

PILOT STUDY

RHOTIC VARIATION IN COSTA RICAN SPANISH: A PRELIMINARY ACOUSTIC ANALYSIS

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ABSTRACT

The class of sounds classified under the umbrella term “rhotic” demonstrate considerable variability across languages, dialects, and speech styles. This is no exception in Spanish, where rhotics have received considerable attention. Among Spanish dialects, the pronunciation of rhotics in Costa Rican Spanish is a highly salient feature of this variety, where the standard trill /r/ and tap /r/ are often assibilated or realized as fricatives. A number of studies have examined Costa Rican rhotics from both phonological and phonetic perspectives, yet the results of these studies have been inconclusive. Notably absent from these studies are acoustic analyses of rhotic production, instead relying on impressionistic transcriptions which risk glossing over phonetic detail. This pilot study revisits the question of rhotic variation in Costa Rican Spanish by analyzing five sociolinguistic interviews with native speakers of Costa Rican Spanish. Using acoustic analyses of rhotic tokens, I propose a rhotic inventory for this variety which includes approximant and fricative variants in addition to the tap and trill. Additionally, I compare my proposal to previous accounts and propose a potential explanation for the distribution of rhotic variants through an Articulatory Phonology framework, suggesting that variation can be explained as a result of gestural weakening and co-articulation. The study presents preliminary conclusions regarding socioeconomic factors, suggesting areas for future research, including the effect of age and gender on rhotic variation. Overall this work contributes to the understanding of the Costa Rican



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variety of Spanish, considering both linguistic and extralinguistic factors as potential predictors of variation.

RESUMEN

La clase de sonidos que se clasifican como “róticas” muestran una gran variabilidad entre idiomas, dialectos y estilos. Esto incluye el español, donde las róticas han recibido considerable atención. Entre los dialectos del español, la pronunciación de las róticas en la variedad costarricense es un rasgo altamente saliente: en esta variedad, las vibrantes simple /r/ y múltiple /r/ suelen realizarse como asibiladas o fricativas. Numerosos estudios han examinado las róticas en el español costarricense desde perspectivas fonéticas y fonológicas, pero los resultados no han sido concluyentes. Además, los estudios existentes no han incorporado análisis acústicos, valiéndose de transcripciones impresionistas que pueden ocultar detalles fonéticos importantes. Este estudio piloto se enfoca en la variación rótica del español costarricense con base en el análisis de 5 entrevistas sociolingüísticas con hablantes nativos del español de Costa Rica. Usando análisis acústicos de las róticas, propongo un inventario para esta variedad que incluye variantes aproximantes y fricativas. Además, comparo mi propuesta a otras propuestas previas y, con base en una explicación de la distribución de las róticas fundamentada en la Fonología Articulatoria, sugiero que la variación rótica se puede explicar como el resultado de procesos de lenición y de coarticulación. El estudio presenta conclusiones preliminares con respecto a algunos factores socioeconómicos y plantea áreas para estudios futuros, incluyendo el efecto de la edad y del género en la variación rótica. En suma, este trabajo contribuye al entendimiento de la variedad costarricense del español, considerando tanto factores lingüísticos como extralingüísticos como predictores posibles de la variación.

KEYWORDS

Costa Rican Spanish; Rhotics; Sociophonetics.

PALABRAS CLAVE

Español de Costa Rica; Róticas; Sociofonética.

