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‘raar’ticity

Substantive, substance-free, and in-between; some approaches to classifying of rhoticity

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ABSTRACT

Rhotic consonants include a wide acoustic, articulatory, and physical range. Material and historical factors contribute to the high synchronic and diachronic phonetic variability of rhotic consonants and this is briefly illustrated ina the cases of French, Dutch, and Brazilian Portuguese. On the other hand, the cross-linguistic phonological (i.e. behavioural) stability of rhoticity is displayed through common clustering tendencies, word-initial rhotic avoidance (WIRA), and loanword behaviour using the example of French loanwords in Moroccan-Arabic and Tashlhiyt Berber. It is in the tension between the *phonetic variability* and the *phonological stability* that the task of defining rhoticity as a class seems to be so challenging. Substantive models that rely on segmental features, like classification on the basis of a ‘strict set’ or the ‘family resemblance’ strategy, are either entirely incapable of accounting for the phonetic variability or make little cognitive sense – and both strategies struggle to identify or explain the phonological stability which rhotic consonants display. Substance-free (and similar) models are more capable of acknowledging and accounting for this tension than fully substantive models because by their nature they allow for phonetic variability and are required to more closely analyse the behaviours of rhotic consonants. Existing ‘partially’ substance-free models seem to bump into–and therefore raise important questions about the nature of–topics such as syllables, so-called extra-syllabic contexts, and sonority. This poses potential challenges to the coherence and cohesiveness of their models. Substance-free approaches to rhoticity should strive to supply sufficient historical-material analysis to help contextualise the synchronic analysis with potentially relevant phonetic patterns and ‘exceptions’ or edge-cases.

1. INTRODUCTION

‘Rhoticity’ is generally brushed over in introductory linguistics courses and the reason becomes clearer (or even more confusing, depending how you look at it) when you dig a bit deeper. If we accept rhoticity to be a phonetic and/or phonological class, then we must of course be able to define it somehow. If you ask the average undergraduate linguistics student at the UvA, you might get an answer along the lines of Figure 1 (or perhaps something even more limited):

Figure 1: ‘casual’ view of the set of rhotic consonants
[r, ʁ, ɹ, ɻ, ɾ, ʁ]

Some might also mention vowels (think about ‘rhotic’ vs. ‘non-rhotic’ varieties of English), others may just say ‘r-like sounds’, and plenty of others might say ‘what’s rhoticity?’ - a fair enough question. Of course, this is not a result of polling all the aforementioned students to see what they think, but something I’ve subjectively noticed in the day to day. In any case, ‘rhoticity’ is a broader concept than just a list of sounds, and especially just *this* list. Limited understandings of rhoticity are not just prevalent among students (how could it be when they learn from teachers, textbooks, papers, classmates, etc.). The consequence of this ‘casual’ view of rhoticity, along with a lack of a ‘better option’ in their understanding, seems to be that defining it in any way is frequently looked over for the sake of ease – which in a way is understandable, especially in research where it may not seem necessary or worthwhile to deal with the topic head-on, because it can seem like quite the rabbit-whole.

There have been multiple attempts to classify rhoticity flowing from different theoretical frameworks. There are, roughly speaking, two ‘types’ of approaches which this thesis will focus on, namely ‘substantive’ approaches to Feature Theory (including the ‘family resemblance’ model) and (at least partially) substance-free approaches to defining the class.

This thesis seeks to answer two questions. Firstly, what is the rhoticity problem – i.e. why has the classification of rhotic consonants been challenging? Secondly, is a substance-free approach to rhoticity more useful than substantive theories? However, there are some key limitations in the scope of this study which should be considered. For instance, this study will focus on ‘stand-alone’ rhotic consonants only; that is to say it will not be dealing with the notion of either ‘rhotisised vowels’ or ‘vocalised rhotics’. Furthermore, Element Theory, which also presents an argument for the classification of rhoticity, will not be discussed. Other limitations are that this thesis does not seek to answer the question “what exactly is rhoticity and how can it be specifically classified?”, rather it focuses on some of the issues that shape the problem in an attempt to gain some insights into rhoticity and briefly reviews some attempts to classify rhoticity. Furthermore, in the course of answering the target questions around ‘the rhoticity problem’ other topics may be touched upon, such as the nature of syllables, ‘extra’-syllabic consonants, and more, but these will not be deeply investigated. Of course from a dialectical point of view, there will always be relevant or related topics or aspects of language which any other part of language could in some way interact with, but given the scope of just this thesis, not everything will be investigated thoroughly.

However, it can still be said that understanding some of the difficulties in defining rhoticity (especially with respect to the origin of its complexity) contributes to an attempt at potentially clarifying a phonetic and/or phonological class of sounds. This can be useful because it allows the research (when it concerns rhotics either directly or tangentially) to be more precise and also more useful in their analyses, experiments, etc. To this end, we shall begin with a brief typological overview of rhoticity.

2. TYPOLOGICAL OVERVIEW OF RHOTICITY

According to Chabot (2019), who analysed rhotic consonants in various languages, the phonemic variation of rhotic consonants is wide. Chabot determined which sounds were a distinct class of 'rhotics' on the basis of historical change, allophony, phonological patterning and interaction, loanwords, etc. Chabot concluded that its attested forms can be said to include at least the following consonants:

Figure 2: Inventory of rhotic consonants according to Chabot (2019)

	Labio-dental	Dental Alveolar Postalveolar	Retro-flex	Velar	Uvular	Glottal
Trill		r̪ r			R̪ R	
Tap or Flap		ɾ̪ ɾ	ɽ			
Fricative		ʃ ʒ	ʂ ʐ	x ɣ	χ ʁ	h ɦ
Approximant	ʋ	ɹ̪ ɹ	ɻ ɻ	ɰ		

As Figure 2 shows, rhotic consonants have a wide phonemic variation that includes at least labio-dental, dental, alveolar, postalveolar, retroflex, velar, uvular, and glottal locations or articulation as well as manners of articulation which include trills, tap/flaps, fricatives, and approximants. We could go on and discuss other potential phonetic instantiations of rhotic consonants but that is not particularly necessary to illustrate the point, which is that there is *a lot* of variation, either synchronically, or diachronically, or both. At the same time, it seems there is some evidence for the phonological stability of rhotic consonants. The interplay between the variability and potential stability should be explored. Let us begin with the phonological stability, by which is meant the cross-linguistic tendencies which are common to rhotic consonants. Specifically we begin with discussion on phonotactic properties of rhotic consonants, such as their clustering behaviour, and then look at loanword behaviour of French loanwords in Moroccan-Arabic and Tashlhiyt Berber. Then we will move on to some more examples of the phonetic variability from both a synchronic and diachronic perspective.

