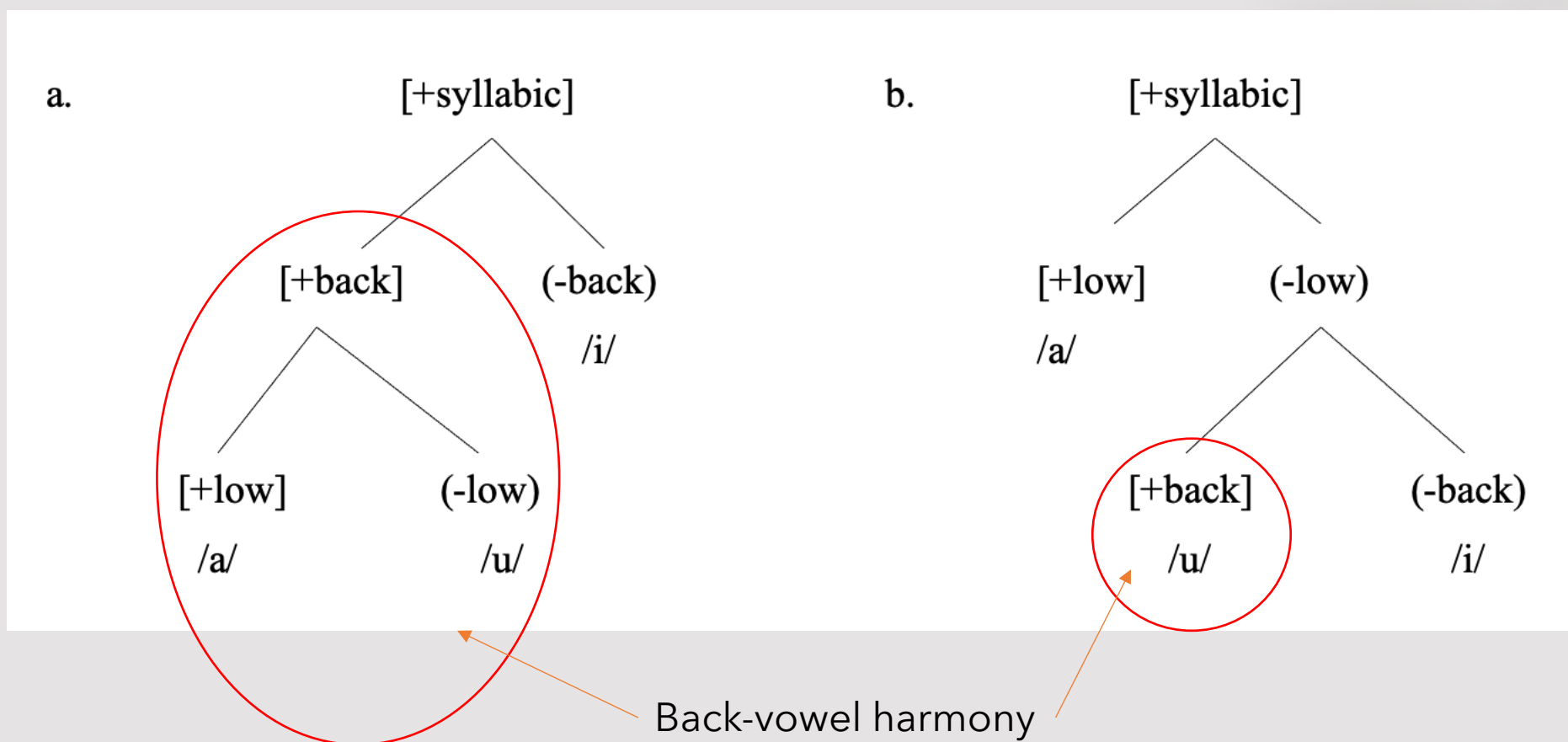
# Contrastive Hierarchy Theory

- Dresher (2009); Hall (2011, 2017); Chandlee (2023); Archibald (2022ab)
- A theory of hierarchically-ranked contrastive specification

# Two 3-Vowel Systems Example



# Two 3-Vowel Systems Example



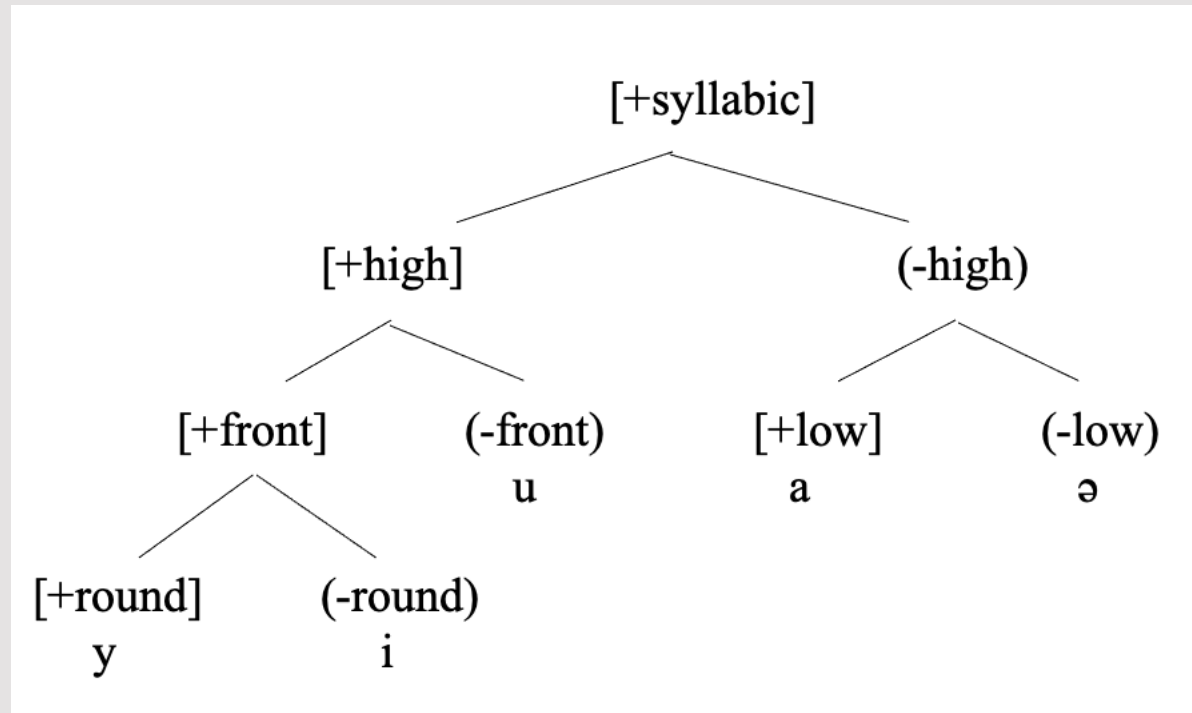
<b>Variability of Feature Ordering</b>	Contrastive feature hierarchies are language particular.
<b>The Contrastivist Hypothesis</b>	The phonological component of a language L operates only on those features which are necessary to distinguish the phonemes of L from one another.
<b>Feature <i>Activity</i></b>	A feature can be said to be active if it plays a role in the phonological computation; that is, if it is required for the expression of phonological regularities in a language, <i>including both static phonotactic patterns and patterns of alternation</i>
<b>Phonological primes</b>	Features are binary; every feature has a marked value, designated [+F], and an unmarked value, designated (-F).

# Phonological Parsing

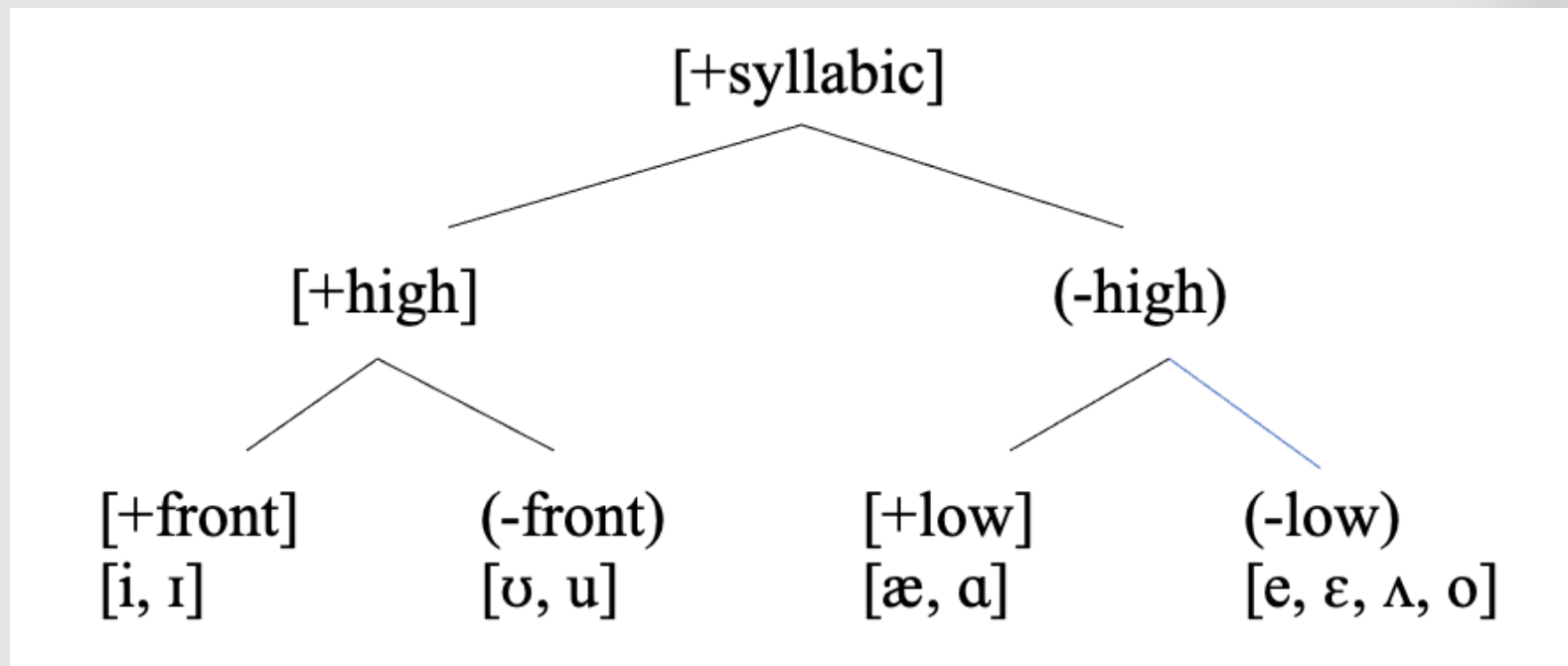
- The L1 CH uniquely identifies and represents each phoneme
- The L1 CH may not be able to disambiguate all of the L2 input; some sounds may be parsed ambiguously

# From Archibald (in press)

- Here's an example from the Mandarin vowel hierarchy (Wu, 2021):

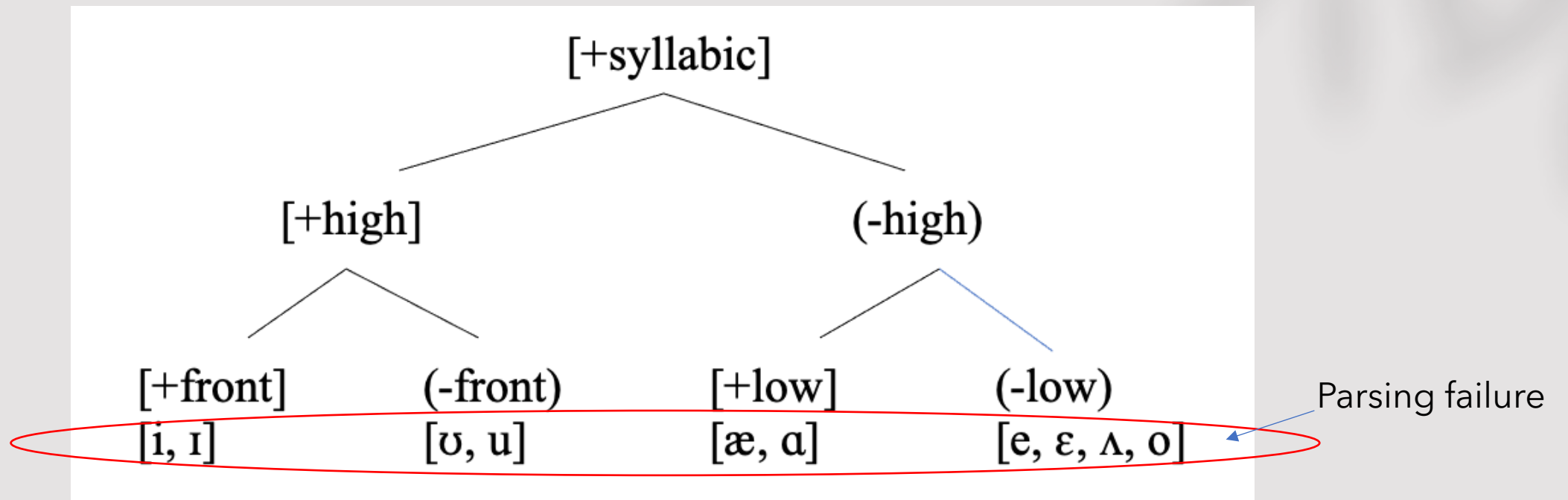


- How would this L1 CH parse the L2 English vowels?

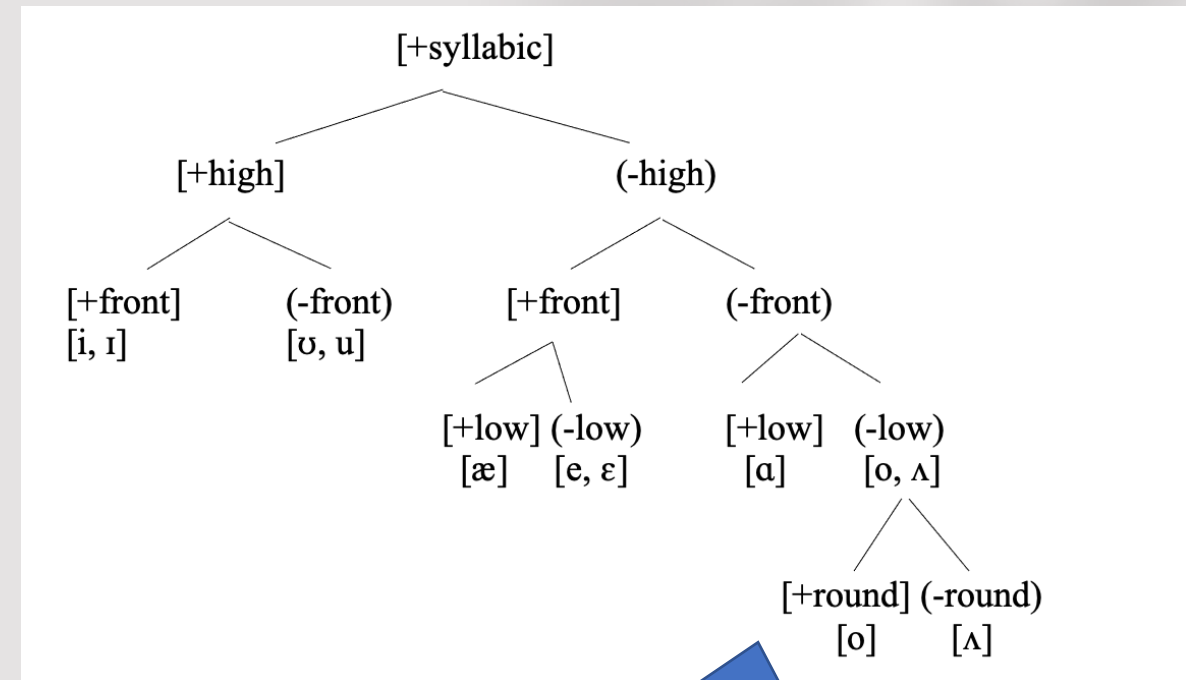
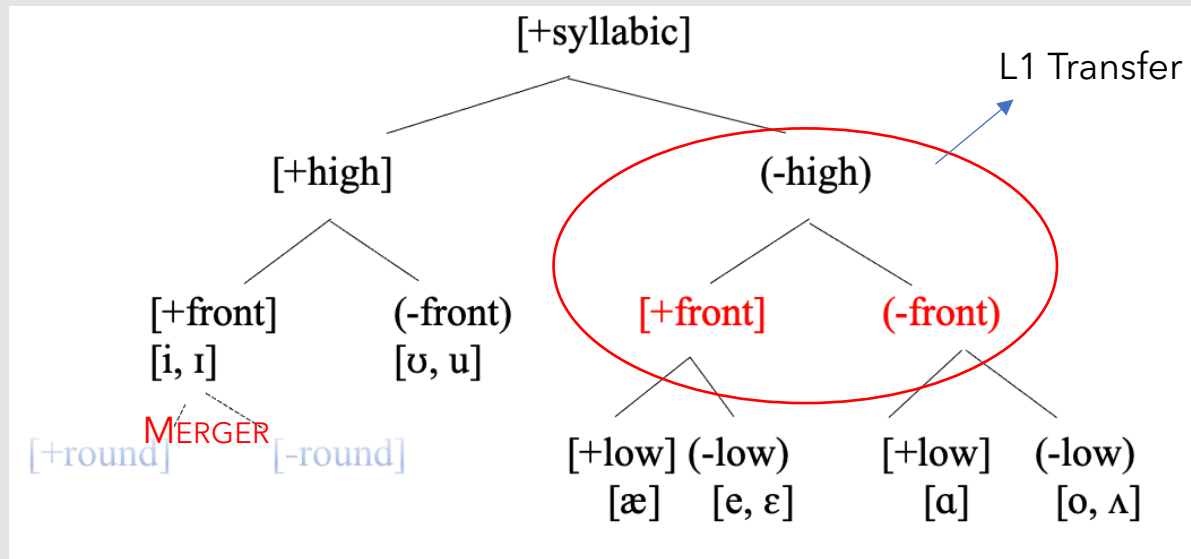




- How would this L1 CH parse the L2 English vowels?