INTRODUCTION

It is well documented that the diverse class of sounds classified under the umbrella term “rhotic” demonstrate considerable variability across languages, dialects, and speech styles (BRADLEY, 2006). This is no exception in Spanish, where rhotics have received considerable attention, both because of their questionable phonemic status and variable phonetic realizations (HUALDE, 2004; LIPSKI, 2012). Among dialects of Spanish, the pronunciation of rhotics in Costa Rican Spanish¹ is a highly salient feature of this variety, where the standard alveolar trill /r/ and alveolar tap /r/ are often assibilated or realized as fricatives. A number of studies have examined Costa Rican rhotics from both phonological (CHAVARRÍA, 1951; AGÜERO CHAVES, 2009) and phonetic (CALVO SHADID, 1995; GAÍNZA, 1976; QUESADA PACHECO, 2015; VÁSQUEZ CARRANZA, 2006) perspectives, yet the results of these studies have yielded inconclusive results, offering different hypotheses for both the phonemic representation of the rhotics of this variety and how best to characterize their differing phonetic realizations. Notably absent from these studies are acoustic analyses of rhotic production, instead relying on impressionistic transcriptions which, as Bradley (2006) notes, risks glossing over important phonetic details. Additionally, few studies have examined the social and linguistic factors which may condition rhotic variation in Costa Rican Spanish, suggesting the need for further research. The present study is an attempt to begin filling these gaps by examining both the phonetic realizations of rhotics in Costa Rican Spanish and the factors which condition variation. In what follows, I will summarize the existing literature regarding rhotic variation in Spanish in general and in Costa Rican Spanish in particular, before discussing the results of a study designed to further explore the use of rhotics in this variety and the linguistic and extralinguistic factors that condition their use. Through the incorporation of an acoustic analysis of rhotic tokens, I propose a rhotic inventory and distribution for Costa Rican Spanish and compare them to those proposed in previous studies. This pilot study offers preliminary conclusions which suggest that there is still much to be learned regarding rhotic variation in Costa Rican Spanish, particularly in terms of the extralinguistic factors that condition variation and how these operate together with grammatical constraints.

1 Here and elsewhere, “Costa Rican Spanish” should be understood as shorthand for the variety of Spanish spoken in the country’s central valley, including the large metropolitan area that encompasses the capital, San José, and the surrounding cities of Cartago, Alajuela, and Heredia, where roughly 70% of the country’s residents live. The rhotic variants discussed here are not typically found on the country’s Caribbean coast or in the northwestern province of Guanacaste. I discuss the issue of intra-country dialectal variation briefly below.

1. LITERATURE REVIEW

Before discussing rhotic variation in Spanish, it is worth recognizing that the use of the term ‘rhotic’ to categorize a variety of disparate speech sounds runs the risk of reifying the category and suggesting a unity to a class of sounds that are not connected by any single criterion. Unlike other natural classes, the sounds captured under the umbrella term ‘rhotic’ differ not only in manner and place of articulation, but also have limited acoustic similarity, and, in many cases, have little in common except a shared historic orthography (LADEFOGED; MADDIESON, 1996). Some have suggested a lowered third formant to be a possible unifying characteristic of rhotic sounds; however, as Ladefoged and Maddieson (1996) note, not all rhotics share this characteristic, and rhotics with differing places of articulation may have significantly different formant structures.

Despite differing phonetic manifestations, rhotic sounds often behave similarly phonologically. Lindau (1985) suggests that instead of a natural class, rhotics are perhaps better understood in terms of “family membership.” Figure 1, below, illustrates Lindau’s proposal, where the different phones of the rhotic family are connected by virtue of different relationships. As one example, the alveolar tap and trill are connected by a shared closure duration (a_5) and shared place of articulation (a_2), while the trill and approximant are connected by similar spectral characteristics (a_3 , a_5). Given the heterogenous nature of the sounds within the category, it is perhaps unsurprising that there is significant rhotic variation both across and within languages and across speech styles.

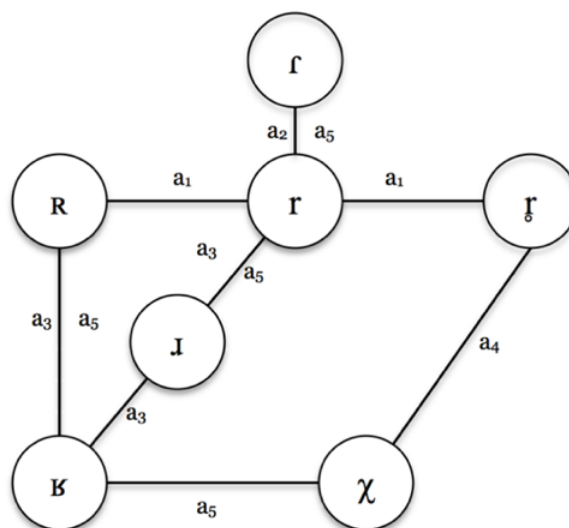


Figure 1. Rhotics grouped by family membership (LINDAU, 1985).