2.1 Phonological stability of rhotic consonants

2.1.1 Similarities of phonotactic properties; clustering and WIRA

A key observation about rhotic consonant phonotactics which Wiese (2001) elaborates on is that rhotics tend to be vowel adjacent and distributed in a CrVrC (where 'r' is the rhotic) pattern. This is

on the basis of an observation that many languages which do allow complex onsets rhotics and lateral are only allowed to be in the second position of those clusters, and in the first position for complex coda clusters. However the broader observation is that rhotic consonants are "non-arbitrary in terms of its phonotactic patterning. Its constant appearance between vowels and other consonants leads to the conclusion that [rhotic consonants are] a prosody." (Wiese, 2001:360) In other words, Wiese argues that rhotic consonants behave as phonotactic sonorants. That is to say, even though their instantiation might be *phonetically* an obstruent, their *behaviour* tends to pattern with other sonorants. As we will explore later, there are some potential exceptions with regard to 'extra-syllabic' or 'trapped' rhotic consonants.

Another seemingly similar feature among rhotic consonants is the appeared tendency of word-initial-rhotic-avoidance (WIRA). A typological study by Labrune (2021) on the tendency showed that 49% of investigated languages (of a 200-language sample) displayed some degree of phonological WIRA behaviour (i.e. they posses no, or very few, words that phonologically begin with one of their native rhotic consonants). Another interesting proposal from Labrune (ibid.) is that if a language does not allow liquids word-initially, then it will also forbid rhotics word-initially. In this way, there appears to be a phonological relationship between rhotics and liquids in some way, either directly or indirectly.

As we can see, common tendencies like clustering behaviour and WIRA seem to suggest that rhoticity has some kind of core phonological stability. Another piece of evidence to support such a thing is the behaviour of rhotic consonants in loanwords. Rhotic consonants in one language will be changed into the rhotic consonant of the language it is loaned into. As an example we will look at French loanwords in Moroccan-Arabic & Tashlhiyt Berber.

2.1.2 French loanwords in Moroccan-Arabic & Tashlhiyt Berber

We can see the phonological stability of rhoticity displayed in the case of French loanwords adopted into Moroccan-Arabic and Tashlhiyt Berber. Due to historical and cultural context, including colonial occupation and language policy, the vocabulary of Moroccan-Arabic and Tashlhiyt Berber include a variety of loanwords from French. It is in the interaction between these two linguistic systems (and the adoption of loanwords) where we can find interesting support for the phonological stability of rhoticity.

In Moroccan-Arabic and Tashlhiyt Berber the rhotic consonant is generally realised as the voiced alveolar trill [r] or the tap [ɾ] (Lahrouchi, 2017). In the relevant varieties of French (with consideration to the context), the rhotic consonant is generally realised as the voiced or voiceless uvular fricative ([ʁ] and [χ], respectively). French words were incorporated into the vocabulary of speakers of Moroccan-Arabic and/or Tashlhiyt Berber as illustrated below in Figure 3:

Figure 3: French loanwords in Moroccan-Arabic and Tashlhiyt Berber (Lahrouchi, 2017)

(1)	*French*	*Tashlhiyt Berber / Moroccan Arabic*	
a.	byʁo	lbiɾu	'office'
	ʁeʒim	rriʒim	'diet'
	sɛʁʒɑ̃	ʃɑrˁʒˁɑn	'sergeant'
	pɛʁmisjɔ̃	b$^{(ə)}$rmsjun	'permission'
b.	tχɛ̃	ttɾan	'train'
	fχɑ̃s	fransa	'France'
	sɛχtifika	ss$^{(ə)}$rtafika	'certificate'
	kaχtɔ̃	kɑrˁtˁon	'cardboard'

As seen above, when French words are adopted into Moroccan-Arabic and Tashlhiyt Berber, the rhotic consonants of the original French (the fricative [ʁ] or [χ]) is adapted into the rhotic consonants of Moroccan-Arabic and Tashlhiyt Berber (the trill [r] or the tap [ɾ]). This may seem relatively straight-forward and potentially uninteresting on its own. However, the key consideration is that Moroccan-Arabic and Tashlhiyt Berber also already have a phonemic *non-rhotic* uvular fricative consonants /ʁ/ and /χ/ in their inventory (ibid.). Specifically, speakers seem to accurately identify the French rhotic as a phonological sonorant, and this pattern occurs in both mono- and bilinguals (ibid.). This would suggest that in the mind of a Moroccan-Arabic or Tashlhiyt Berber speakers integrating loanwords from French, the *phonological* stability of rhotics is likely prioritised over the *phonetic* closeness of the individual sounds.

It could be argued that this transfer happened due to orthography-based influence, but a partial counter-argument is that the borrowing languages do not use the same alphabet (See Vendelin & Peperkamp 2006). Furthermore, according to Lahrouchi (2017) Tashlhiyt Berber has a rich oral tradition with less influence from written sources, and the official orthography (the Tifinagh alphabet) has only been taught in schools in the last two decades or so but is still barely used. It is difficult to fully and entirely discount the possibility, but the primary data used by Lahrouchi is also that of illiterate speakers, which weakens the orthography-based argument.