# An Incremental Learning Path

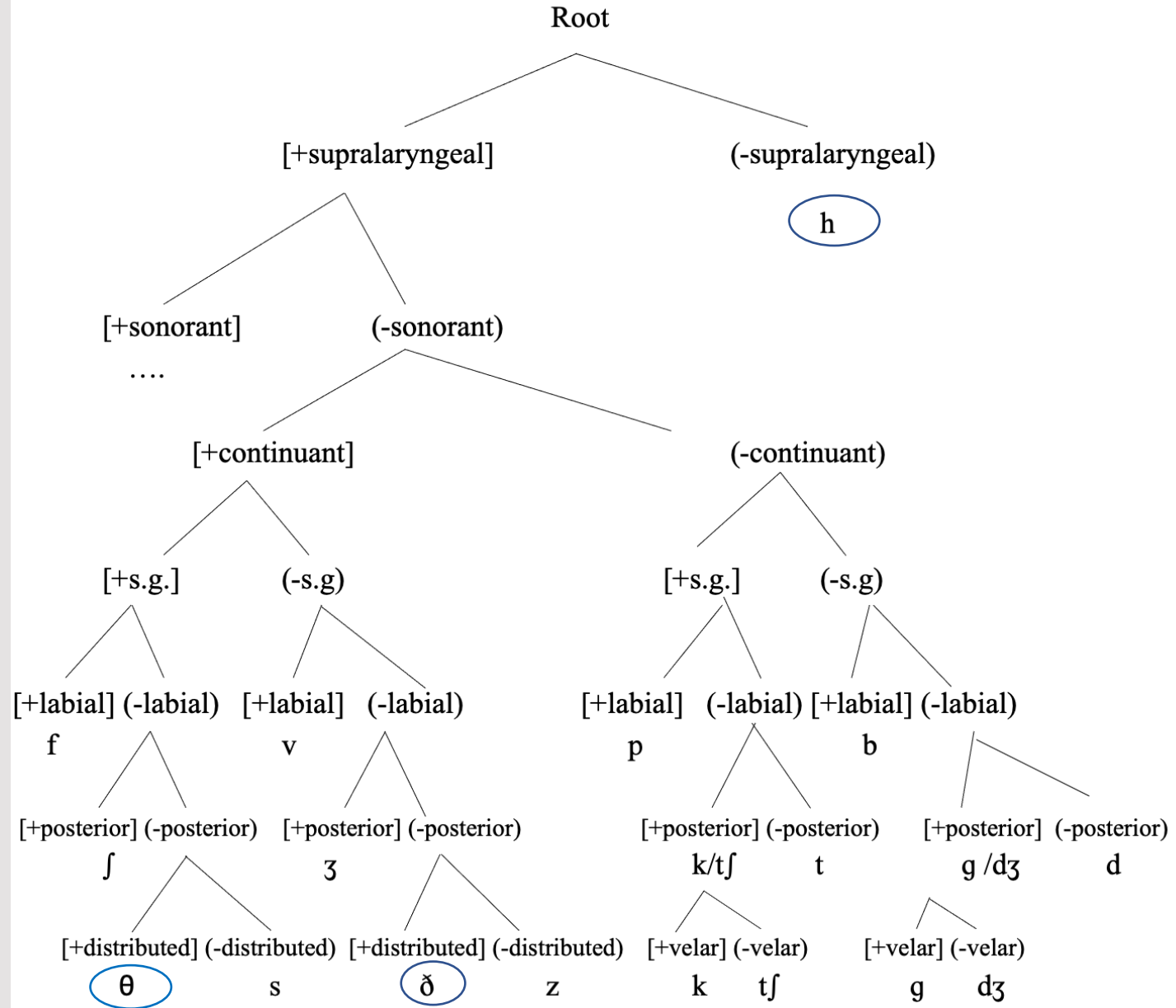


redeployment

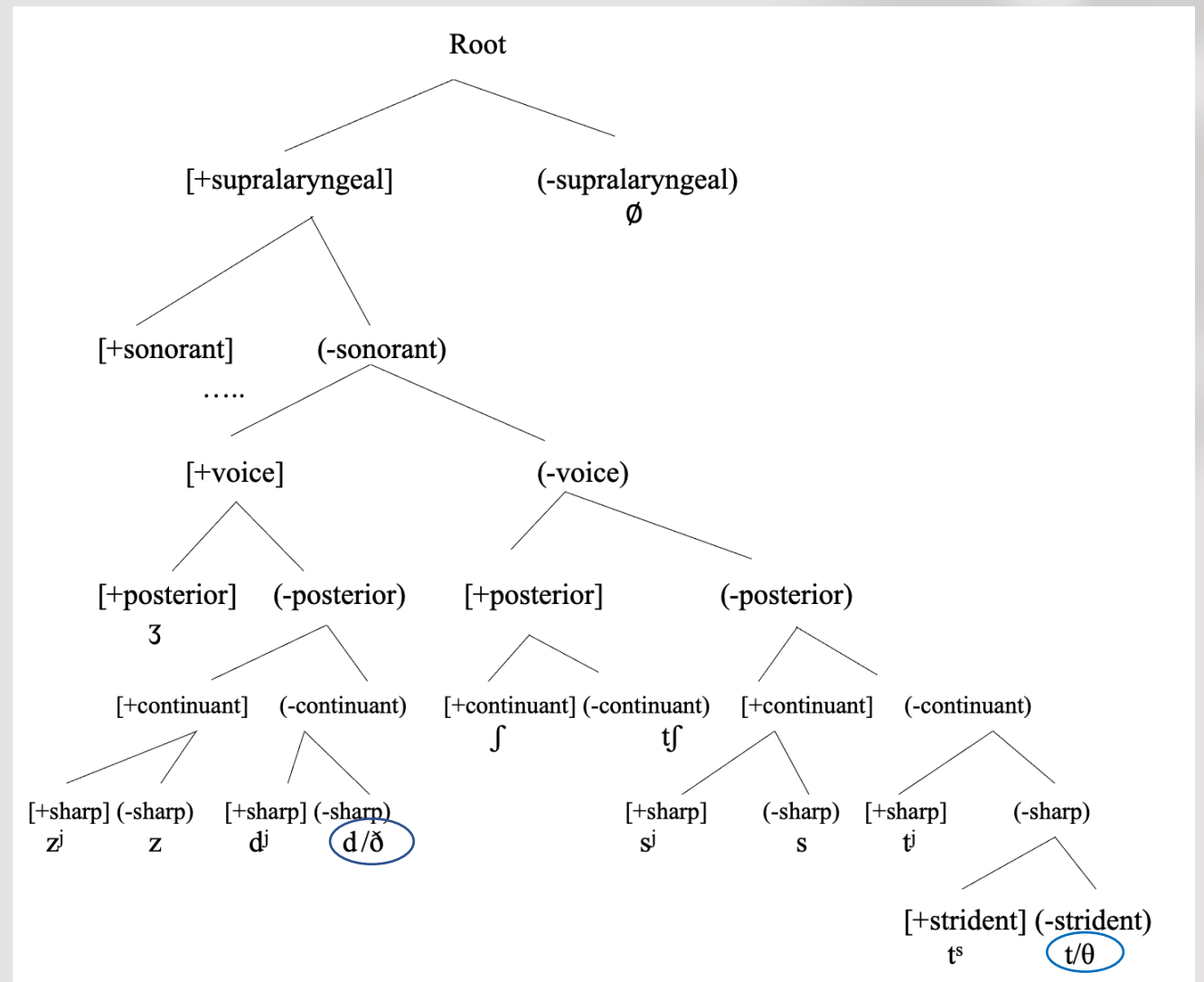
# Differential Substitution

- I will argue that differential substitution results from the parsing of the L2 input via the L1 contrastive hierarchy (similar to loanword phonology (Herd, 2005))

# English



# Russian /θ/ → [t]



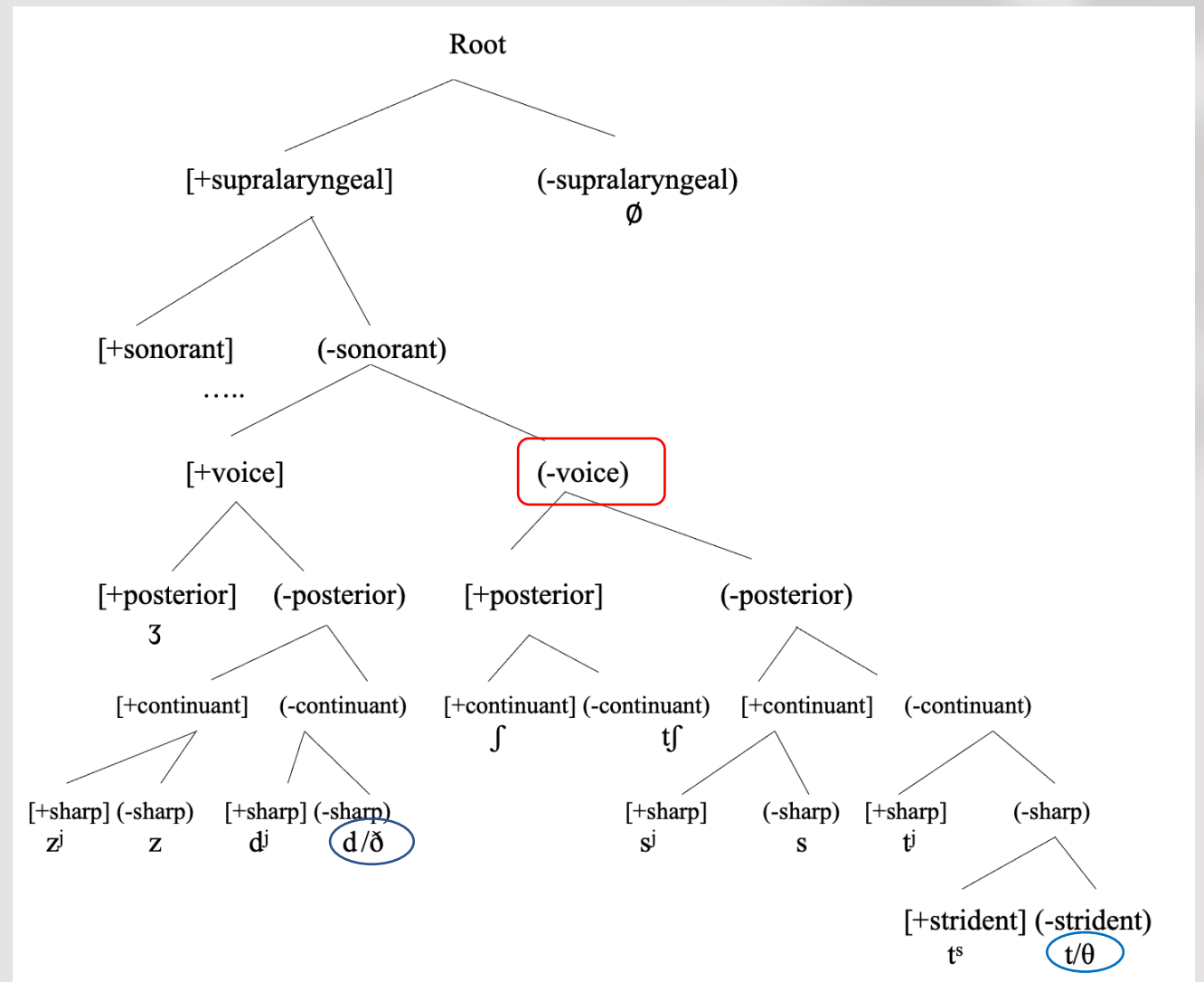
Based on Dresher & Hall, (2020)

# Russian Activity Check

- [voice]: assimilation
- [sharp]: palatalization

Dresher & Hall (2022); Halle, (1959)

# Russian /θ/ → [t]

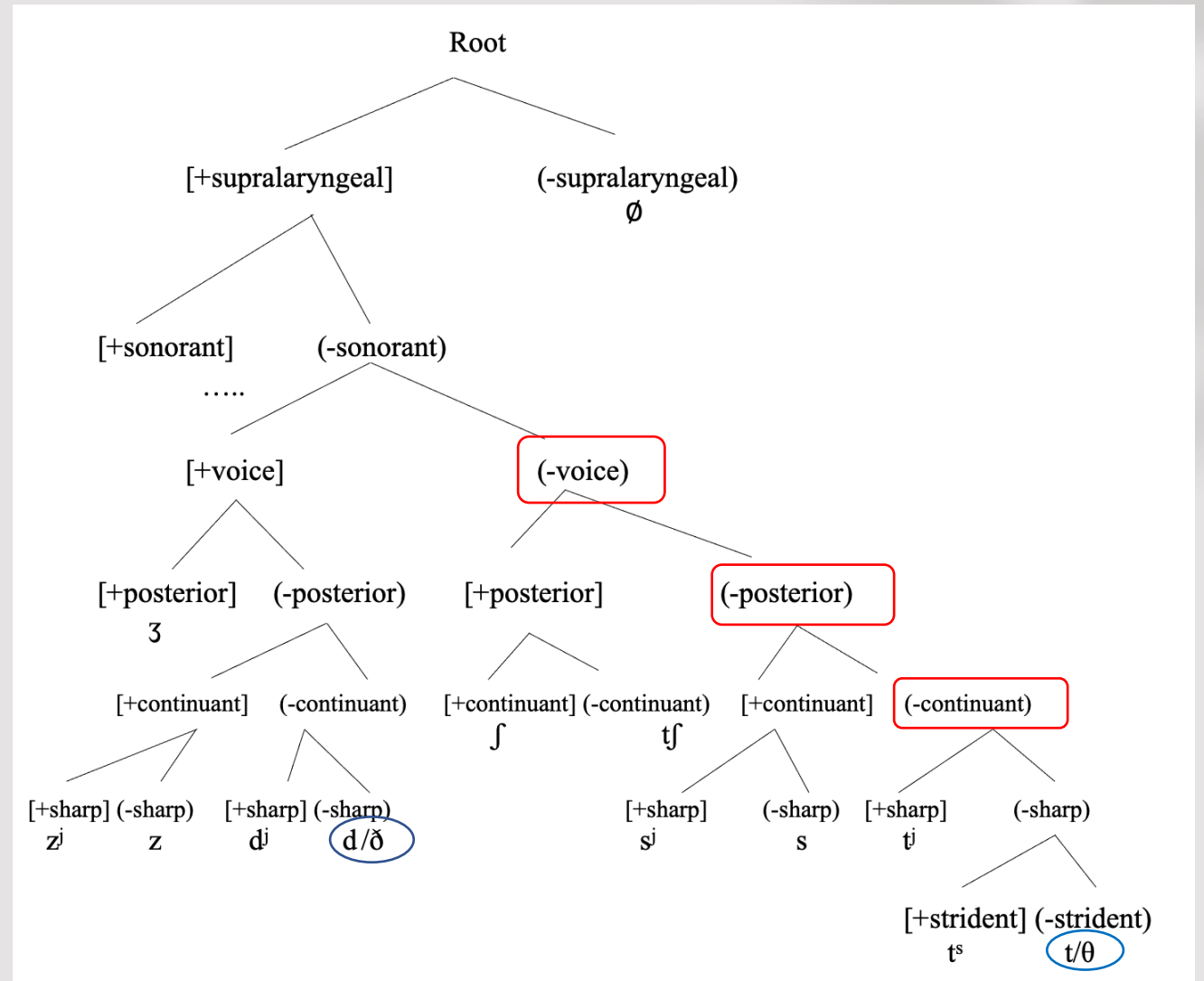


Based on Dresher & Hall, (2020)