1.1. RHOTICS IN SPANISH

As mentioned above, Spanish is no exception to the generalization that rhotics present significant variation across languages, dialects, and speech styles. Before turning to variation, however, we begin with a discussion of “standard” Spanish. While there are several proposals regarding the phonemic inventory of rhotics in Spanish, it is often assumed that there are two phonemes, the alveolar trill /r/ and the alveolar tap /r/ (CAMPOS-ASTORKIZA, 2012; LIPSKI, 2012). As mentioned above, the alveolar trill and tap share place of articulation and are characterized by brief occlusions in airflow which appear as breaks in the formant structure, as can be seen in Figure 2:

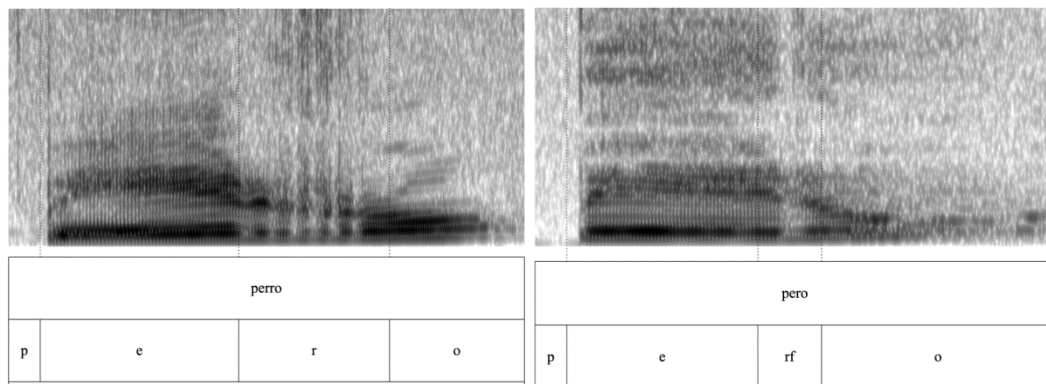


Figure 2. Spectrograms of *perro* [pe.ro] on the left, and *pero* [pe.ro] on the right. These spectrograms and those that follow all come from personal data collected for the purposes of the present study.

While the duration of the individual occlusions of the tap and the trill has been shown to be similar, the physical mechanism for the production of the tap and trill are distinct. Taps are characterized by a single, short closure in which the tongue moves towards the alveolar ridge in a ballistic motion, which can be seen as a break in the formant structure in the right panel of Figure 2. The trill, on the other hand, is characterized by the vibration of speech organs due to favorable aerodynamic conditions, in which a stream of airflow is passed through a sufficiently narrow aperture, causing the tongue tip to make repeated contact with the alveolar ridge, visible as 6 breaks in the formant structure in the left panel of Figure 2. Importantly, “the aperture size and airflow must fall within critical limits for trilling to occur, and quite small deviations mean that it will fail” (LADEFOGED; MADDIESON, 1996, p. 217). In speech, this requirement for optimal aerodynamic conditions produced by complex articulatory gestures is often not satisfied, explaining the cross-linguistic tendency of trills to vary with non-trilled variants.

In terms of distribution, in Spanish the tap and the trill are contrastive only in intervocalic position. Elsewhere they are in complementary distribution: setting aside dialectal variation for the moment, trills are found in word-initial position and in onset

position after heterosyllabic consonants, while taps appear in second position in onsets of consonant clusters. The distribution in word-final/coda position is variable but never contrastive and depends on a number of factors including dialect and speech rate. Campos-Astorkia (2012) notes that in the presence of a following vowel that causes resyllabification, only the tap occurs, while the trill may surface in emphatic speech or prior to a following consonant or pause.