However, it is relevant to explore in greater historical detail the context in which the language contact occurred most intensely, and the state of the French rhotic at that time within those contexts. This was difficult to find given the many factors involved (a potentially ongoing process of sound change at the time of the invasion, the geographical context, socio-linguistic policy, etc.). Because of these factors, the particular example of French loanwords in Moroccan-Arabic and Tashlhiyt Berber seems to only partially support the argument made here that phonological stability is a strong tendency which *overrules* phonetic closeness in the case of rhoticity.

2.3 Diachronic & synchronic phonetic instability of rhotic consonants

Rhotic consonants are subject to a wide variety of change within and between languages as well. To make this claim it must of course be qualified that a 'language' is itself not a discrete boundary, especially with consideration to the constant interaction, change, and fluidity of the way a 'single

language' can be expressed. On the surface, it might seem like an irrelevant point to make, but it is closely interconnected with the diachronic & synchronic instability of rhotic consonants because it is *by means of* this constant interaction between speakers of language that rhotic consonants are shaped and either maintained or changed in various ways. Some material factors identified here as being contributing factors to the diachronic and/or synchronic instability of rhotic consonants:

1. Articulatory complexity/ease & acoustic distinctiveness
    - In a way, these are two sides of the same coin. The tendency for articulatorily complex (i.e. more difficult to pronounce) consonants to be diachronically unstable because of a natural preference for ease of articulation is in tension with the fact that there is a tendency for acoustically 'distinctive' sounds to be preferred to retain acoustic clarity (and oftentimes to attain accoustic distinctiveness, more complex articulations must be used). This is a dialectic interaction which, along with other factors, contributes to the tendency for instability in the phonetic output of rhotic consonants.
2. Phonetic/phonological context
    - Sounds are able to be influenced by their phonetic/phonological context. For instance, assimilation, dissimilation, vocalisation, fronting, backing, lenition, fortition, etc. are a few examples of potential changes resulting from the phonetic/phonological context like neighbouring sounds, syllable structures, stress patterns, etc. These tendencies interact with other factors and help contribute to sound changes.
3. Speaker idiosyncrasies & language contact
    - Individual speaker variation/idiosyncrasies and language contact are also two sides of the same coin, given the blurred line of what constitutes a 'language'. Differences in pronunciation (which can itself be a product of varying factors) can lead to sound change if it is adopted within a speech community over time. Language contact can have a similar effect given conditions which favour such influence and change in a particular or across multiple speech communities over time. In this sense, the phonetic variability of rhotic consonants owes itself also to social factors.

In all cases of change, the nature of the change is highly contextual to the relevant historical and material conditions which shape these contributing factors. It can be said that all the factors contributing to the phonetic variability of rhoticity may apply to other classes as well; this may be (at least partially) true as language is 'alive' in the sense that it is part of constant dialectical interaction and change, and all classes may be subject to such interaction to greater or lesser extents. However, the key thing to note is that rhoticity certainly displays this behaviour in a 'special' (or perhaps 'intensified') way. Given this brief and abstract overview, let us quickly go over some real-world examples when it comes to rhoticity:

French, a Romance language (of the Indo-European family) provides an example of diachronic change in a rhotic consonant. For instance, the original Latin apical trill [r] seems to have evolved into the [ʀ] toward the end of the 18th Century and eventually evolved (first in Paris) to become the voiced and voiceless uvular fricatives (Straka, 1965) (Lahrouchi, 2017). Of course that is not to say

that the apical trill is completely unused, some speakers still use it, but the point is that this particular sound change took hold and is now widely and consistently used by a large number of speakers.

In standard and central varieties of Vietnamese (from the Austroasiatic family), the rhotic consonant seems to be pronounced as [ɻ], northern variety as the voiced alveolar fricative [z] or the trilled [r], and in the southern variety as the voiced velar fricative [ɣ] (PhȦm & McLeod, 2016). These are examples of the instability, both diachronic and synchronic, of rhotic consonants in different varieties of Vietnamese.

Another real-world example of synchronic variability is Dutch, a Germanic language (of the Indo-European family). Collins & Mees (2003) describe some of the variation including the alveolar trill, tap, voiced fricative, voiceless fricative, approximant, pre-velar bunched approximant, uvular trill, tap, voiced fricative, weak voiceless fricative, approximant, etc. The key point is that while some variation happens *between* different Dutch speech communities (which can be seen as evidence of diachronic change), there is yet some variation which occurs *within* a given speech community. For example, the word *raar* (‘strange’) is often pronounced with a different phone for the initial and final rhotic. This is evidence of synchronic variability. To further explain, Sebregts (2014) argues that the synchronic variability can only be explained through a model that establishes the diachronic relationships between the variations. In other words, Sebregts argues that the synchronic variation exists on the basis of ongoing historical change, especially through processes of casual speech.

In Nusu, a Tibeto-Burman language (of the Sino-Tibetan family) spoken in Yunnan Province, China, and Northeastern Kachin State, Myanmar, the rhotic consonant has variations which include [s, z, ɻ] (Ikeda & Lew 2017). Some varieties of Nusu, include Topya and Myagu Nusu reveal the existence of both alveolar and palatalized alveolar approximant [ɹ] (ibid.). The existence of a rhotic consonant in Nusu has been debated, but Ikeda & Lew (ibid.) determined it does exist on the basis of phonotactic patterning (especially on the basis of clustering behaviours) and cross-linguistic analysis. This example seems to be evidence of both diachronic and synchronic variability.