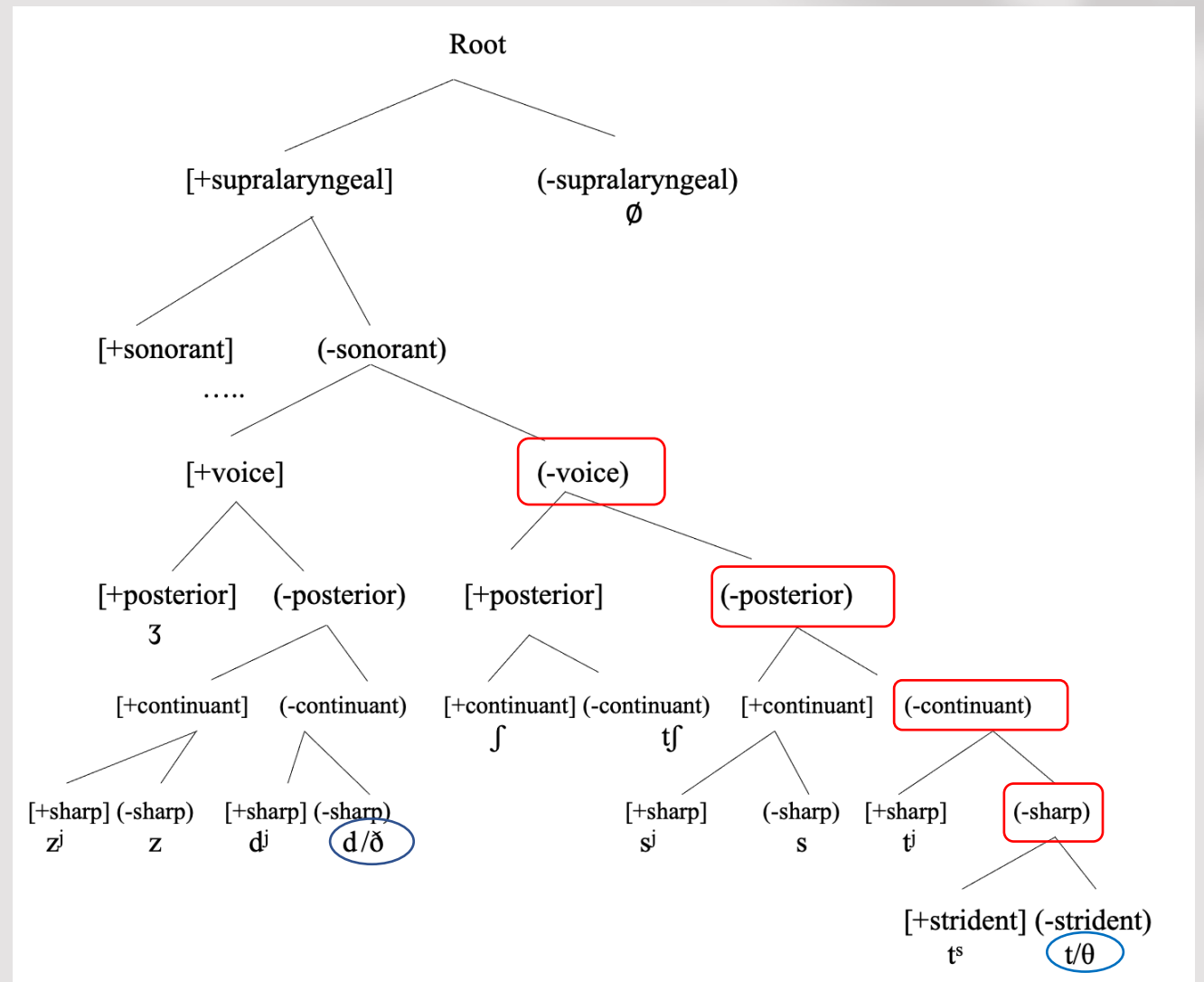


Russian /θ/ → [t]



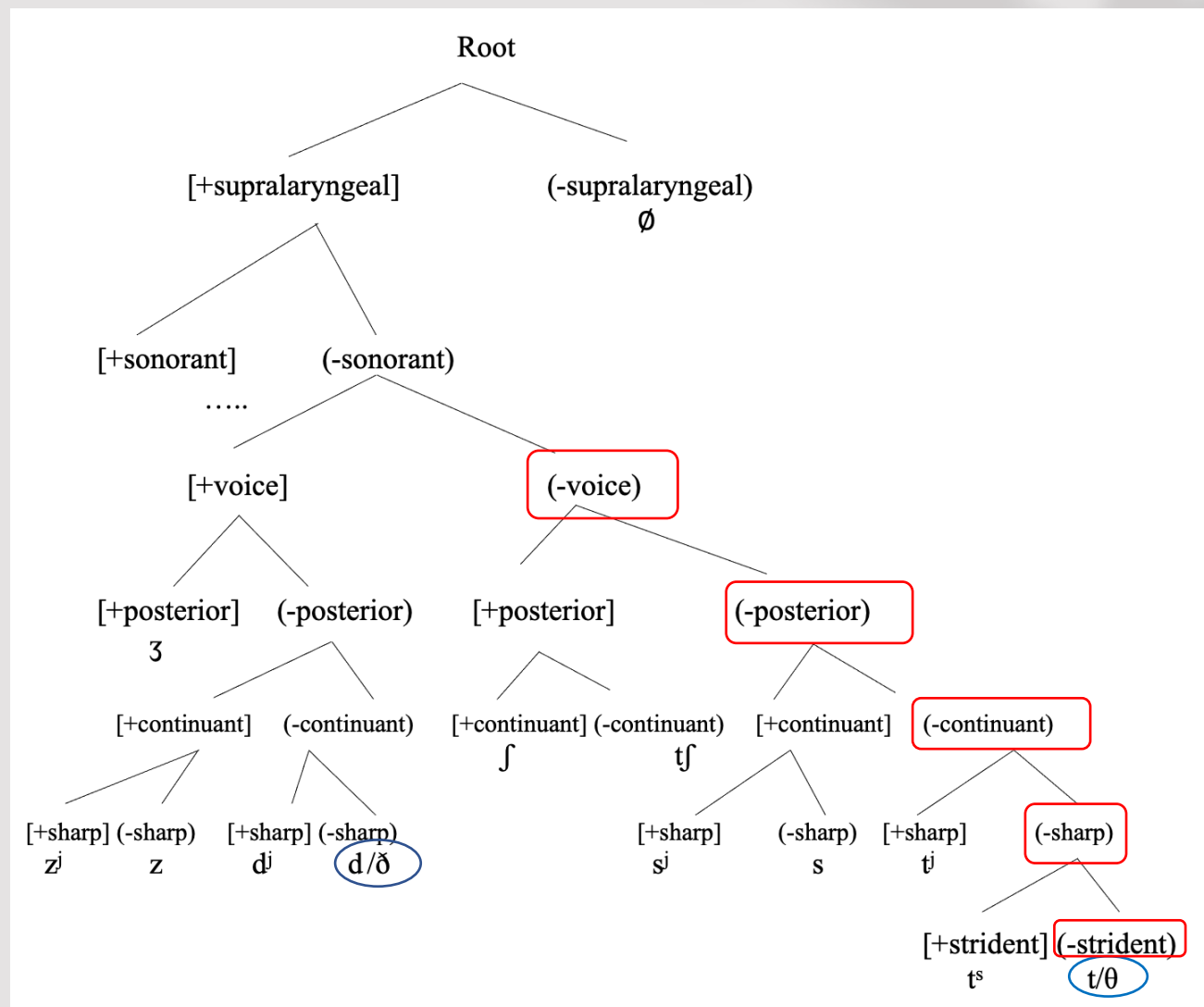
Based on Dresher & Hall, (2020)

# Russian /θ/ → [t]



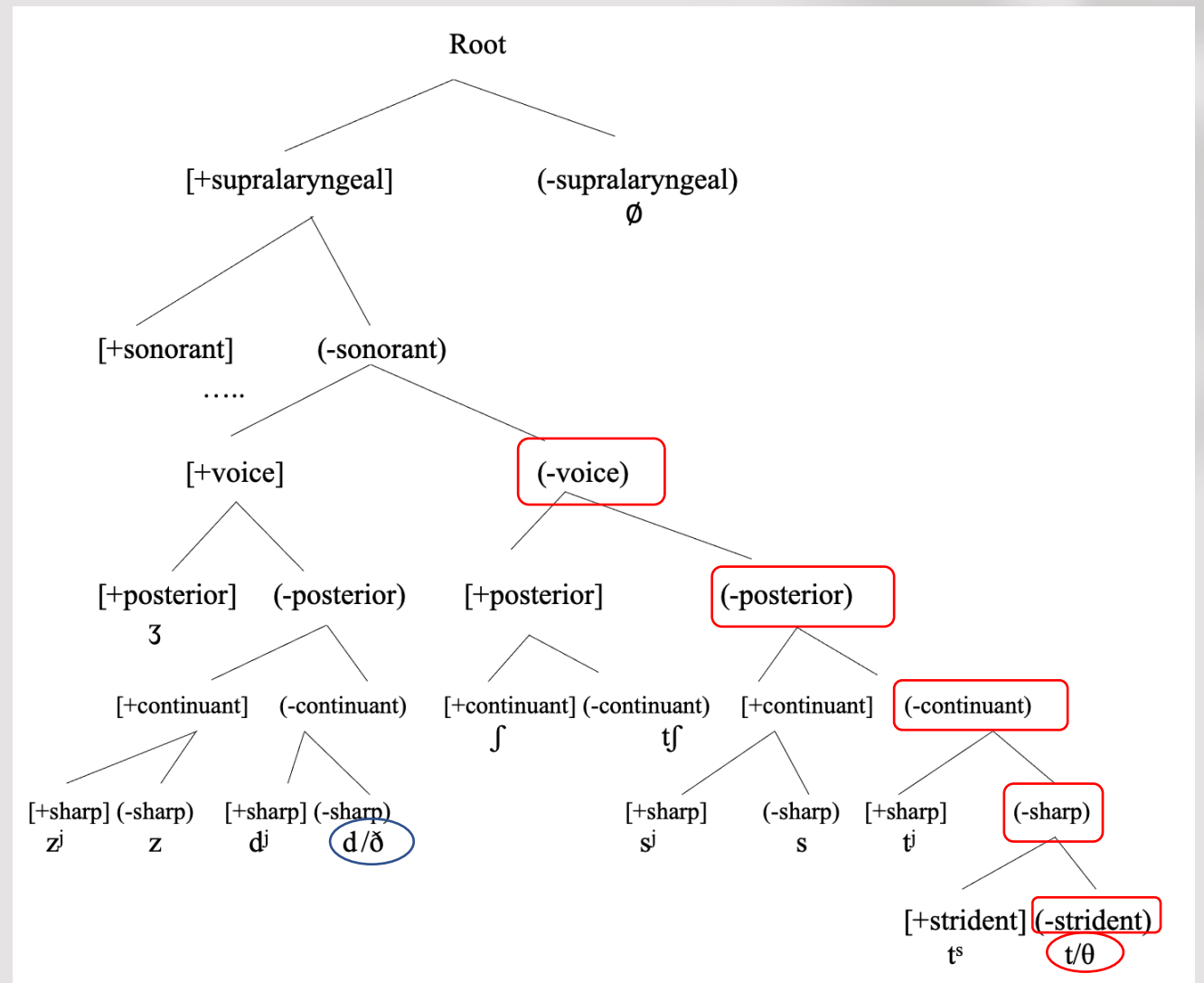
Based on Dresher & Hall, (2020)

# Russian /θ/ → [t]



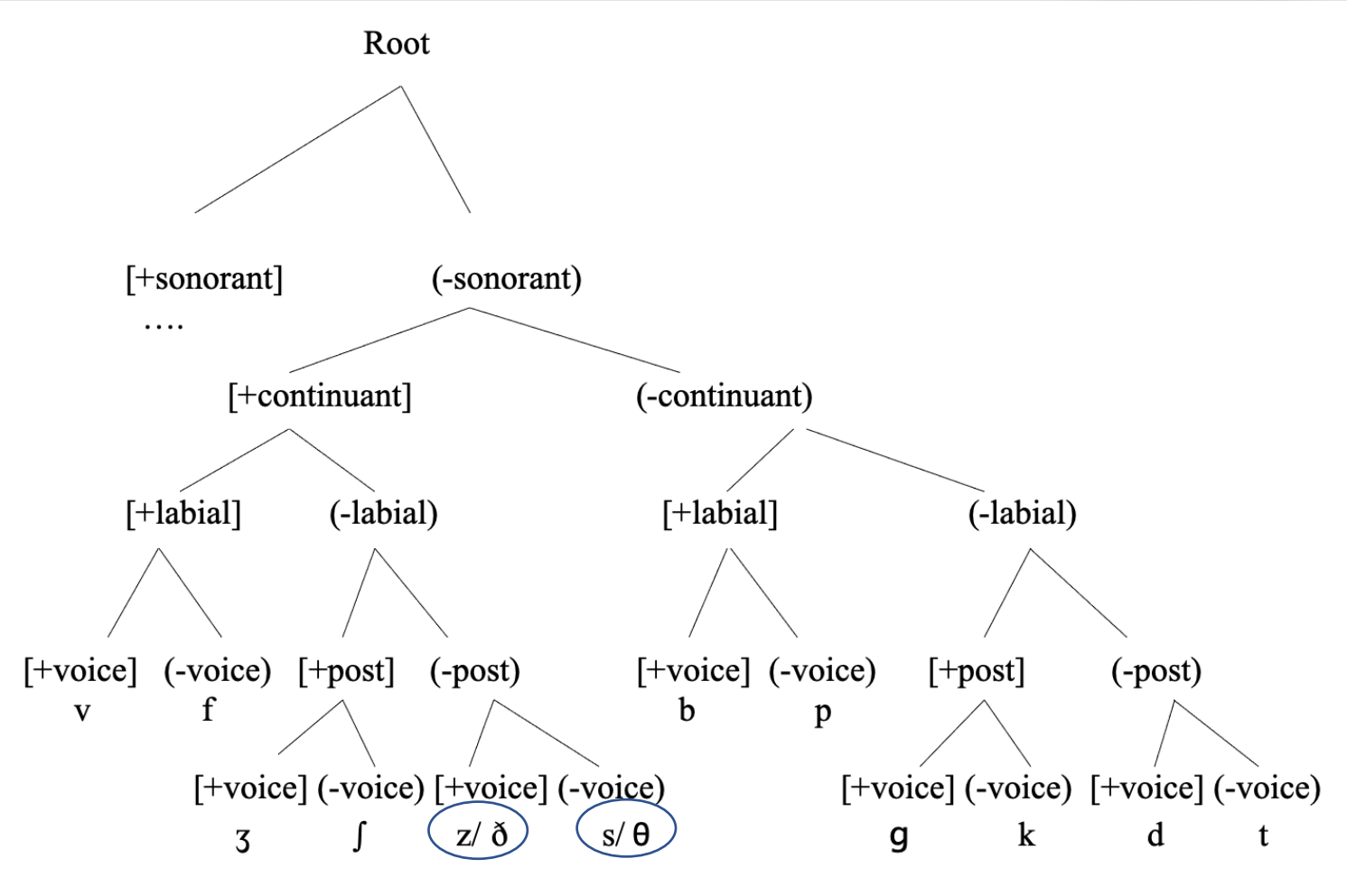
Based on Dresher & Hall, (2020)

Russian /θ/ → [t]



Based on Dresher & Hall, (2020)

# European French /θ/ → [s]



Based on Walker, (1984)