1. Contrast cases: Intervocalic position

a.	trill:	<i>perro</i>	[pero]	'dog'
b.	tap:	<i>pero</i>	[pero]	'but'

2. Predictable fixed cases

a.	Word initial: trill	<i>ritmo</i>	[ritmo]	'rhythm'
b.	1 st in onset, /C_: trill	<i>Enrique</i>	[enrike]	'Enrique'
c.	2 nd in onset: flap	<i>precio</i>	[presjo]	'price'

3. Predictable variable cases

a.	Coda, intervocalic, resyllabification: tap	<i>m[ar a]dentro</i>		'open ocean'
b.	Coda, pre-consonant: trill	<i>m[ar b]rava</i>		'rough waters'

Table 1. Spanish rhotic distribution (adapted from BONET & MASCARÓ, 1997)

Historically there have been a number of different approaches to explain this fairly complex distribution. Beginning in the 1960s, researchers in generative phonology used SPE formalism to elaborate transformation rules that would account for the distribution. These works typically assumed a single underlying phoneme /r/ which surfaced as [r] depending on the phonological context. For example, Harris (1983) postulated a geminate flap /rr/ that would surface as [r] intervocalically and word initially based on the rules in Table 2.

a. r → r / [R] ___	tap becomes trill after rhotic
b. r → ø / ___ r	delete tap before rhotic
c. r → r / [+cons]_ [___	tap becomes trill after heterosyllabic consonant
d. r → r / x[___	tap becomes trill word-initially

Table 2. Phonological rules for Spanish rhotics (from BRADLEY, 1999)

The ordered rules in (a) and (b) account for surface trills in intervocalic position. First the second member of the geminate tap becomes a trill, and then the first member of the geminate is deleted. Rules (c) and (d) also account for surface trills after heterosyllabic consonants and word-initially.

While SPE approaches were able to account for surface trills in most positions, they did not satisfactorily account for rhotics in coda position where both taps and trills surface. Additionally, while these approaches were descriptively adequate, they lacked explanatory power by failing to postulate *why* Spanish and the other Iberian Romance languages demonstrate this particular distribution of contrastive rhotics intervocalically and predictable cases elsewhere. As a potential remedy to this problem, Bonet & Mascaró (1997)

reversed the proposal of a single underlying tap and instead suggested a single underlying rhotic which is unspecified in all positions except intervocalically, where it is marked with a flap feature [+f]. Elsewhere, surface taps and trills are derived from sonority principles, based on the sonority scale in Table 3. Assuming that the trill patterns with obstruents and is minimally sonorous, and that the tap patterns with glides, they suggest rules that prefer large sonority jumps syllable-initially, and small sonority falls syllable-finally, yielding the distribution shown in Table 4:

0 obstruents trill	1 nasals	2 laterals	3 glides tap	4 vowels
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Table 3. Sonority scale (from BONET & MASCARÓ, 1997).

*[rV]	(3 → 4)	[.rV]	(0 → 4)	word-initial trill
*[Cr]	(0 → 0)	[Cr]	(0 → 3)	complex onset tap
*[Vr]	(4 → 0)	[Vr]	(4 → 3)	word final tap

Table 4. Rhotic distribution based on sonority (from BONET & MASCARÓ, 1997).

While the sonority approach provides more explanatory power than traditional SPE approaches, neither is free from problems. Particularly, while both SPE and sonority approaches can explain the distribution in standard Spanish, they fail to account for the considerable variation across dialects which, in some cases, appears to be replacing canonical productions with innovative realizations (LIPSKI, 2012; CAMPOS-ASTORKIA, 2012). Among the phonological contexts mentioned above, rhotics in consonant clusters in onset position demonstrate considerable variation.² In standard Spanish, consonant clusters with rhotics are typically produced with an intrusive vowel that separates the consonant and the rhotic. The left panel of Figure 3 illustrates this process of vowel intrusion in the production of the word *frases* (/fra.ses/). In the spectrogram the alveolar tap can be seen as a slight break in the formant structure, with the intrusive vowel immediately following the frication noise of the initial /f/ and before the tap closure.