Portuguese, and specifically some varieties of Brazilian Portuguese, a Romance language (of the Indo-European family), also show interesting historical change. It includes things like the change from the Latin-originating apical trill [r] to a uvular trill [ʀ] becoming more common in Lisbon, certain varieties using the uvular fricative [ʁ], and more eventual changes leading to the current situation in Brazil where some of the occurrences include voiceless fricatives in velar [x], uvular [χ], and glottal [h], but also as tap [ɾ] and trill [r] (Mateus, Helena & d'Andrade, 2000). This is an example of diachronic change of course, but also of the synchronic variety. For instance, the uvular fricative instantiation [χ] is usually pronounced in syllable-final position (ibid.).

2.4 What does this mean?

The range of rhotics also raises the questions of *why?* The answer to this is multifaceted and interlinked; historical (diachronic) change, phonetic/phonological context (like adjacent sounds/syllable structures causing a sound change of some kind), and the differences between speakers (speech patterns, idiosyncracies, etc.). All of these factors also do not exist in isolation and

could of course influence each other as well. As a rough hypothetical, consider a speaker who cannot produce an apical trill in certain positions and so resorts to a uvular trill instead, perhaps then passing this down to their child, who then passes it on to their sibling, etc.. The point being that rhotic consonants exhibit significant phonetic variation with a wide variety of instantiations across different languages (and even within the 'same' language) and the reasons for this are related to the complexity of interaction and diversity of historical-material contexts. There is an inherent potential for variability in rhotic consonants' phonetic content.

However, while there is a great deal of variation regarding the acoustic, articulatory, and physical properties of rhotic consonants phonetic instantiation (occurring both synchronically and diachronically), there is also some phonological (i.e. behavioural) stability. We see this in the common tendencies such as clustering behaviour, WIRA, and loanword adaption. It is in this tension, between the *phonetic variability* and the *phonological stability*, where the task of defining the 'class' of rhotic consonants seems to gain its complexity.

Given this understanding, any more 'casual' view of rhoticity (such as a basic list) is obviously inadequate because it is not only usually an incomplete list, but it also cannot explain the phonological stability of rhotic consonants. So what about some of the formal attempts to classify rhoticity?

3. OVERVIEW OF FAILED 'SUBSTANTIVE' MODELS TO CLASSIFY RHOTICITY

Substantive models are those which classify sounds on the basis of their common *substance*, that is to say their acoustic, articulatory, and physical properties. In this way their behaviour is described in regards to their substantive acoustic and/or articulatory properties. We will start with the 'strict set' model of rhoticity.

3.1 Feature Theory: 'strict set' model

What I refer to as the 'strict set' model of rhoticity is the conception of a discrete set of segmental features where all in the set must apply for it to be considered a rhotic consonant (i.e. that all rhotics must have [+feature_A] and [+feature_B] and [-feature_C]). Given the variety in the cross-linguistic instantiations of rhotic consonants, this has posed a particular challenge. In fact, if we take the inventory given in Figure 2, then it is impossible to create such a discrete, all-encompassing set because even just these attested rhotic consonants have too much variation in their articulatory and acoustic properties to find a common 'strict set'. There is no combination of major segmental features which can account for all rhotic consonants because the manner of articulations, the acoustic qualities, and the places of articulation are simply too varied. Wiese (2001) and Chabot (2019) both made efforts to show how different combinations of features are unable to account for the variation that exists in rhotic consonants. For instance, take what is often referred to as a prototypical rhotic consonant, the alveolar trill. If we use Feature Geometry (see Clements 1985, McCarthy 1988, Halle 1995) then it could described in terms of [+cons, +cont, +son, -lateral,

+coronal, -nasal]. Try as you might, you will not be able to find any common *phonetic* features for the inventory in Figure 2.

Another issue with this strategy is that it starts with a list of attested rhotic consonants and tries to form a restricted definition on that basis. But what if the list changes? In other words, we have shown that rhotic consonants undergo strong tendencies for phonetic variability, both synchronically and diachronically, and can ultimately find their instantiations in many articulatory categories (even perhaps ones which are less expected given traditional notions, such as fricatives). In this way, this model can neither account for unattested yet actually existing instantiations, nor can it account for potential future changes, which given the tendency for phonetic variability is a reasonable factor to consider. This is more a critique of the logic of the 'strict set' model, since it is somewhat beside the fact that the primary issue with the model is that it is simply impossible to apply to the *already attested* rhotic consonants as given in Figure 2.

3.2 Feature Theory: 'family resemblance' model

The 'family resemblance' model is an extension of the 'strict set' feature theory model. Given that the strict set strategy cannot yield fruit when it comes to rhoticity, another strategy must be employed. The key difference is that instead of a discrete list where all in the list must apply, there must only be a 'resemblance'. By this is meant a set of substantive features where only *some* in the set must apply for it to be considered a rhotic consonant. In practice you can indeed create a list which covers the attested rhotic variety. In fact, you could make a list that covers any potential variation, even the total inventory of all humanly possible consonants, as long as you keep adding features to the list. The problem is that adding more and more features reduces the predictive value of the definition and makes learners tasks much more complex (Currie Hall, 2023) (Wiese, 2001). This 'family resemblance' model makes little psycholinguistic sense, it is too broad in its definition to the point that it loses much of its usefulness (despite technically allowing for the phonetic variation in rhoticity), because it also suffers in its explanation of rhotic consonants' cross-linguistic phonological stability (i.e. it *does not* explain it). In fact, the family resemblance model struggles to explain the phonological stability by the same mechanism that it *allows* for the phonetic variability. It simply expands the list of potential constituent features, but the list must be so long (to account for already attested rhotic consonants) that it loses it's predictive power. It basically seems to state that 'a rhotic consonant is one which has N number of a list of X features where N<=X, and therefore it behaves as a rhotic consonant does.' But the list would be so long that many other consonants from different phonological classes (i.e. with different behavioural patterns) could be included as well. One could argue to add phonologcial (i.e. behavioural) criteria to the 'family resemblance' definition, but at that point you circumvent the problem and thus circumvent the need for the defining notion of the family resemblance model – so why even use it?