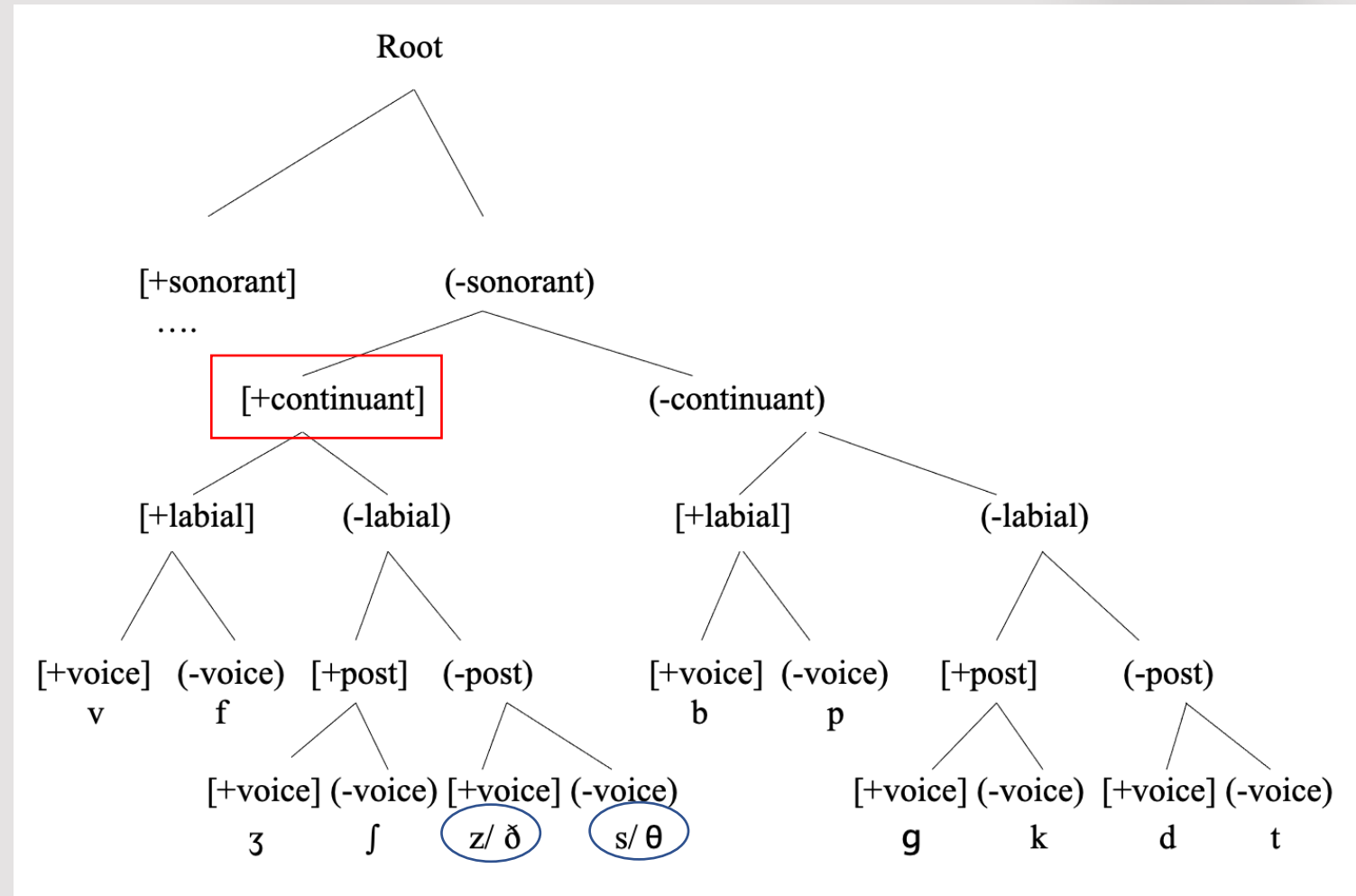
# European French Activity Check

- [posterior]: /s/ → [ʃ] (Kohler, 2002; Bertrand, Blache & Espesseer, 2007)
- [voice]: assimilation
- [continuant]: lack of intervocalic lenition (Colantoni, Kochetov & Steele, 2023) compared to QF. Specified features have high scope.

# EF Loanword Phonology

English Source	EF Repair	QF Repair
jockey [dʒɑki]	[ʒɔkɛ]	[dʒɔke]
chips [tʃɪps]	[ʃɪps]	[tʃɪps]
jamboree [dʒæmbəri]	[ʒãmbɔre]	[dʒambəri]

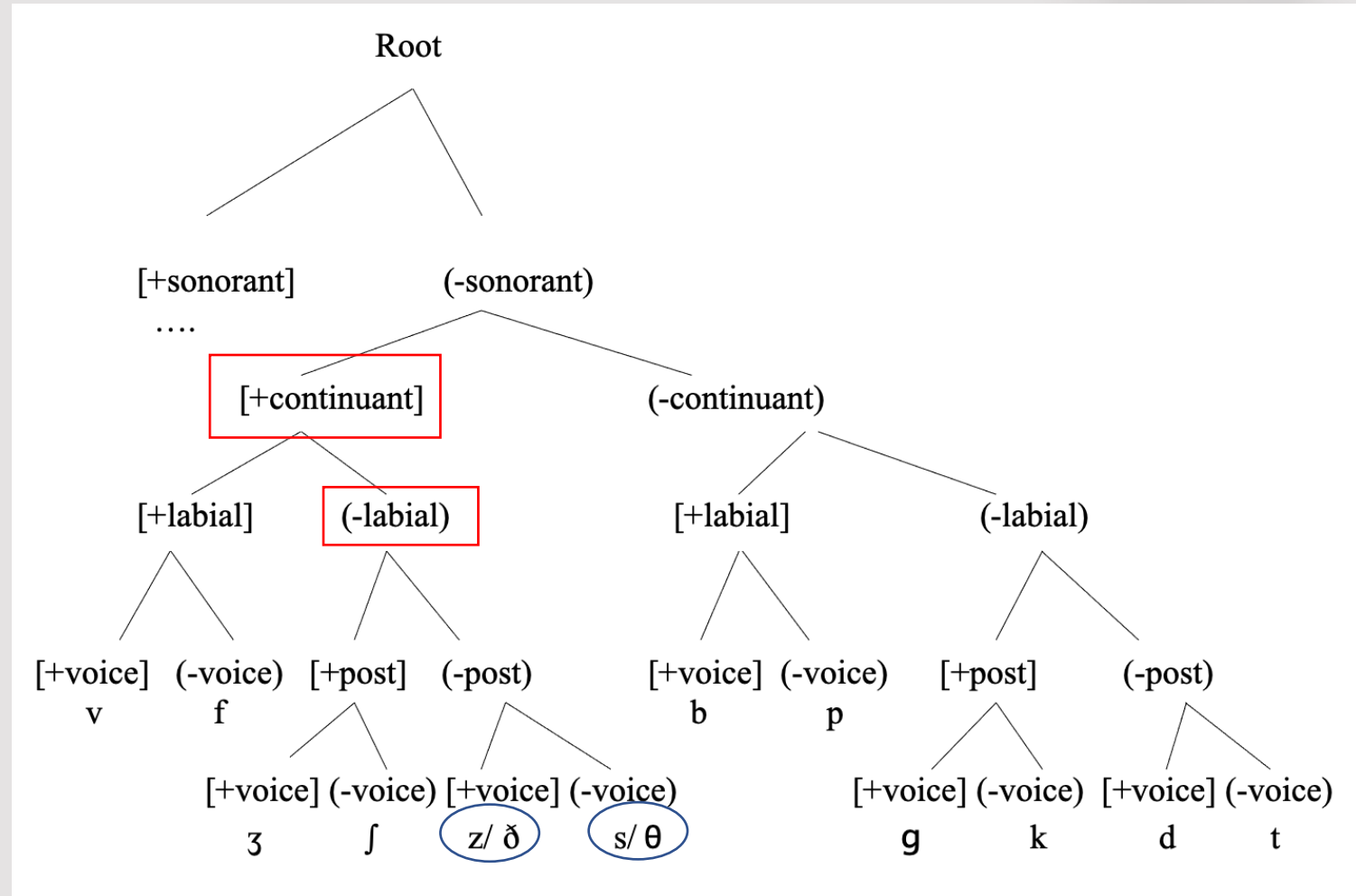
# European French /θ/ → [s]



Based on Walker, (1984)

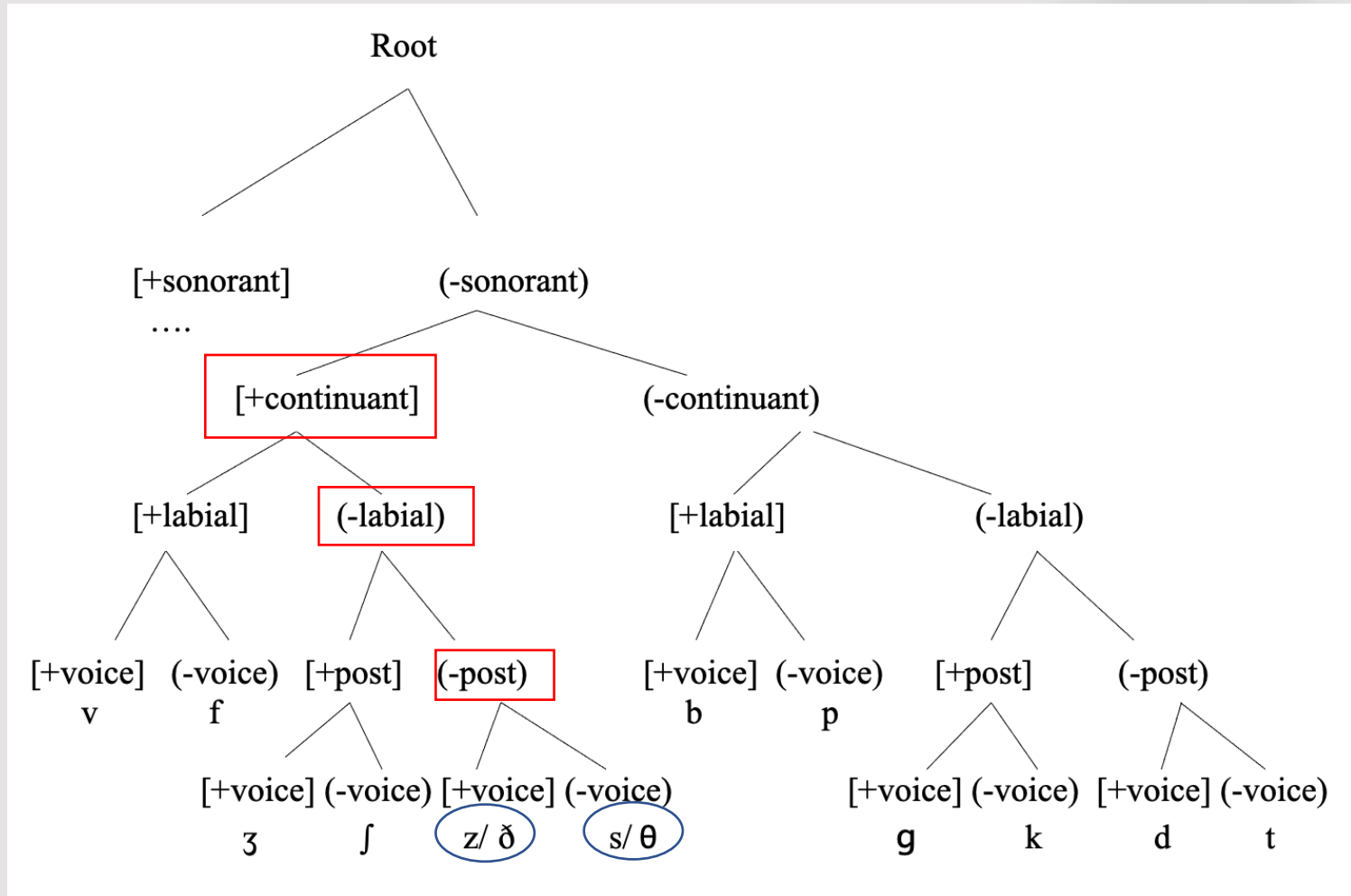


# European French /θ/ → [s]



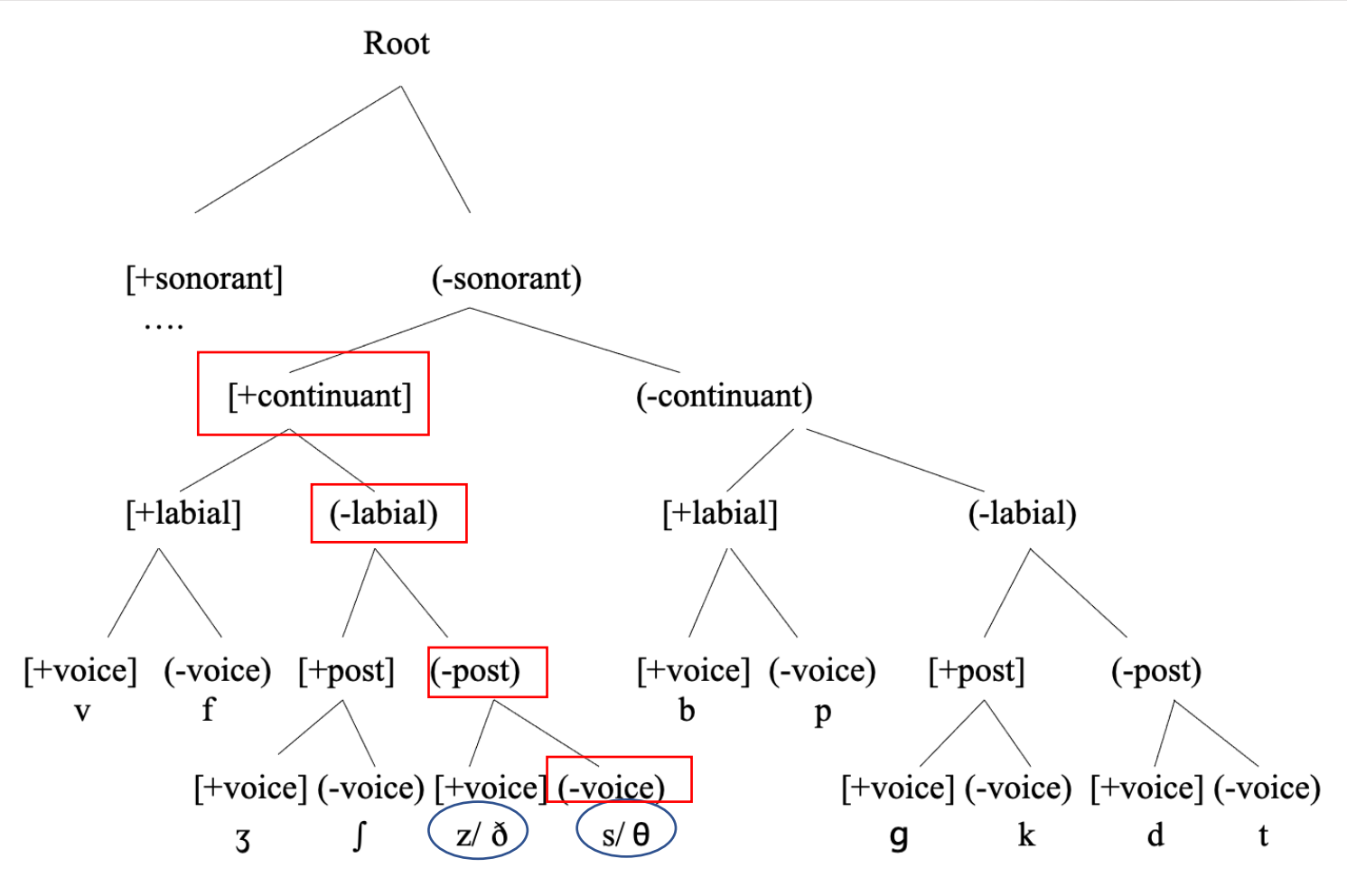
Based on Walker, (1984)