In addition to vowel intrusion, in a number of Spanish dialects, the alveolar tap /r/ alternates with an assibilated fricative variant in consonant clusters, in some cases accompanied by a loss of sonority and realized similarly to alveolar [s] (ALEZA IZQUIERDO; ENGUITA UTRILLA, 2010). In many cases, this assibilation is caused by the production of a rhotic without complete closure, yielding fricative and approximant variants which may be

² In Spanish phonology, possible complex onsets are formed by the voiced and voiceless obstruents /p, t, k, b, d, g/ as well as the voiceless fricative /f/, followed by a liquid, either /l/ or /r/. All of these stop-liquid clusters are possible in Spanish with the exception of /dl/, and /tl/, which is limited to a small number of loan words and is usually resyllabified to break up the consonant cluster (e.g., *atlántico* [a.tlan.ti.ko] > [at.lan.ti.ko]).

voiced or voiceless (CAMPOS-ASTORKIZA, 2012). The right panel of Figure 3 shows this assibilated variant in the word *otro* /o.tro/, realized here as [o.t̚ro]. Here frication is evidenced by energy concentrated in the upper part of the spectrum, and a lack of voicing is evidenced by a lack of periodic vocal pulses.

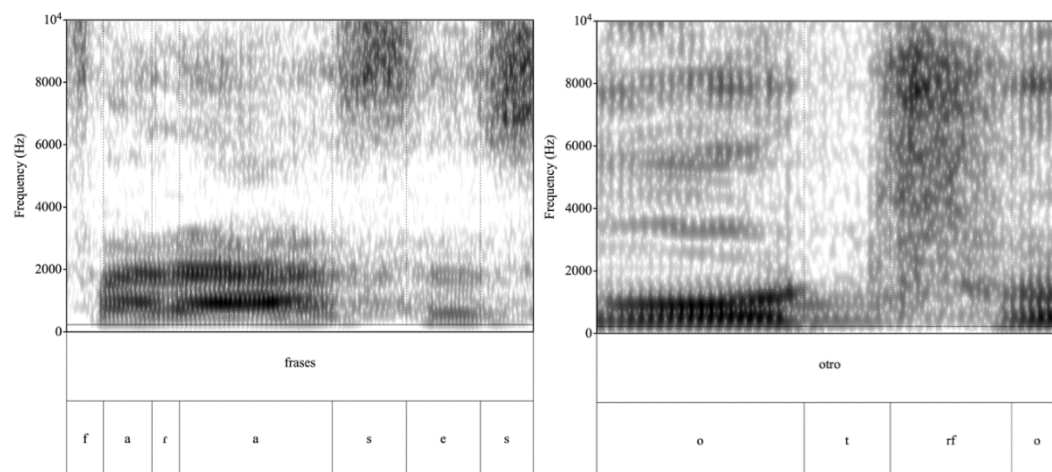


Figure 3. On the left, the spectrograms of *frases* /fra.ses/ realized with an intrusive vowel [f^əra.ses]. On the right, the spectrogram of *otro* /ot.ro/ with assibilation, with the rhotic realized as a strident fricative [o.t̚ro].

Bradley (1999, 2006) notes that rhotic assibilation proposes a problem for generative accounts of Spanish phonology, given that the distribution of the assibilated rhotic is different from both the tap and the trill in standard Spanish. Using Ecuadorian Spanish as a case study, Bradley notes that while assibilated rhotic alternate with the trill in word-initial position, they alternate with taps in complex onsets with coronal consonants but are unattested after labial and velar consonants and are prohibited in word-internal codas where both taps and trills may appear. To solve this problem, Bradley (1999) appeals to Articulatory Phonology (AP), an approach which takes the articulatory gesture as the phonological primitive (BROWNMANN; GOLDSTEIN, 1986). In this approach, vowel intrusion and assibilation are theorized to be two ends of an articulatory continuum. In the case of vowel intrusion, the consonant is fully released, and the intrusive vowel is the result of gestural anticipation of the vowel following the tap constriction. Assibilation, on the other hand, is a result of coarticulation. In the case of /tr/ clusters the gestures for /t/ and /r/ are on the same articulatory tier and as such partially overlap, yielding assibilation. Similarly, the assibilation of the trill can be explained in articulatory terms. Instead of coarticulation, Bradley suggests that underlying trills are weakened in the phonetics, and that this reduced gesture fails to produce both the adequate airflow and the sufficiently narrow aperture necessary to sustain vibration.