Very similar to the family resemblance model is the strategy of using '[± rhotic]'. However in this case, it is about creating the category of rhotic consonants as a feature in and of itself. It circumvents the issue by acknowledging the existence of the class but does not help explain it, nor how a '[+ rhotic] consonant' could be predicted. It also may not be very useful to apply cross-linguistically, given that some consonants, such as phonetic obstruents, would be [+ rhotic] in one

language and [- rhotic] in another. We will now move on and consider some (partially) 'substance-free' models' attempts at defining rhoticity.

4. OVERVIEW OF 'SUBSTANCE-FREE' PHONOLOGY

In a conception of radically substance-free phonology outlined by Blaho (2008), features are no longer substantive in the sense that they do not refer to phonetic properties like acoustics, articulation, or other physical properties. Instead "features model the fact that the segments possessing them act as a class in phonological processes" (ibid.). In this way, the phonological feature is abstract, and segments can trigger the feature but are not confined to particular substantive properties. An important aspect of Blaho's approach is that radically substance-free phonology does not actually "exclude the possibility that some or all features of a language have a fixed phonetic interpretation." (Blaho, 2008:23) Blaho acknowledges that phonetic factors play a significant diachronic role in shaping sound systems. The point that Blaho wants to make is the importance of removing substance from language non-specific understandings of phonology (ibid.). This does not exclude the likelihood of language-specific contexts behaving in ways which could more adequately be described in terms of acoustic, articulatory, or other physical ways.

Odden (2006) also claims that phonological theory does not need any substantive definition at all. In other words, that all fundamental parts of phonology (i.e. phonological primitives) have no phonetic content which is integral and that phonological grammar does not need to refer to anything outside of this 'substance-free' conception of the phonological primitives. This view which both Odden (ibid.) and Blaho (2008) uphold is called Radical Substance-Free Phonology.

In summary, a radically substance-free model of phonology has an important advantage for specifically modeling rhoticity in that it allows for the phonetic variety of rhotic consonants observed. Neither Blaho (ibid.) nor Odden (2006) supply a specific analysis of rhoticity in their texts, but other attempts at partial or fully substance-free approaches have been made. We begin with Wiese (2001).

4.1 Wiese's (2001) potentially hybrid model with revised sonority hierarchy

Wiese (2001) analyses rhotic sounds in relation to phonotactics and proposes this to be done with emphasis on language-specific contexts. A notable observation that Wiese makes is that if there's syllabic consonants in a language, and the language has rhotic consonants, then there will be instances of syllabic rhotic-sounds. They conclude that the common core for all the possible realisations of rhotic consonants is most likely to be found in terms of syllable prosody, with reference to the sonority hierarchy. In order to do so however, they say that the conception of the sonority hierarchy needs to be revised and propose changing it from being defined in terms of segmental features to an abstract ordering relation independent of segmental features. In this way, Wiese removes the *language non-specific* substance from the sonority hierarchy, in favour of *language-specific* formulations.

Wiese states that the problem lies in the variation of rhotic consonants, which ranges from trills of all kinds, taps (also including for example the alveolar lateral tap), fricatives, and approximants (even the labio-dental approximant) (ibid.). This makes it impossible to arrive at a phonological class of 'rhotics' through segmental features, as the variation in surface form is too great.

Their prosodic approach argues that "the *phonotactic* properties of [rhotic consonants] in general, and the general instability of [rhoticity] with respect to any segmental properties" (Wiese, 2001:349) could be a common feature of rhoticity. Here Wiese argues that the essence of rhoticity lies in the domain of its distributional patterning (i.e. that rhoticity is a prosody and can only be defined in terms of its common phonotactic behaviour). Their proposed prosodic definition of rhotic consonants is that rhoticity is the position on an abstract *language non*-specific sonority hierarchy; more specifically, the position between laterals and glides (Figure 4).

Figure 4: "An abstract sonority hierarchy" (Wiese, 2001:357)

P1 < P2 < P3 < **P4** < P5 < P6

Under this conception of the sonority scale, Wiese claims it is not the features and natural classes defined by them which constitute the basis of the points on the scale. Instead, the points on the scale (defined by the ordering relation) are primes which define classes – at least for rhotic consonants. This is advantageous because by removing the need for segmental features (and thus the substance) in the language non-specific scale, it can account for the high phonetic variability of rhotic consonants. Then the language non-specific scale can act as a kind of template which allows for language-specific hierarchies to be described on the basis of "observable sequential patterns of sounds within the syllable" (ibid.) to determine the position of relevant classes on the scale. A summary of the conclusions drawn by Wiese in this paper are as follows:

Figure 5: Wiese (2001:360) conclusions on rhoticity

1. *Being an /r/ is what matters in a phonological system, while the type of /r/ in terms of segmental features is often systemically irrelevant (and subject to wide variation and rapid change).*
2. *Synchronic and diachronic changes in r-quality are frequent and ubiquitous and do not affect the phonological system.*
3. *On the other hand, /r/ is non-arbitrary in terms of its phonotactic patterning. Its constant appearance between vowels and other consonants leads to the conclusion that /r/ is a prosody.*
4. */r/ is therefore best defined as a point on the sonority scale. This point can be located precisely through observable sequential patterns of sounds within the syllable.*
5. *The concept of the sonority scale needs to be revised. Points on the sonority scale are nothing but relative positions on this scale, not to be defined by segmental major class features.*

Wiese's definition relies on a revised concept of the sonority scale. The revision attempts to resolve the issues in the scale by removing the substance from any *language non-specific* definition, instead stating that the particular substance of a sonority hierarchy can only be found *language specifically*. A further consequence of this definition, which may be a challenge to the proposed solution is that because of the specific prosodic approach (i.e. on the basis of sonority and syllable structure), the model can struggle to account for certain extra-syllabic rhotic consonant behaviour. As Wiese explains, there are some initial rhotic-obstruent clusters, for example in Polish and Russian, which are more difficult to accommodate. Some of these r-obstruent clusters in Polish are given as examples (Figure 6).