# European French /θ/ → [s]



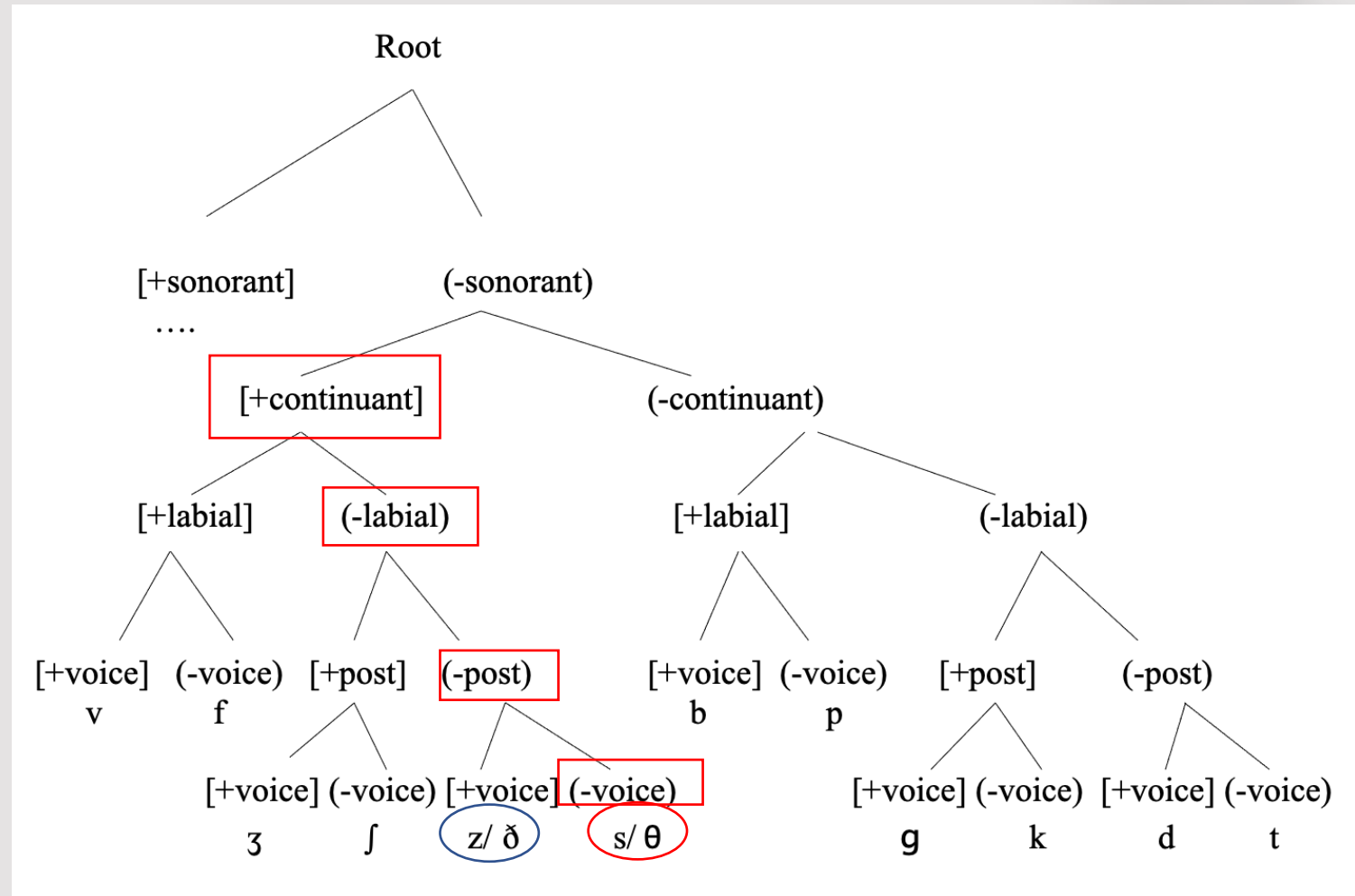
Based on Walker, (1984)

# European French /θ/ → [s]



Based on Walker, (1984)

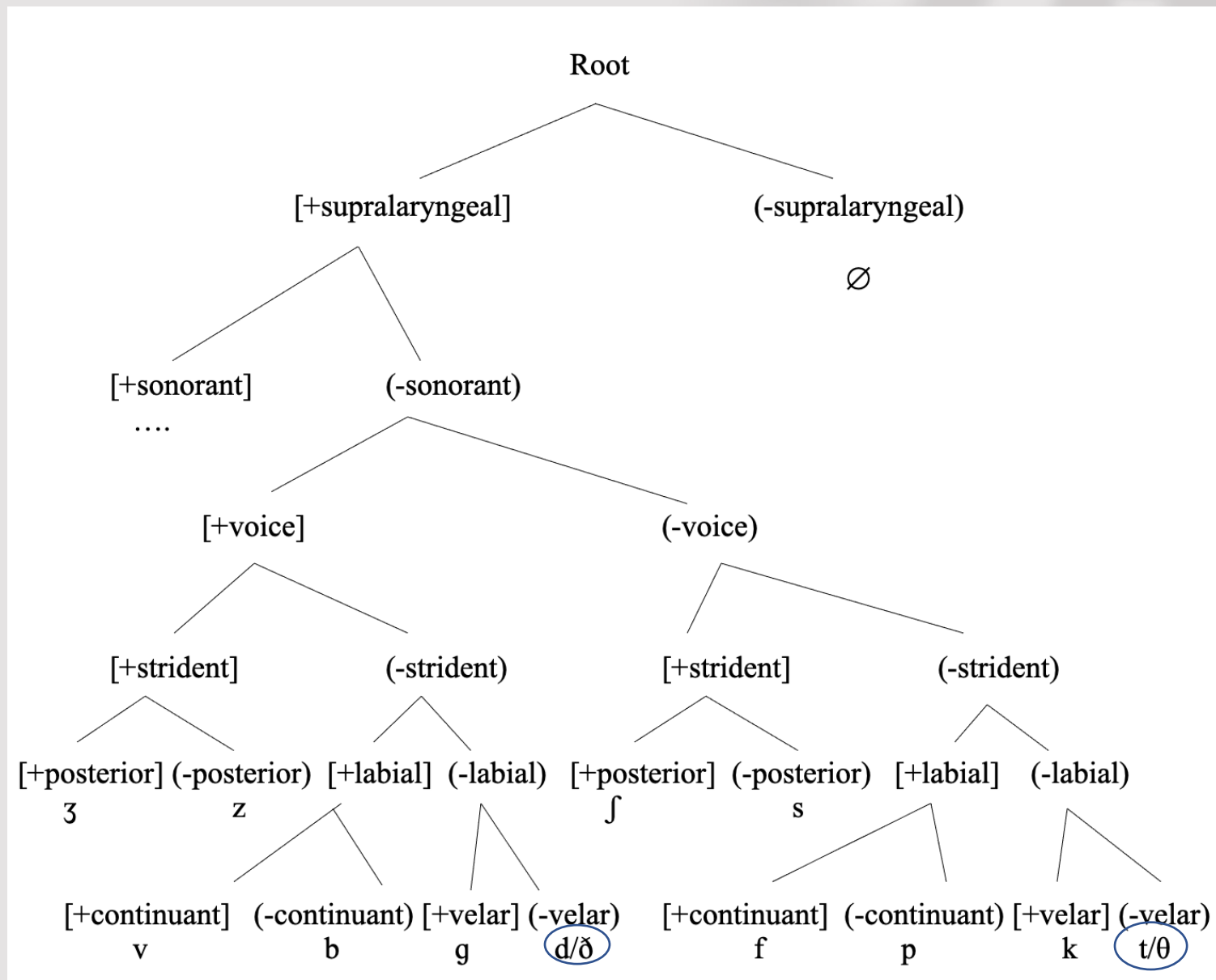
# European French /θ/ → [s]



Based on Walker, (1984)

# Quebec French

/θ/ → [t]

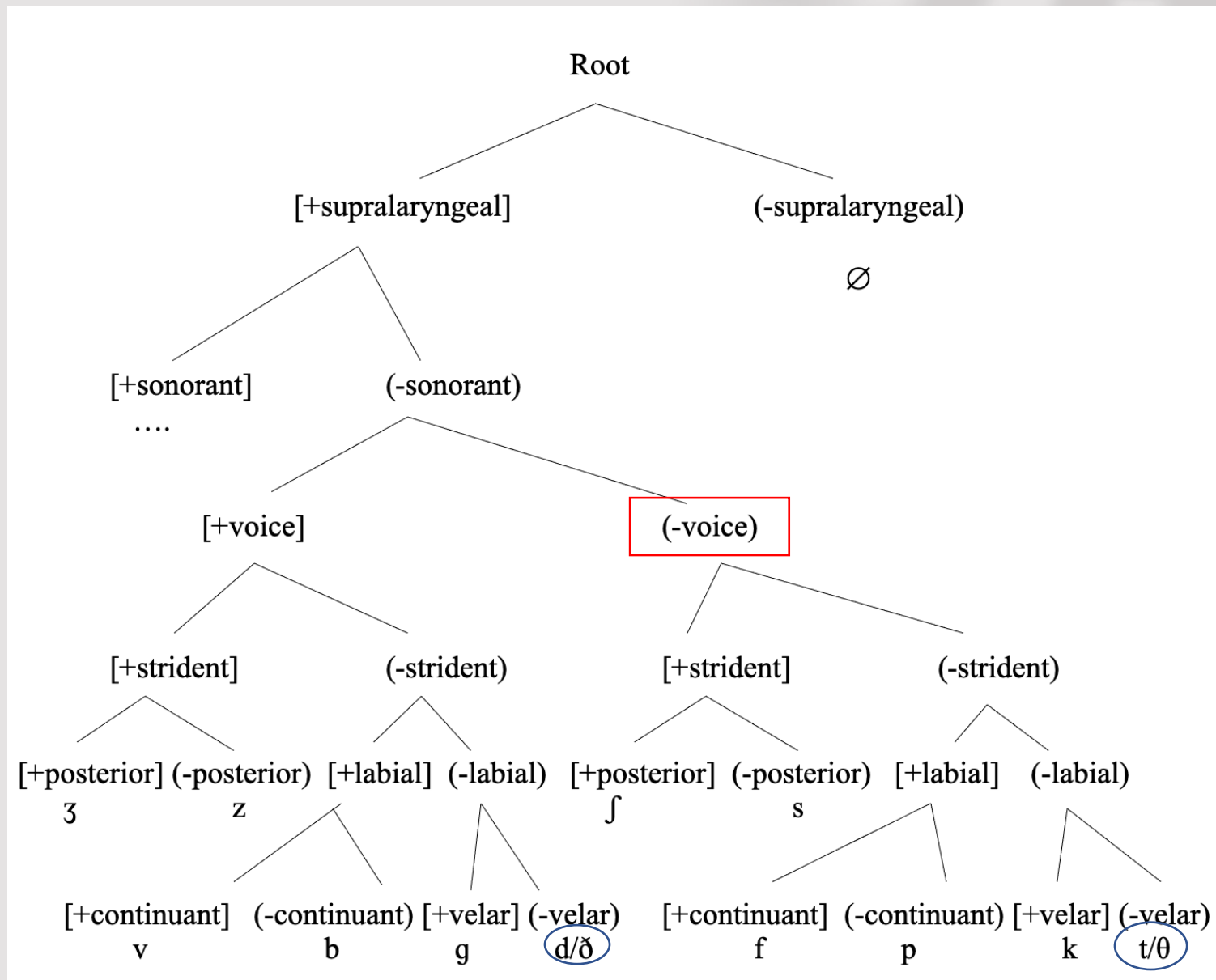


# Quebec French Activity Check

- [strident]: assibilation
  - /t/ → [t<sup>s</sup>]; /d/ → [d<sup>z</sup>]
  - mellowing (Walker, 1984)
- [posterior]: mellowing (targeting /ʒ/ & /ʃ/)
- [continuant]: unspecified for non-labials. This unmarked value leads to greater variation including intervocalic lenition. Greater lenition in QF compared to EF

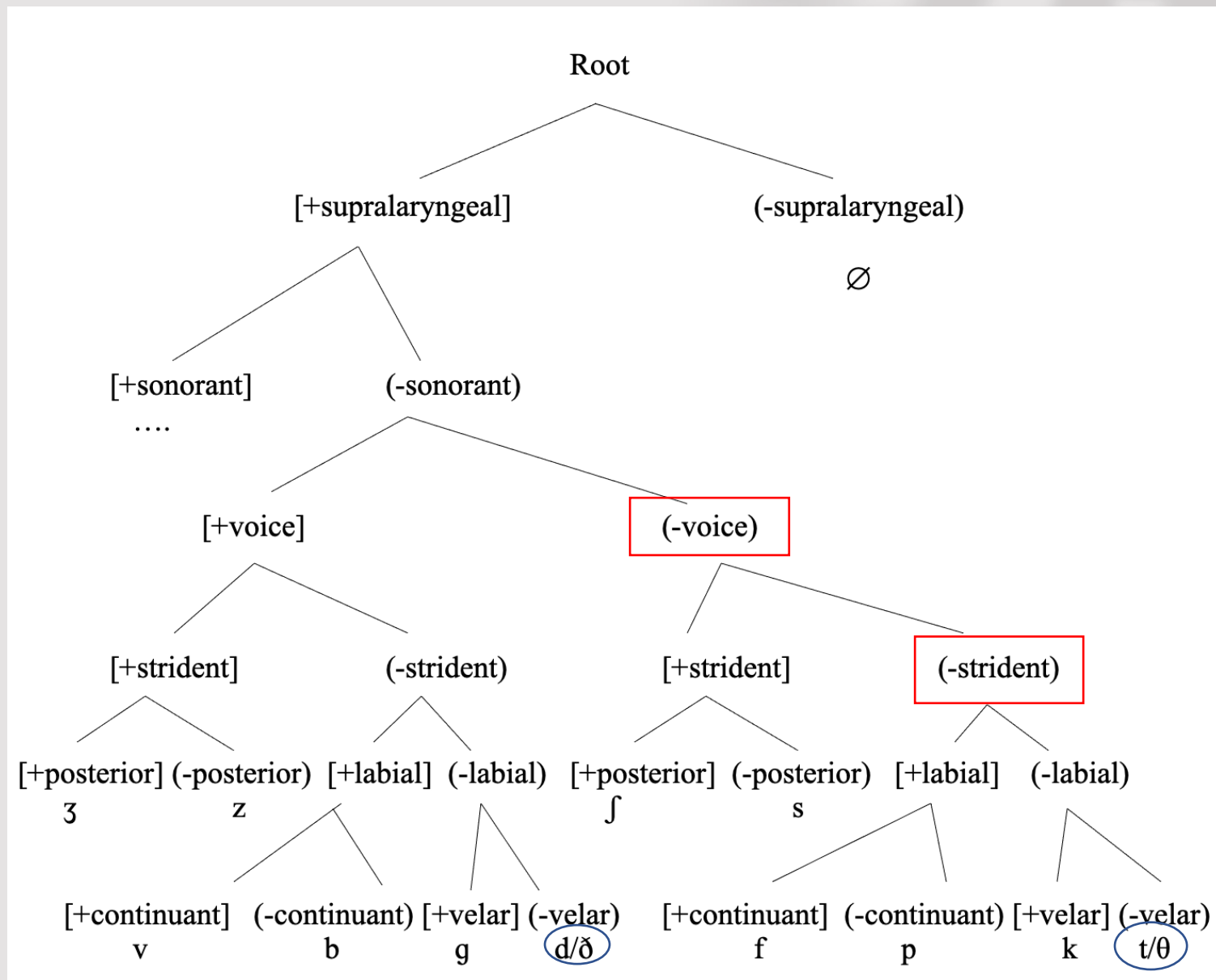
# Quebec French

/θ/ → [t]



# Quebec French

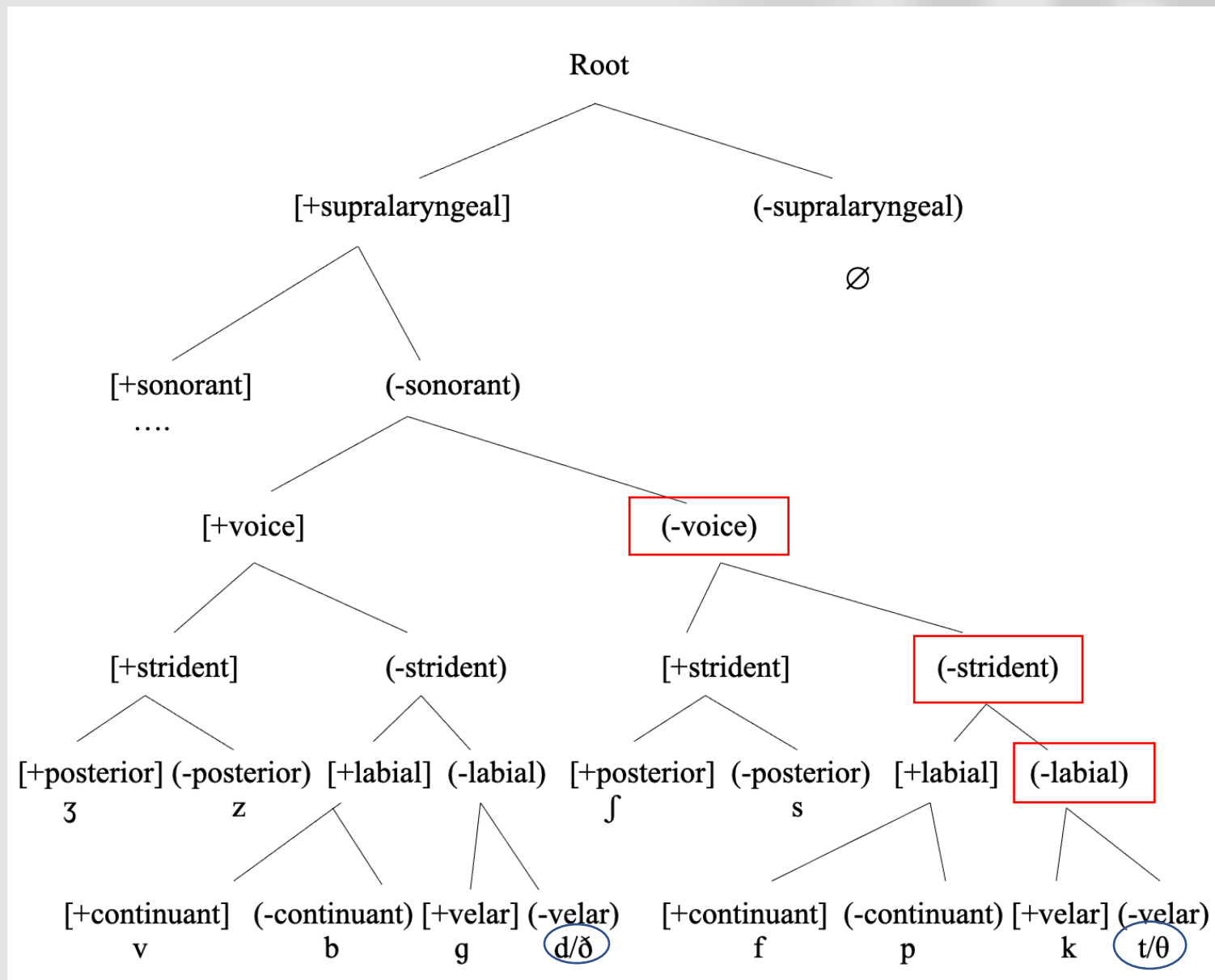
/θ/ → [t]