1.2. RHOTICS IN COSTA RICAN SPANISH

The above approaches have all had some success in describing the complex distribution of rhotics in Spanish as well as proposing explanations for variation in certain varieties. One variety that has received a significant amount of scholarly interest in rhotic variation from both a phonological and phonetic perspective is the Spanish spoken in the central valley of Costa Rica, and in fact, the variable pronunciation of rhotics has been suggested as the most salient feature of this variety (GAÍNZA, 1976)³. However, despite the relatively large number of studies investigating the Spanish of this relatively small country, few of these studies do more than describe the different rhotic variants and leave unanswered the questions of how these variants are distributed and how this variation can be accounted for. In what follows I summarize some of the previous work on Costa Rican rhotics, before describing the results of a pilot study which begins to fill in the gaps left by previous works by offering initial hypotheses as to the factors that condition variation in Costa Rican Spanish.

In one of the first formal phonological studies of Costa Rican Spanish, Chavarría (1951) offers an alternative to the standard distribution of Spanish rhotics outlined above, and proposes an alternative phonemic inventory for Costa Rican Spanish: /r/ and /r̄/⁴, the latter an “apico-alveolar groove spirant, tense and very fricative,” as opposed to the standard trill (p. 250). Additionally, he suggests voiced and voiceless allophones for the fricative, as well as an approximant variant for the tap in consonant clusters. In terms of distribution, he suggests that /r̄/ is found in all positions, usually voiced but voiceless in utterance-final position, while /r/ is found only word-medially. He notes that his analysis is “a somewhat radical departure from the usual one,” but that the nature of the Costa Rican data does not support the standard notion of phonemic status for the alveolar trill (p. 250). While Chavarría’s work is an important first approximation to the question of rhotic distribution in Costa Rican Spanish, he appears to assume that the spirant variant is categorical, an assumption that simplifies his analysis, but which is not borne out in the data, as will be shown further below.

3 Gaínza (1976) emphasizes the distinction between the variety of the central valley of Costa Rica and the varieties of Guanacaste, a large province in the northwest of the country, and Limón, the province comprising the country’s Caribbean coast, but claims that “the central region of the territory deserves the most attention from Spanish Linguistics in Costa Rica” due to “the importance of the urban centers in the diffusion of [linguistic] norms.” While the varieties of Guanacaste and Limón certainly warrant further study, the present study and the works summarized herein focus on the variety spoken in the central valley.

4 In the original, Chavarría (1951) uses /r/ for the alveolar tap, which he calls a “voiced single-flap alveolar trill,” and /R/ for an assibilated rhotic (p. 250). To avoid confusion with the standard IPA notation for the alveolar and uvular trills, I follow standard usage and use /r/ for the alveolar tap and /r̄/ for the spirant fricative.

Later works extended this trend of distinct proposals for the phonemic inventory of Costa Rican Spanish. Gaínza (1976) identifies /r⁵/ variation as the most important phonological problem presented by Costa Rican Spanish. He notes the assibilation of [r] in a number of phonological contexts, which, he argues, has resulted in the insertion of a new phoneme, /ʃ/ (a voiceless, acute-compact palatal consonant) into the Costa Rican inventory, and which has voiced, voiceless, and devoiced allophones. Additionally, he suggests that /ʃ/ also appears as an allophone of /r/ in consonant clusters. Gaínza's approach has much in common in terms of Bradley's analysis of Ecuadorian Spanish, proposing gestural overlap as a possible cause of rhotic variation. However, like Chavarría, he falls short of postulating any explanation for the unique distribution of rhotics in Costa Rican Spanish.