Figure 6: rhotic-obstruent clusters (Wiese, 2001:361)

[rt, rd, rd^{z}, rv, rz̨, rz̨n, rz̨ɲ]

Some words including rhotic-obstruent clusters include *rdza* ('rust'), *rwać* ('tear'), *rdest* ('knotweed'), *rżeć* ('say'), *rżnąć* ('butcher'), and *rtęć* ('mercury'). Since these kinds of clusters are only in word-initial position, and because of certain historical-material reasons (See Jaworski, 2021) it seems to suggest 'extra-syllabicity' (Wiese, 2001). In that way, the syllable-based principles of a revised sonority hierarchy are no longer relevant. An important take away from Wiese's analysis is that "The main proposal of this paper is that the rhotics as a class are to be characterized as a prosody, crudely put, as 'P4' [see Figure 4]. However, this is no substitute for the need to *give a featural specification to individual phonemes [which are rhotic] in a language*" (Wiese, 2001:361; italics mine). In this way, Wiese's model still relies on a semi-substantive basis, at least in any language-specific context, and especially in the case of 'extra-syllabic' rhotic consonants. Another reason given is because the model can struggle to categorise rhotic consonant behaviour in languages with certain 'simple' syllable structures; the example Wiese supplies is a "prototypical language, namely one with CV- and CVC-syllables only, and with one phoneme /r/" (Wiese, 2001:361). In such a case /r/ being categorised according to the given model in Figure 4 is not possible because it coexists in the same position as all other consonants. On this basis, an inevitable prediction of the Wiese model is that in such a language there are either: no rhotics; or, if there are, they do not display the same kind of variability that rhotics in other languages do. As such, Wiese argues that "This individual consonant needs to be described by adequate feature specifications, and any variation of this r-sound too" (Wiese, 2001:361). But what constitutes 'adequate' is not quite explained, and the consequence of this approach is that it also seems to split rhotics which appear in syllables from extra-syllabic rhotics, where the former are classified according to phonotactic behaviour but the latter according to substantive accounts of its properties. For the given Polish example, this means "an account of Polish phonology needs to give a featural description of the phoneme /r/ in this language, and it is this /r/ which we can refer to in a discussion of its clustering properties" (Wiese, 2001:361).

For Wiese, the substantive account of the extra-syllabic /r/ can exist side by side with the (sort of) substance-free phonotactic approach to /r/ within the same language. This seems to imply that the phonological stability of rhotic consonants ceases to apply outside of what is considered a 'syllable'. This raises the question, how might words with so-called extra-syllabic rhotic consonants behave when loaned into a language – i.e. with similar relevant context to the French to Moroccan-

Arabic and Tashlhiyt Berber example in Section 2.1.2? This question is outside of the scope of this thesis, and could perhaps be more generally framed as an investigation into the 'syllable problem' and its consequences. In any case, the distinction between two 'kinds' of rhotics that Wiese references seems to further exhibit how the tension between phonetic variation and phonological stability is at the heart of the challenge to classify rhoticity coherently and cohesively.

As Sylwester Jaworski (2021) explains in their paper *The obstruentised rhotic of Polish: An acoustic study*, the existence of the extra-syllabic (or as Jaworski calls them, obstruentised) rhotic in the Polish context was an extended historical and material process. In the Late Proto-Slavic period short vowels underwent qualitative change, giving rise to mid-open and mid-closed vowels (called *jers*), the jers further changed and as the weak-jers were dropped (which seems to have happened by the end of the 12th century), certain phonotactic constraints on consonant clusters (i.e. the tendency for rising sonority) were no longer applicable (ibid.). This gave rise to to the syllabic and obstruentised rhotics which seem to exist today.

In this way, from a substance-free perspective, if you acknowledge the specific diachronic context of extra-syllabic rhotic consonants, it would be unnecessary to still categorise rhotic consonants into two separate 'kinds' (with one that is substantive) as Wiese (2001) seems to do. Despite this, a language-specific approach to rhoticity does have its advantages in necessitating the investigation of such context.

4.2 Substance-free approach by Chabot (2019)

Chabot (2019) argues the impossibility of substantive models on the basis of the wide variety of articulatory, acoustic, and physical properties that seem arbitrary. They further claim that that the phonetic instantiation of a rhotic cannot be predicted; it can only be determined based on their "phonological behaviour: their status as sonorants, their procedural stability, and their diachronic stability" (Chabot, 2019:18). In this way, Chabot also recognises the phonetic variability and the phonological stability in rhotic consonants. Chabot describes the need for an interface between phonetics and phonology to be able to map the arbitrary instantiations with the non-arbitrary behaviour.

> "In a theory of phonology that allows for such arbitrary realizations, there must be an interface between the phonetics and the phonology that transforms phonological primes into phonetic objects, and that is capable of handling an arbitrary relationship between the two." (Chabot, 2019:16)

> "In order to avoid stipulating that the interface treats some classes in an arbitrary fashion and others in a phonetically natural fashion, the position adopted here is that the phonetics-phonology interface is capable of arbitrary realizations of all phonological objects." (Chabot, 2019:16)

In this way Chabot comes closest to a substance-free approach to dealing with rhoticity. However, the key problem that they identify with this model is the counter-intuitive nature of 'arbitrary' relationships, which they then claim is resolved given a modular theory of mind:

> "In a modular framework, cognition is viewed as work carried out by a series of modules, each of which uses its own vocabulary and transmits inputs and outputs to other modules via interfaces known as transducers (Pylyshyn 1984; Reiss 2007), and the relationship between phonetics and phonology must be arbitrary. This formalizes the intuition that phonology deals in the discrete while phonetics deals in the continuous." (Chabot, 2019:16)