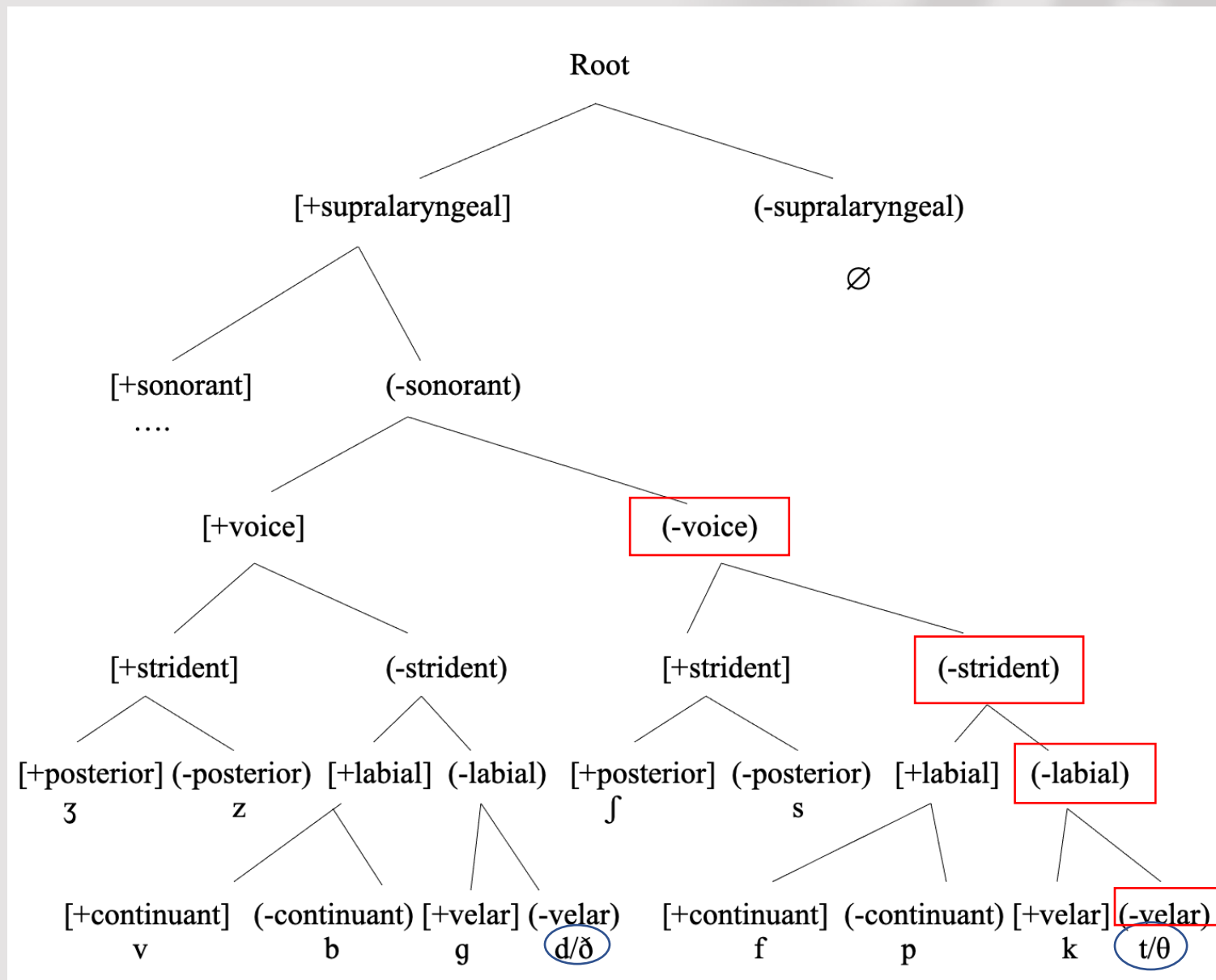
# Quebec French

/θ/ → [t]



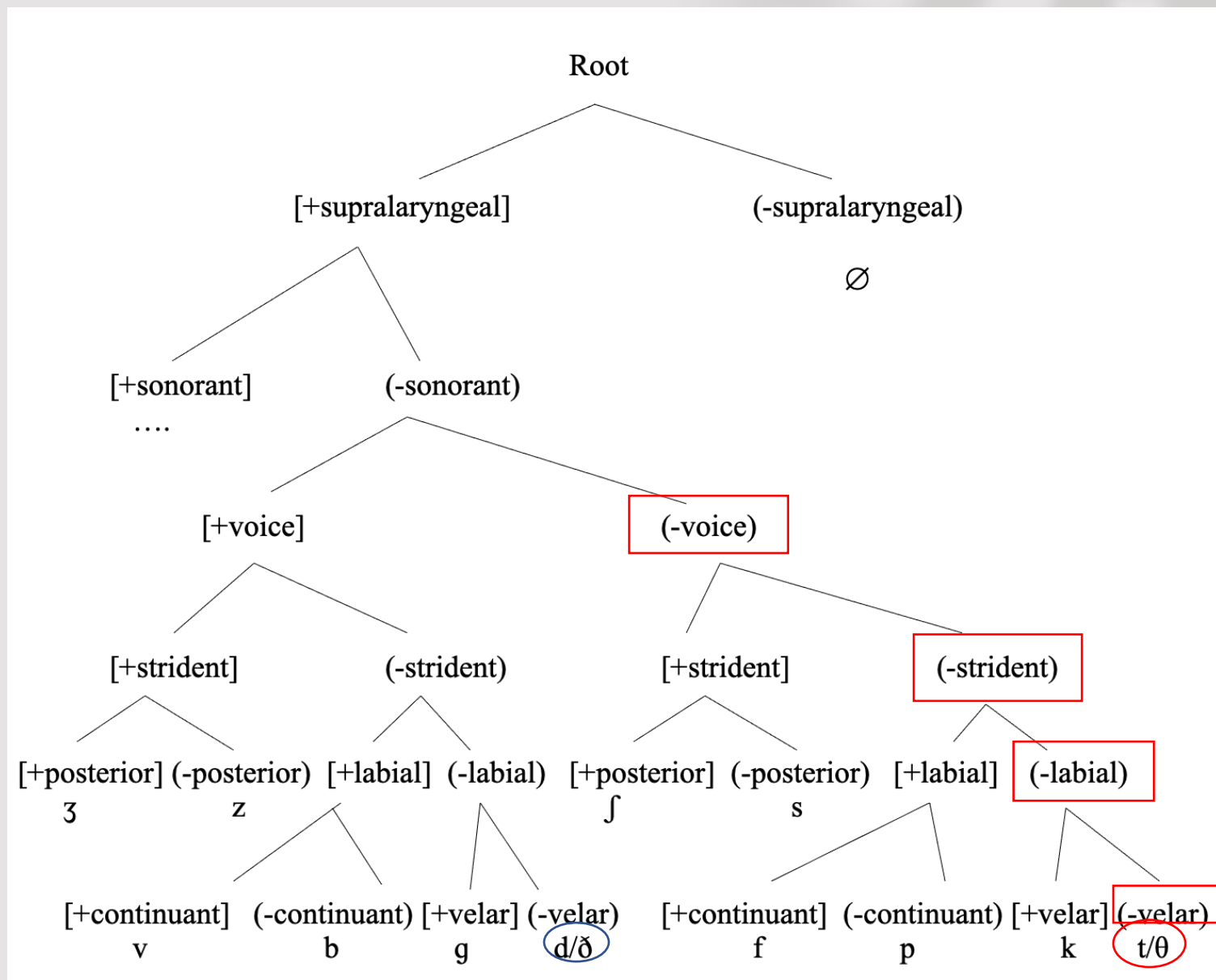
# Quebec French

/θ/ → [t]

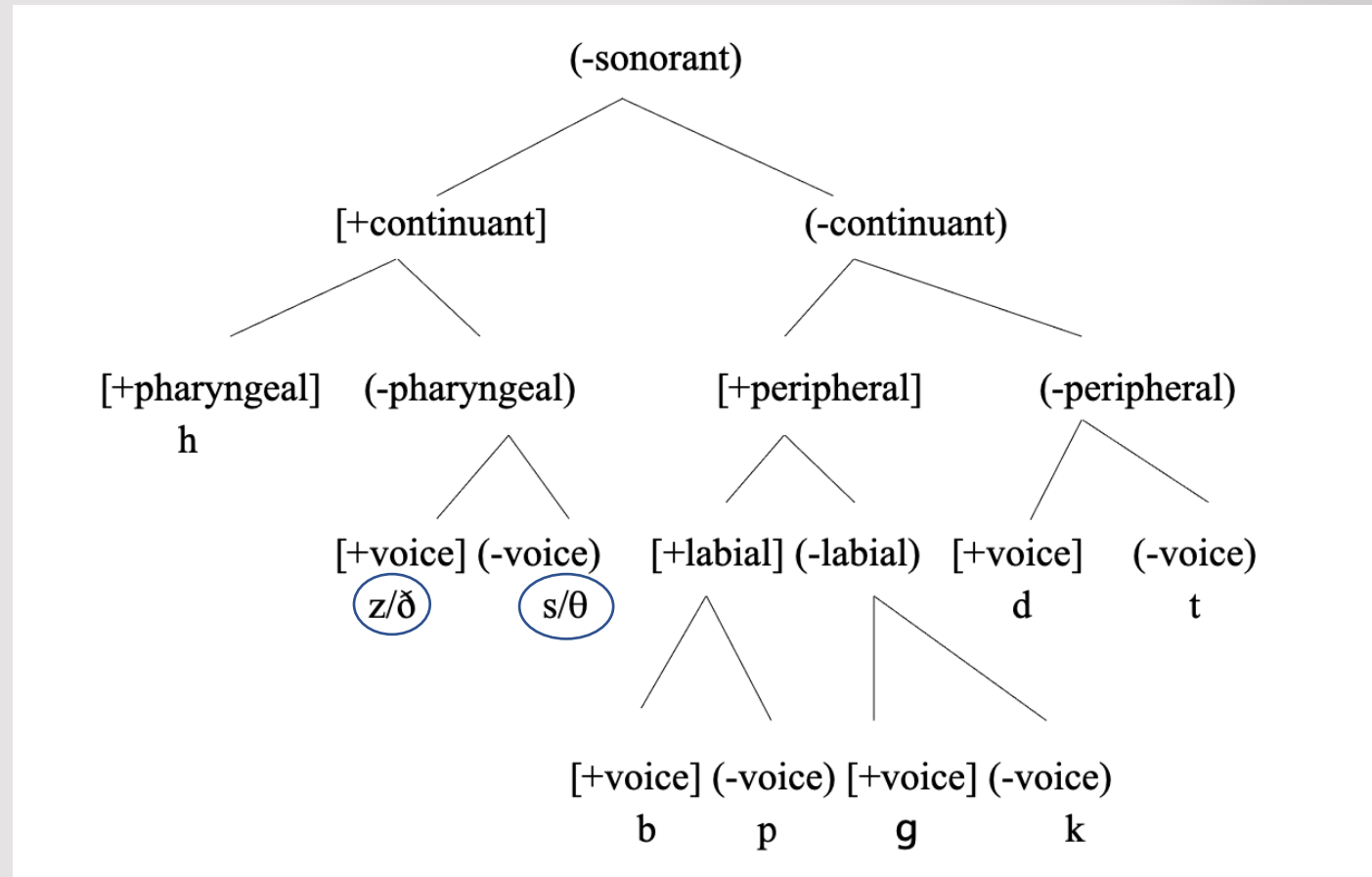


# Quebec French

/θ/ → [t]



# Japanese /θ/ → [s]

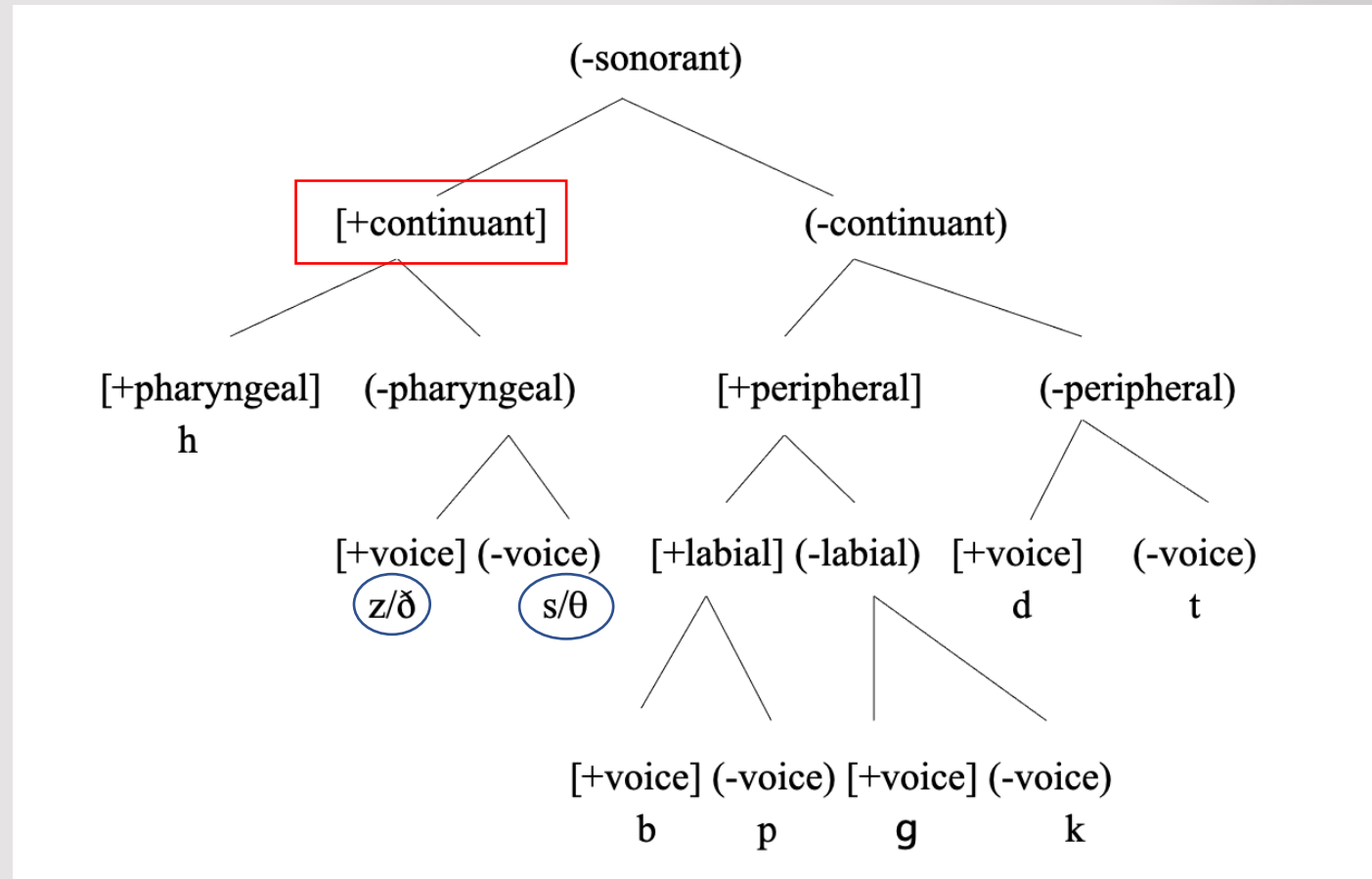


Based on Kubozono, (2015)