A more recent discussion of rhotics in Spanish comes from Agüero Chaves (2009), who maintains that the phonemic inventory of Costa Rican Spanish includes the two rhotics of standard Spanish, /r/ and /r̄/, but does admit that the trill is generally realized as a fricative [ɹ] in the area surrounding the Costa Rican capital, San José. Additionally, he suggests that the tap tends to be realized as a fricative [ɹ] before pauses and heterosyllabic consonants. Finally, he suggests that the consonant cluster [tr] is pronounced as an alveolar affricate due to rhotic assimilation with the previous consonant. Similarly, Quesada Pacheco and Vargas Vargas (2010) describe the phonetic variation across Costa Rica with data collected for the Ethnographic-Linguistic Atlas of Costa Rica. They find three allophones for /r/ and a preference for assibilation after /t/ in consonant clusters but not after /d/. In terms of the trill, they report a preference for approximant and retroflex variants, rejecting the idea that these variants are limited to vernacular speech and suggesting a change in progress across the country.

In addition to these formal approaches of determining the phonemic inventory of Costa Rican Spanish and attempting to identify the allophonic variants of this variety, some authors have approached the question of rhotic variation in Costa Rica from a sociolinguistic perspective. One of the first is Umaña Aguiar's (1990) study that examined rhotic variation in middle-class speech, finding a preference for approximant and fricative variants across phonological contexts, as well as a gender effect, with men more likely to use fricative variants. Additionally, this study found the tap to be nearly categorical in all consonant clusters except after /t/, which promoted fricative pronunciation; however, the study stops short of offering any explanation as to why coronal consonants may be more likely to cause frication than others.

5 Similarly, in the original, Gaínza (1976) uses nonstandard symbols, employing [r̄] for the alveolar trill, and [r̄] for the alveolar tap.

In a similar vein as Umaña Aguiar (1990), Calvo Shadid (1995) examined the phonetic variation of /r/ and /r/ in educated speech in San José, identifying *thirteen* variants of /r/ and /r/ and seven variants of /tr/ clusters. While this study is without a doubt one of the most extensive studies on rhotic variation in Costa Rica to date, it is fair to question whether this number of phonetic variants is too large to be useful. Additionally, by not offering acoustic correlates for the variants, the question of how so many were identified is left unanswered, and the choice to separate the observed variants into so many different categories makes it difficult to generalize across categories.

More recently, Vásquez Carranza (2006) sought to determine the distribution of assibilated rhotics in Costa Rican Spanish and hypothesized that speakers in the Central Valley of Costa Rica tend to use assibilated rhotics in most contexts with an underlying trill. The data collected for the study included a reading task in which six speakers read a list of words designed to elicit rhotics across a variety of phonological environments. However, participants in this study were explicitly instructed to “make use of their Costa Rican rhotics” (i.e., the assibilated variant). As such, the participants (unsurprisingly) produced assibilated rhotics in all contexts. Given the fact that participants were instructed to use the variant under examination, the results cannot be assumed to be reflective of actual speech.

Finally, Aguilar Porras (2014) examined rhotic variation in coda position, looking at the use of a retroflex approximant [ɻ] before dental and alveolar consonants and the phonological contexts that conditioned variable use. From his data he was unable to extract clear conclusions and suggested a possible case of free variation. However, by limiting the envelope of variation to rhotics before dental and alveolar consonants and excluding other conditioning contexts (e.g., labial, velar, etc.) it is difficult to determine whether the appearance of retroflex in these environments can be attributed to the phonological context or whether it is simply a result of the study design. Additionally, while the stated purpose of the study is to determine the factors that condition variation, only retroflex variants in coda position are reported, implying a categorical decision between underlying /r/ and surface [r] or [ɻ], when in reality /r/ in coda position may also be realized as a surface tap [r]. Neither do the results include a discussion of syllable-initial position where the underlying trill is assumed to be obligatory. Finally, like the studies discussed above, there is no information provided regarding how variants were identified and coded, which, given the potential difficulty of identifying rhotic variants in general and retroflex realizations in particular, makes the interpretation of the results more difficult.