The model adopted by Chabot (2019) is known as Spell-Out, which is a language-specific operation that "tells phonetics what to do with the information it receives from phonology – spell-out is the locus of phonetic variation" (ibid.). Chabot acknowledges that phonology and phonetics are tied to one another, but says that when exploring phonological behaviour, the phonetic substance needs to be removed first. "While "natural" (i.e. typological, anatomical and physiological, etc.) concerns may be useful in phonetics, they should not be included in theories of phonology, as shown by rhotic evidence." (Chabot, 2019:18) Chabot's general definition of rhoticity is supplied here:

Figure 7: Chabot (2019:11) definition of rhoticity

1. *A rhotic is a segment which may occupy specific syllable positions—that of the secondary element in branching onsets or codas—and functions as a sonorant regardless of its phonetic instantiation.*
2. *A rhotic demonstrates procedural and diachronic stability: its phonotactic status as a sonorant does not change even when the rhotic is subject to variation due to either diachronic evolution or synchronic processing—for example even if the rhotic is realized as an obstruent.*

The definition in Figure 7 is on its own would seem to once again run into challenges faced by Wiese (2001). For example, by limiting rhotic segment behaviour to "the secondary element in branching onsets or codas" (Chabot, 2019:11), it would seem challenging to account for extra-syllabic behaviours; the CV language problem also seems to apply. They acknowledge the exception of Polish "trapped consonants" (ibid.), refers to the same consonants considered "extra-syllabic" by Wiese (2001), but Chabot (2019) does not seem to provide an explanation of it. Nor does Chabot list any examples of the obstruentised rhotic consonant clusters in their examination of Polish rhoticity.

4.3 Arguments against purely substance-free by Currie Hall (2023)

On the topic of substance-free vs. substantive models of phonology, Currie Hall (2023) argues that phonetic substance is still relevant and necessary; for instance, in co-articulations in language-specific contexts. However, even as Hall argues, "it is possible for features to have phonetic content, and even to be universal, without identifying a universal phonetic boundary between their positive and negative values. To be phonetically substantive, a feature need only identify a phonetic dimension of contrast." (Currie Hall, 2023:125). In other words, Hall argues that substance-free approaches to phonology do not allow for phonetic content to play a role, even when the nature of the phonetic dimension of contrast is not necessarily binary. Hall goes on to acknowledge that there are certain properties which are not able to be characterised in phonetic terms, for instance

syllabification. In this respect, Hall is arguing for what they see as a mixed-model of sorts; where phonetic substance is still able to play a role, but that it still allows for (potentially) phonology-heavy representations to be described:

> "The crucial insight that underlies substance-free approaches to phonology is the observation that the phonetic properties of speech sounds do not dictate their phonological behaviour. But while this observation motivates the positing of abstract formal phonological representations and computation, it does not necessarily warrant removing phonetic substance from phonology altogether." (Currie Hall, 2023:122)

The key to Hall's 'partially' substance-free approach is in making (or rather *not* making) the distinction between positive and negative values of a phonetically substantive contrast. This seems difficult to attempt to apply to rhoticity. As we have already shown, there is no single "phonetic dimension of contrast" which could possibly account for the range of rhotic consonants, even "without identifying a universal phonetic boundary between their positive and negative values" (Currie Hall, 2023:125). At best, this places rhoticity in a similar realm as syllabification for Hall. In other words, a phonological representation that is "unique to phonology, or [is] shared with other cognitive modules, but which [is] not directly grounded in phonetics" (Currie Hall, 2023:109).

One of the key aspects of Hall's argumentation is that the critiques of substantive models have led to "theories in which features are not universal or do not (necessarily) have phonetic content (e.g. Odden 2006; Blaho 2008; Mielke 2008), or in which their phonetic content is entirely opaque to the phonological component of the grammar (e.g. Hale and Reiss 2008)." (Currie Hall, 2023:110) When reflecting on Blaho (2008), Wiese (2001), and Chabot (2019), this seems only partly true. Substance-free approaches dismiss that the phonetic content is able to define the phonological class in language non-specific context. However, the point is for the abstract behavioural features (i.e. in phonology) to be more, or in face principally, important in defining a phonological class rather than the phonetic substance. In language-specific contexts, there will be cases where the phonetic content is such that it is possible to describing the sound system on that basis alone without running into many issues (at least on a surface level). The point is not to bind or restrict the definition of a phonological class to the phonetic content. When it comes to the phonetic variability and the phonological stability of the class of rhotics in particular, it would seem that a substance-free approach is more appropriate.

5. CONCLUSION

Language is in a constant state of flux and interaction. Rhoticity is a prime example with its diachronic and synchronic phonetic variety, despite still displaying some kinds of consistency in its phonological behaviour. Therefore any model of rhoticity must consider it in its full potential as a living, moving, complexity, and allow for such change and interaction. Otherwise the model will immediately become far *too narrow* (as in the case of the 'strict' feature theory) or far *too broad* (in the case of the 'family resemblance' model). In general, the difficulty in defining rhoticity comes from the tension between the phonological stability (i.e. common clustering, WIRA, and loanword tendencies) and the wide phonetic variation. The challenge seems to lie especially in identifying

both factors as well as the interaction between them to cohesively and coherently define the class of rhotics.

The substantive based models take a synchronic ‘slice’ and try to define an inherently fluid and ‘living’ aspect of language without much regard to the existence of, nor the underlying reason that there are so many phonetic forms. From a historical-material perspective, there are so many rhotic consonants because of their high potential for interaction and this is influenced by their phonological behaviour (generally as sonorants). Substantive models also struggle to incorporate the phonological stability of rhotic consonants into their definiton. This is why with substantive models you will always have ‘exceptions to the rule’ because a substantive-based ‘rule’ is incapable of accounting for the diversity of phonetic instantiations nor the common behavioural tendencies.