# Japanese Activity Check

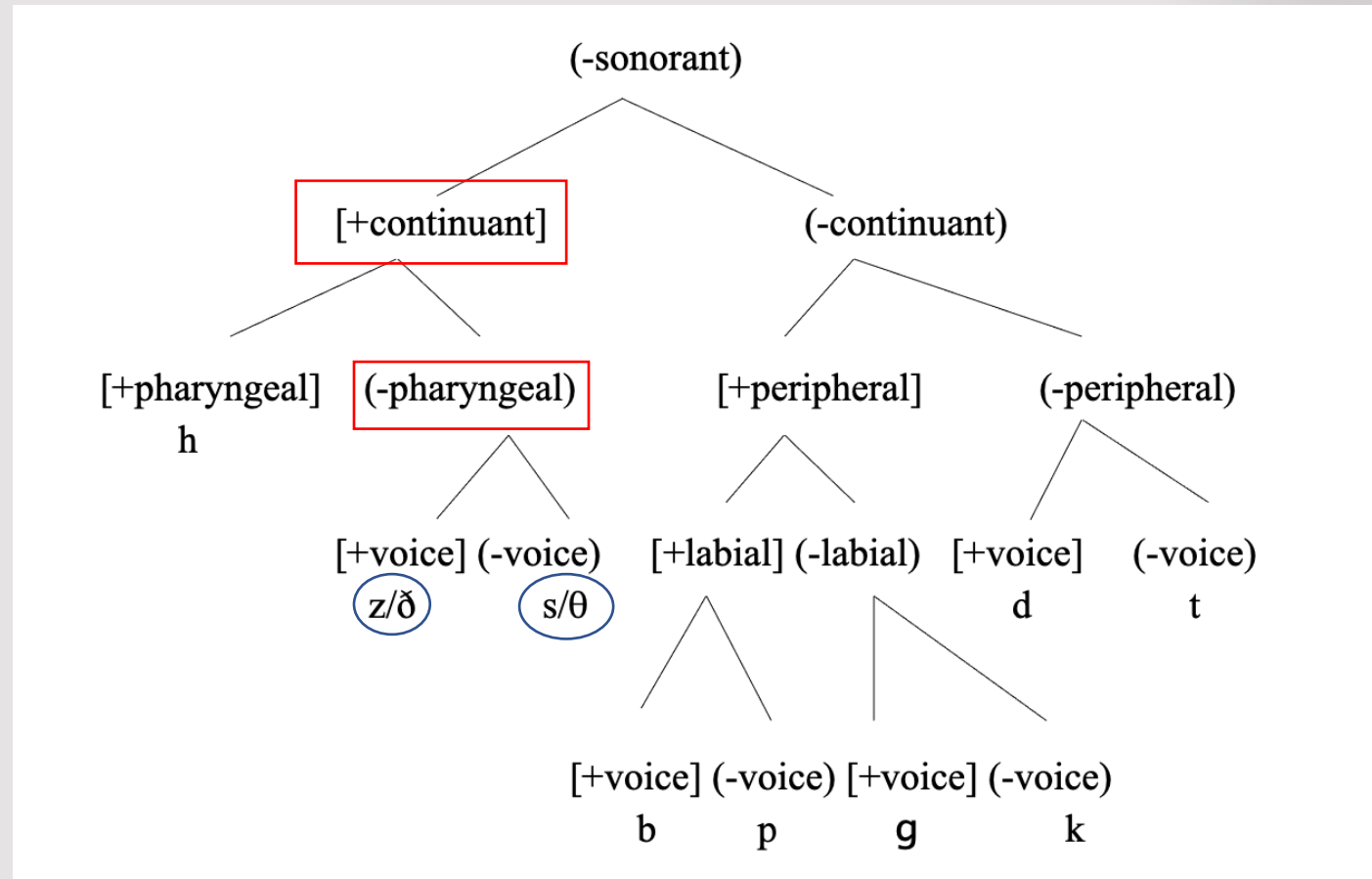
- [continuant]: /d/ -> [z] (Akamatsu, 1997, 2000); intervocalic spirantization (Vance, 1987)
- [voice]: assimilation

# Japanese /θ/ → [s]



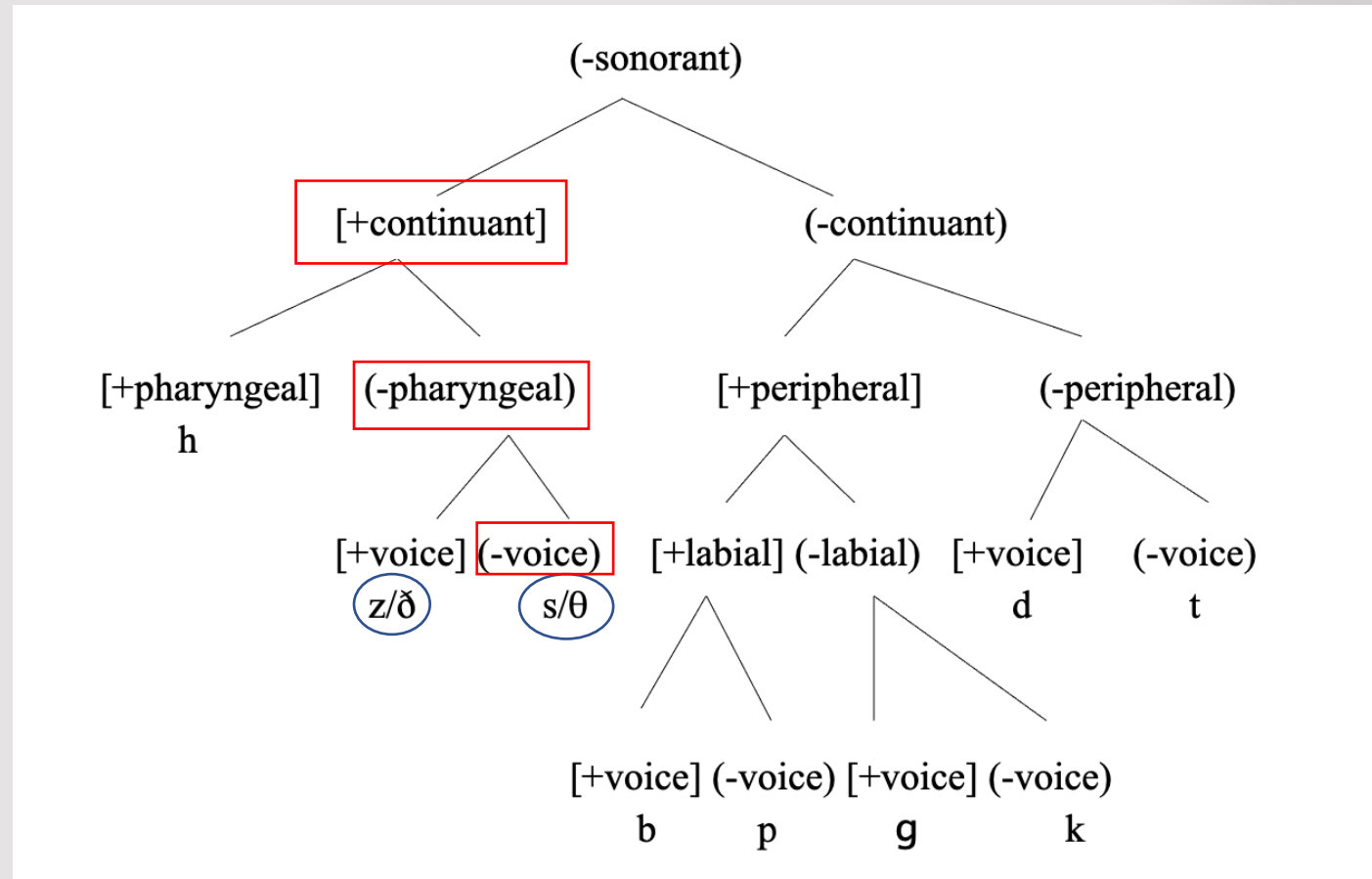
Based on Kubozono, (2015)

# Japanese /θ/ → [s]



Based on Kubozono, (2015)

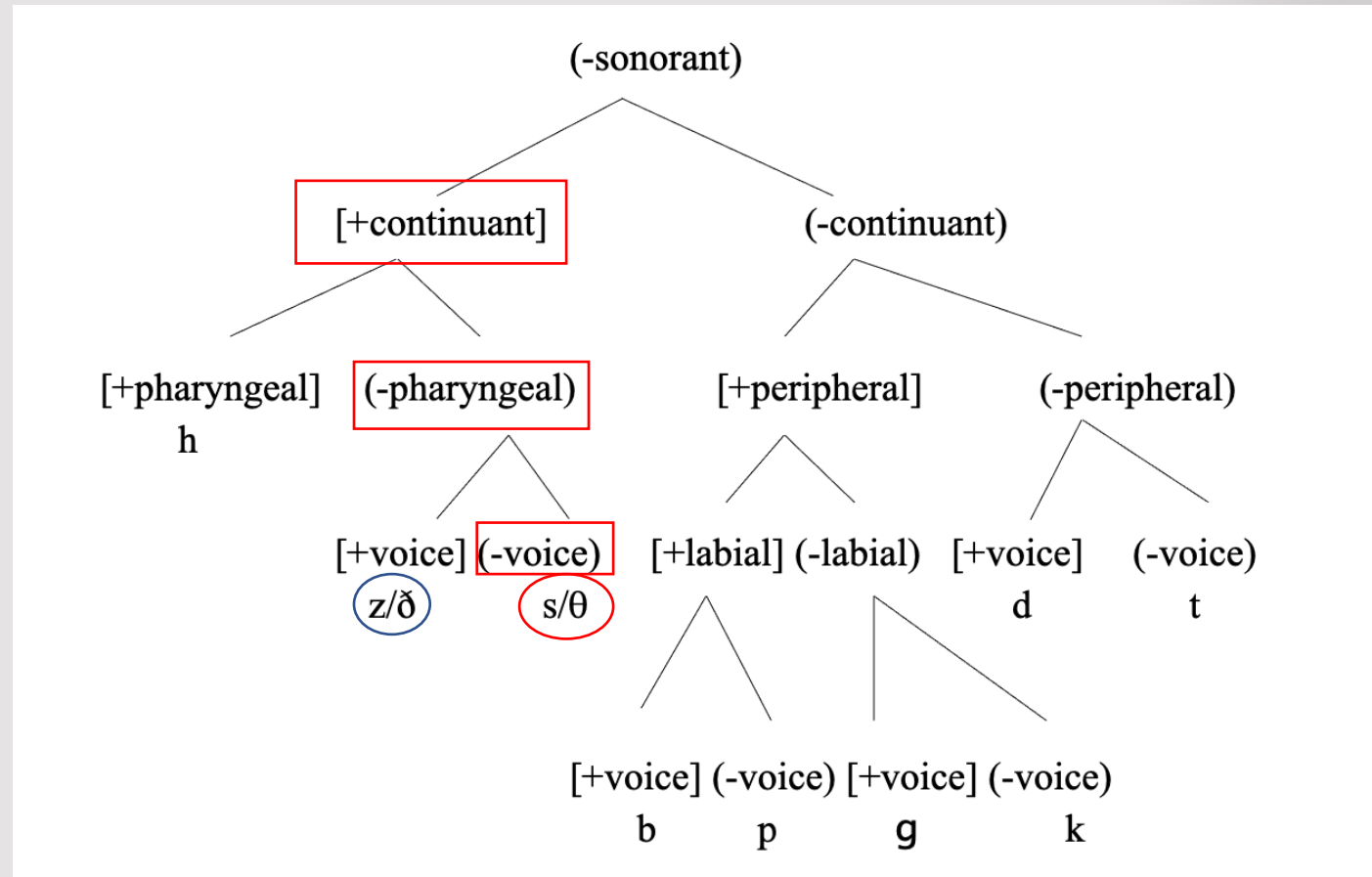
# Japanese /θ/ → [s]



Based on Kubozono, (2015)



# Japanese /θ/ → [s]



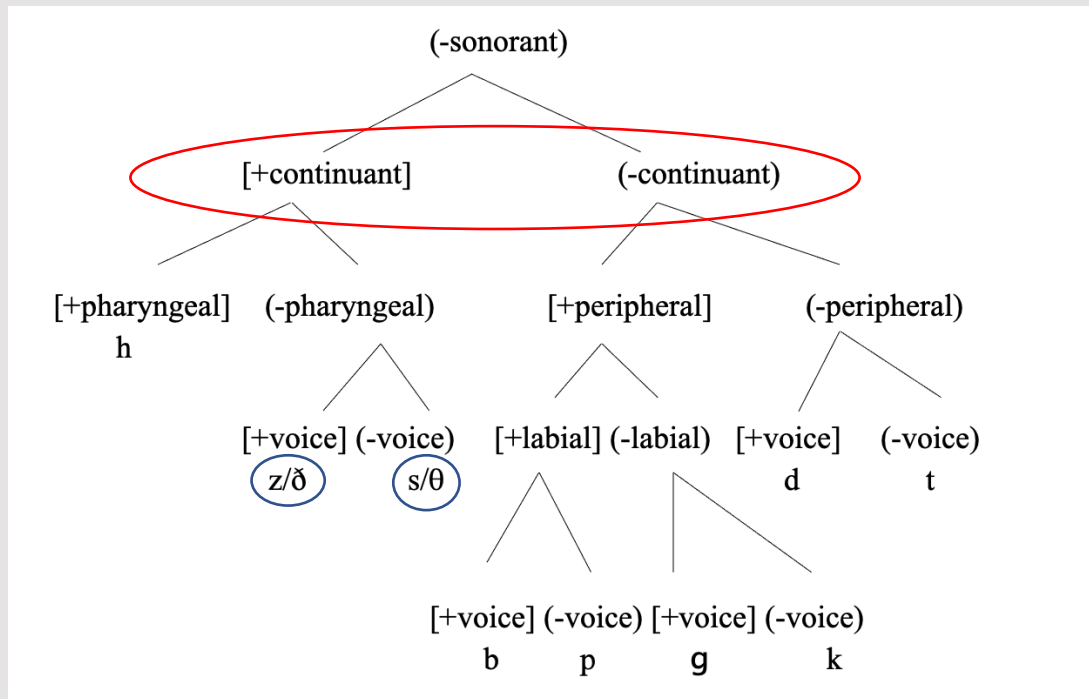
Based on Kubozono, (2015)

# Analysis

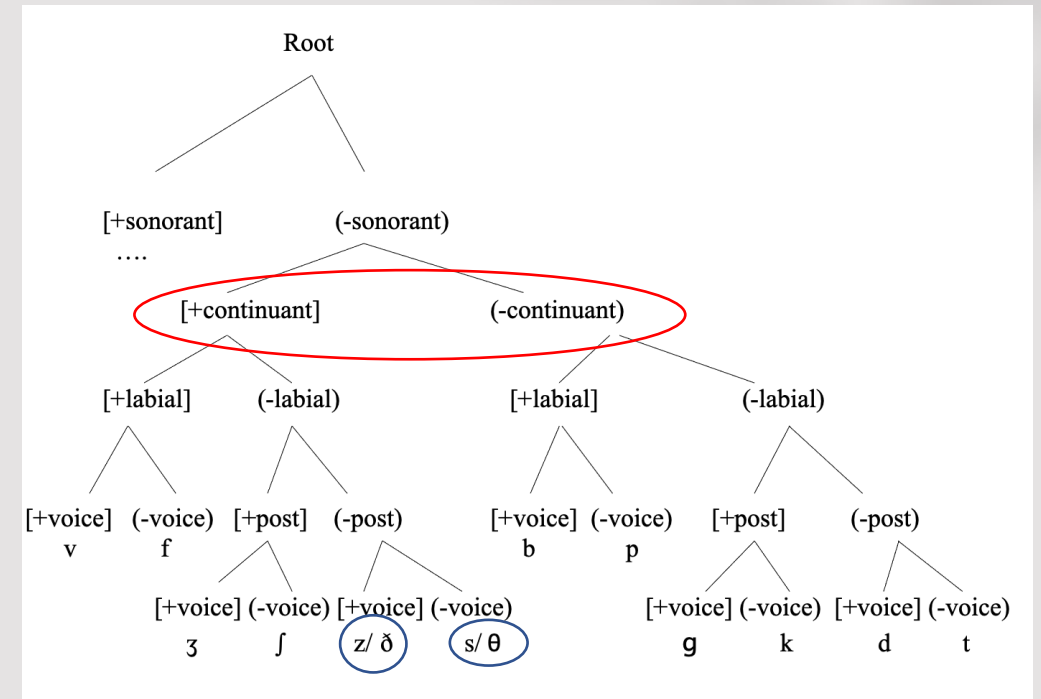
- we see [s] substitution when the [continuant] feature is the highest-ranked feature in the hierarchy
- In languages where [continuant] is not the highest-ranked feature, we see [t] as it is the completely unmarked category into which the /θ/ can be parsed.
- The CH approach differs from Lombardi's (2003) markedness versus faithfulness analysis in that there is a unified analysis of the two substitution options: it's all transfer of parsing.
- Furthermore, unlike Lombardi, this accounts for why there are perception substitutions as well as production substitutions.