The ‘family resemblance’ model is able to account for the phonetic variation by simply adding more substantive features to its ‘list’. This is a problem because while it does allow for a description of any kind of surface level form, it becomes ever more complicated for a learner. Furthermore, neither the ‘strict’ nor the ‘family resemblance’ models require an explanation of the historical-material origin of such forms – it does not consider the phenomenon in its complexity, in its motion, as ‘living’. In this way, purely substantive models are unable adequately model rhoticity.

The advantage of substance-free (and adjacent/similar) models is that they attempt to account for the wide cross-linguistic variety of rhotic consonants in one way or another (i.e. diachronically, synchronically, phonotactically, etc.) since they cannot rely on purely phonetic substance alone. This means they tend to avoid being too narrow. (Partially) substance-free approaches are better able to account for the diversity of surface forms because they do not limit classification to discrete acoustic, articulatory, or physical features. It seems that in order to give an adequate analysis, any substance-free model of rhoticity, when applied to a language-specific context, needs to be materially and historically informed of that context to determine whether the identified common phonological tendencies apply or if there exists phenomena which appear on the surface as unusual. This is because there still appear to be some issues regarding the identified common tendencies of rhotic consonants which seem inadequately resolved, such as the nature of ‘extra-syllabic’ rhotics in some languages. In general, it seems a dialectical approach is necessary in to adequately resolve remaining issues.

The main goals of this paper were to identify the source of the rhoticity’s complexity and to compare some of the existing research with a special focus on substance-free views and their potential importance to rhotic research. However, some of the relevant self-critiques of this thesis include the following points:

> → It is more of an overview of some parts of the research available, rather than a highly-detailed and fully-researched analysis with an answer to what rhoticity is exactly. For instance, did not cover or explore the relevance of element theory, nor explore the topic of ‘rhoticised vowels’ and/or ‘vocalised rhotics’.
>
> → It would be good to find more cases like that of French loanwords in Moroccan-Arabic and Tashlhiyt Berber to better support the argument made about phonological stability being prioritised over phonetic closeness.

In conclusion, the topic of rhoticity inevitably touches on many aspects of phonetics and phonology, but the development of the research seems to at least indicate that purely substantive approaches hold back an understanding of rhoticity and there should be more focus on the behaviour of rhotic consonants. It would be interesting to explore how words with so-called extra-syllabic rhotic consonants behave when loaned into a language – i.e. with similar relevant context to the French to Moroccan-Arabic and Tashlhiyt Berber example in Section 2.1.2. This could help explore some of the 'exceptions to the rule', such as 'extra-syllabic' rhotic consonants.

BIBLIOGRAPHY

Blaho, Sylvia. (2008). The syntax of phonology: a radically subtance-free approach. Tromsø: University of Tromsø dissertation.

Chabot, A. (2019). What's wrong with being a rhotic? Glossa, 4(1). https://doi.org/10.5334/gjgl.618

Clements, George N. (1985) The geometry of phonological features. Phonology Yearbook 2: 223-250.

Collins, Beverley; Mees, Inger M. (2003) [First published 1981], The Phonetics of English and Dutch (5th ed.), Leiden: Brill Publishers, ISBN 9004103406

Currie Hall, D. (2023). Contrast and content in phonological features: Substance use in moderation. Primitives of Phonological Structure. https://doi.org/10.1093/oso/9780198791126.003.0005

Hale, M., & Reiss, C. (2008). The Phonological Enterprise. Oxford University Press.

Halle, Morris (1995) Feature geometry and feature spreading. Linguistic Inquiry 26: 1-46.

Ikeda, Elissa & Sigrid Lew. (2017). The case for alveolar fricative rhotics with evidence from Nusu. Linguistics of the Tibeto-Burman Area 40(1). 1–39. DOI: https://doi.org/10.1075/ltba.40.1.01ike

Jaworski, S. (2021). The obstruentised rhotic of Polish: An acoustic study. Beyond Philology, 18(1), 47–75. https://doi.org/10.26881/bp.2021.1.03

Labrune, L. (2021). Word-initial rhotic avoidance: a typological survey. GLOSSA, 6(1). https://doi.org/10.5334/gjgl.922

Lahrouchi, M. (2019). Not as you R: Adapting the French rhotic into Arabic and Berber. Structures Formelles Du Langage. https://hal.archives-ouvertes.fr/hal-02420958

Mateus, Maria Helena & d'Andrade, Ernesto (2000). The Phonology of Portuguese ISBN 0-19-823581-X

McCarthy, John J. (1988) Feature geometry and dependency: a review. Phonetica 45: 84-108.

Odden, David. (2006). Phonology ex nihilo. Presentation at University of Tromsø phonology meeting, 6 Dec. 2006.

PhȦm, B., & McLeod, S. (2016). Consonants, vowels and tones across Vietnamese dialects. International Journal of Speech-Language Pathology, 18(2), 122–134. https://doi.org/10.3109/17549507.2015.1101162

Pylyshyn, Zenon W. (1984). Computation and cognition: Toward a foundation for cognitive science. Cambridge, MA: The MIT Press.

Reiss, Charles. (2007). Modularity in the "sound" domain: implications of the purview of universal grammar. In Gillian Ramchand & Charles Reiss (eds.), The Oxford handbook of linguistic interfaces, 53–79. Oxford: Oxford University Press. DOI: https://doi.org/10.1093/oxfordhb/9780199247455.013.0003

Sebregts, Koen. (2014). The sociophonetics and phonology of Dutch r. Utrecht: Utrecht University dissertation.

Straka, Georges (1965). "Contribution à l'histoire de la consonne R en français". Neuphilologische Mitteilungen. 66 (4): 572–606. JSTOR 43342245.

Vendelin, Inga & Sharon Peperkamp. (2006). The influence of orthography on loanword adaptations. Lingua 116: 996-1007. DOI: 10.1016/j.lingua.2005.07.005

Wiese, Richard. (2001). The phonology of /r/. In Tracy Alan Hall (ed.), Distinctive feature theory, 335–368. Berlin, New York: Walter de Gruyter.