# Two [s] Languages: [cont] > [place]

## Japanese

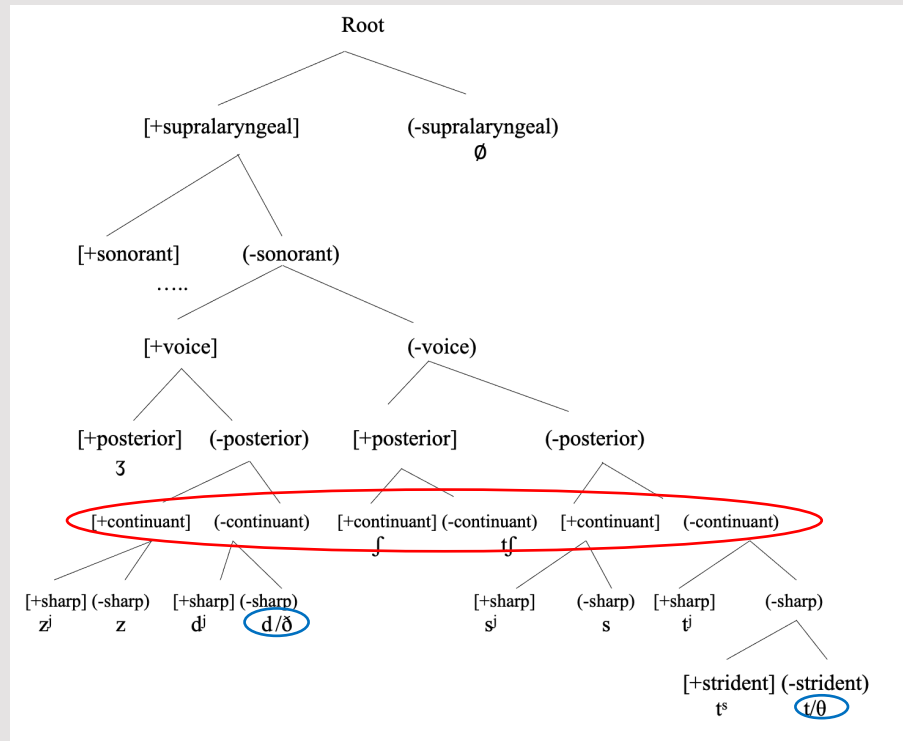


## European French

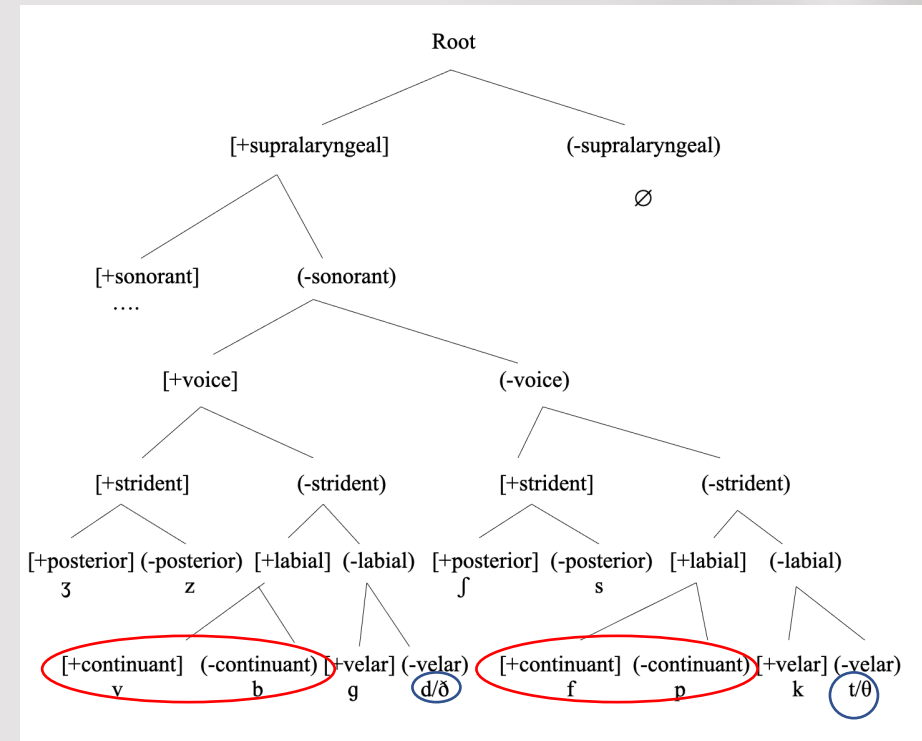


# Two [t] Languages: [place] > [cont]

## Russian

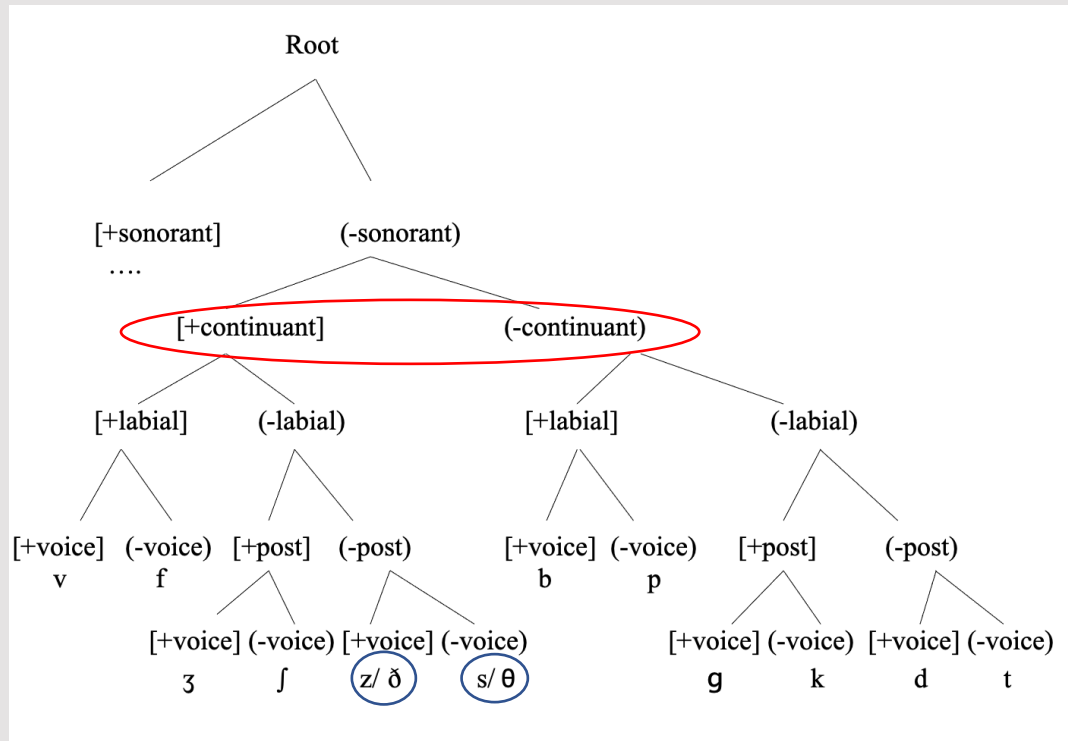


## Quebec French

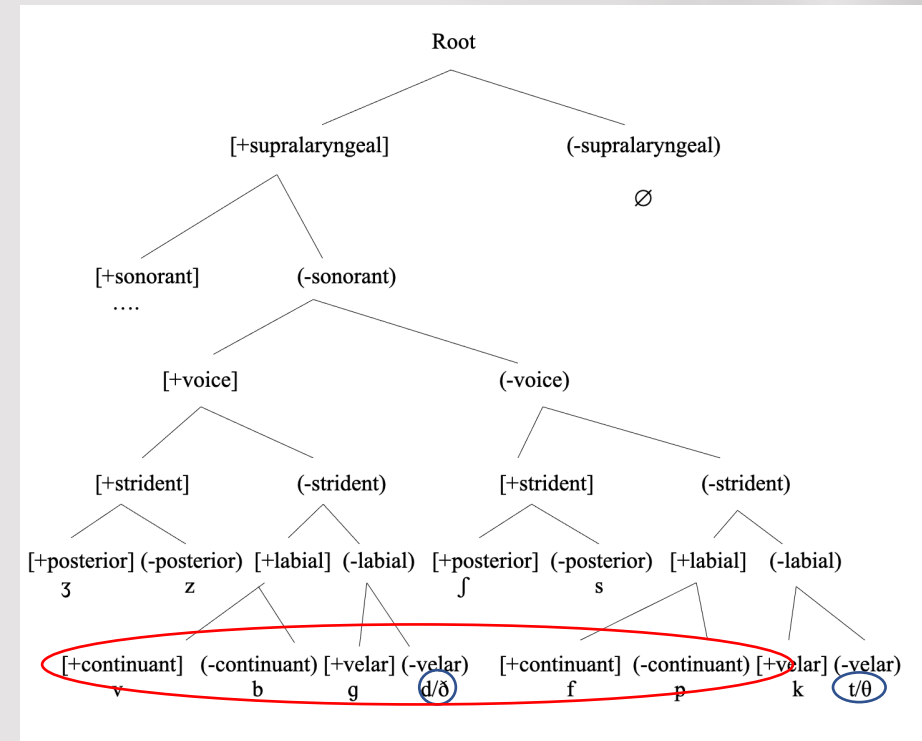


# Two French Varieties

## European French



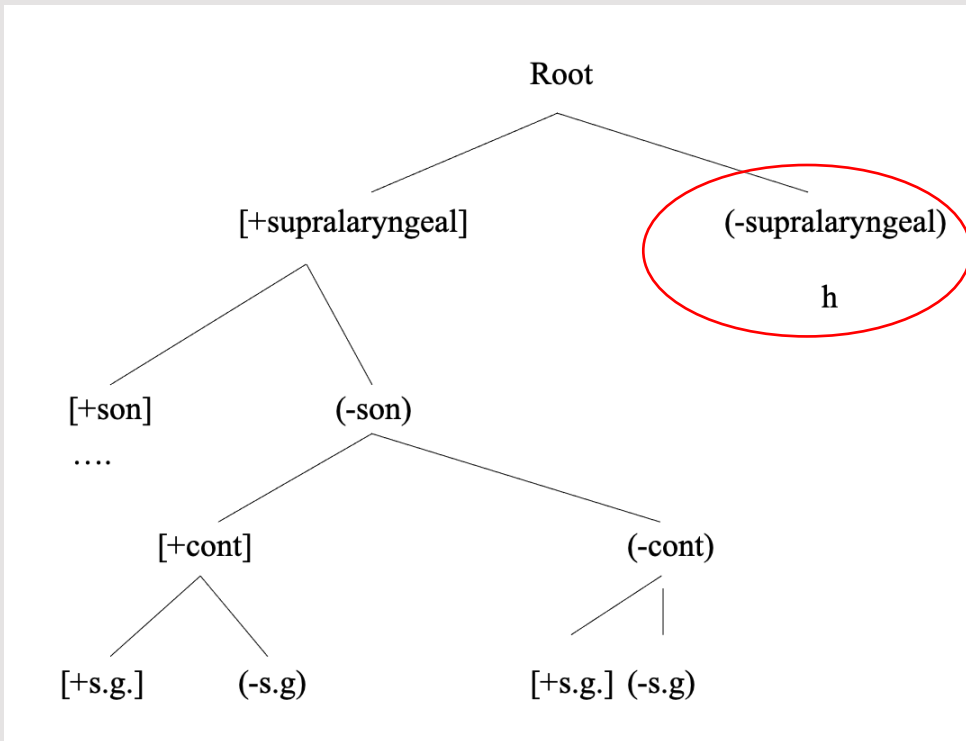
## Quebec French



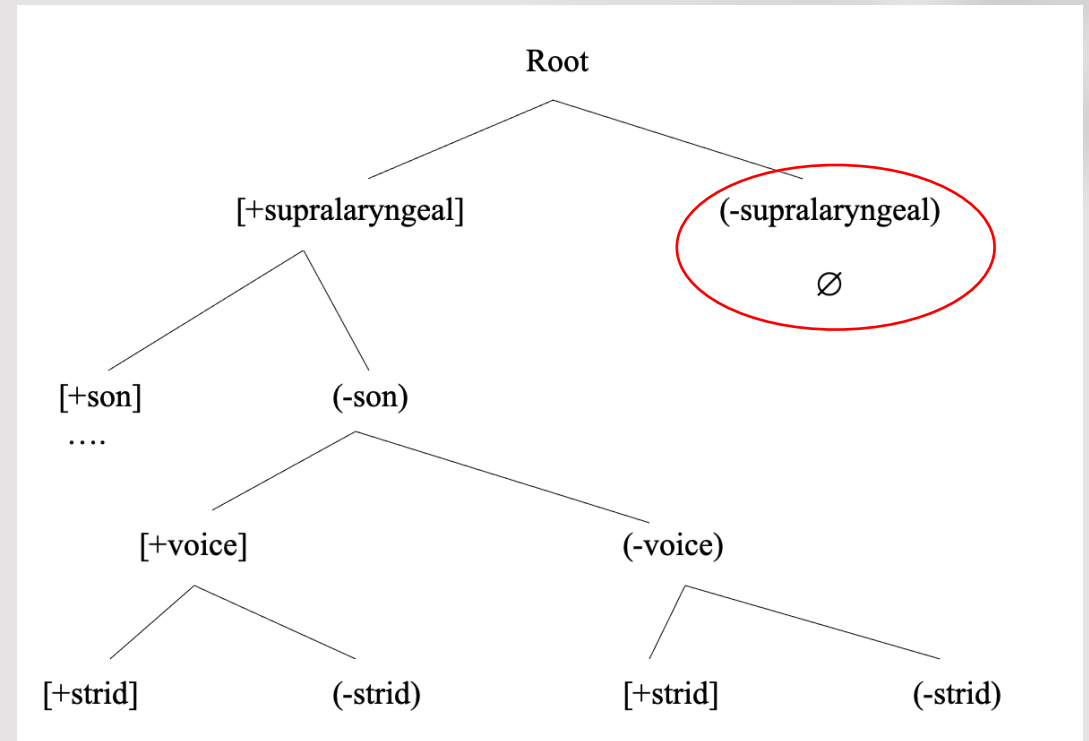
# What about /h/?

- English has a high-ranked supralaryngeal contrast
- Arabic treats /h/ like other gutturals in terms of a Place node (McCarthy, 1994)
- French lacks /h/ and lacks the [supralaryngeal] node

# English



# French



# The Story of /h/

- Acquiring such a high-ranked contrast which is absent from the L1 appears to be difficult (John & Frasnelli, 2023; Mah et al., 2016).
- This is consistent with what Archibald (in press) proposes in terms of a transition theory of acquiring an L2 contrastive hierarchy where learning is conservative and incremental and begins by positing changes at the bottom of the hierarchy.



# Back to /θ/

- Unsurprisingly, previous analyses all had some things right:
  - It's about markedness
  - It's about [continuant]
  - It's about similarity
  - It's about perception and production
- What we have now is a phonological model that can bring all of these things together

# Conclusion

- We do not need to invoke multiple explanations for /θ/ becoming [t] in some languages and [s] in others, nor do we need to invoke special machinery to account for the difficulty of L1 French producing (and perceiving) and English [h] compared with the L1 Arabic ability to produce (and perceive) the English [h]. It can all be explained, more parsimoniously, via the machinery of a contrastive hierarchy.

# Conclusion

- The CH approach recognizes that the substitutions fall out from inventory effects not local comparisons, and further shows that the machinery of CH which has been productively used to account for:
  - L1A (Bohn & Santos, 2018),
  - historical change (Oxford, 2015),
  - sociolinguistics (Natvig & Salmons, 2021; Hunt Gardner & Roeder, 2022) and
  - L3A (Archibald, 2022)

The Contrastive Hierarchy can also be used productively for an explanatory account of one of the oldest questions in L2 phonology: differential substitution.

Thank you

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