2. METHODS

As seen from the review of the literature above, while a number of studies have sought to describe the rhotic variants in Costa Rican Spanish, there is still a lack of consensus regarding how best to describe the attested variants, and the lack of acoustic correlates along with certain methodological issues suggest the need for continued research. This situates the question of rhotic variation in Costa Rican Spanish within the larger picture of rhotic variation across Spanish dialects, where, as Campos-Astorkiza (2012) notes, innovative rhotic realizations are in some cases replacing canonical productions and need to be further explored. As such, the present study seeks to move beyond mere description of which variants appear where and attempts to begin to account for how this variation may be explained. Concretely, this study seeks to explore two main research questions:

1. What is the rhotic inventory of Costa Rican Spanish and what is its distribution? Additionally, how does this distribution compare to previous accounts of Costa Rican rhotics?
2. What are the linguistic and extralinguistic factors that condition variation?

With regards to the first research question, based on previous research, I hypothesize that fricative and approximant variants will be more common than trills overall. Additionally, I hypothesize that the distribution of Costa Rican rhotics will be more nuanced than previously suggested. Regarding the second research question, I hypothesize that phonological context and style will emerge as important predictors of variation, with non-standard variants being more common in conversational speech.

To answer these research questions, I conducted 5 sociolinguistic interviews with native speakers of Costa Rican Spanish. Each interview lasted for approximately one hour and included three sections: an informal conversation lasting roughly 45 minutes, the reading of a word list, and the reading of a short story. The conversation portion of the interview was open ended but followed the same general outline in which participants were asked about their work, followed by a discussion of Costa Rica and their observations of how the country has changed over the course of their life, and finally about any experiences outside of Costa Rica. When time permitted, I concluded by asking participants to identify some of the most salient features of Costa Rican Spanish, and to discuss other varieties of Spanish that they either liked or disliked.

The word list was designed to elicit rhotics in a variety of different contexts based on the distribution of the standard Spanish phonemic inventory outlined above. The list contained 100 items including 65 target items and 35 distractors. The target items included 22 items with word-initial consonant clusters (/pr, br, kr, gr/), 16 items with /r/ in

word or syllable-initial position, 12 items in word-final position, 8 items with [r] and [r̥] in intervocalic position, and 7 other items to elicit other categories. Words were presented to participants in a PowerPoint, embedded in the carrier phrase “*Digo _____ porque sí*” (“I say _____ just because”). The short story used for the experiment is entitled “*Rana ¿dónde estás?*” (“Where are you frog?”; MAYER, 2009), which elicited 60 trills and 60 taps in different contexts.

Recordings were made on a Zoom 4HN Pro recorder and were recorded at 44,100 Hz with a 16-bit sampling rate. Participants were equipped with an Audio Technica AT831R condenser lavalier microphone. Transcriptions were made in ELAN and TextGrids were aligned using the Montreal Forced Aligner (MCAULIFFE et al., 2017). The pronunciation dictionary was generated using a Spanish grapheme-to-phoneme model and was manually corrected to reflect the pronunciation of the Costa Rican variety.⁶ The aligned TextGrids were checked for accuracy by examining a subset of rhotic tokens, and intervals were hand-adjusted as necessary. Tokens were then coded for the independent variables shown in Table 5. Four independent variables—categorical age, birth province/province of residence, education, and sex—were not included in the analysis due to the relatively homogenous nature of the sample: all participants are from the same dialectal area, are college educated, 4 of the 5 are female, and 4 of the 5 are middle-aged. I discuss the limitations of the sample further in the conclusion.

Altogether, 8,495 tokens were collected across 5 speakers. Underlying intervocalic taps ($n=2,325$) were excluded from this analysis because they lie outside the envelope of variation (realized invariably as taps). Additionally, tokens from the tag question word *verdad* ‘right’ ($n=474$) were excluded from the analysis since the rhotic from this lexical item is usually elided, suggesting lexicalization as opposed to a productive phonological process. Finally, 735 tokens were excluded because they could not be reliably coded, due to noise, speech errors, or low speech volume. This left 4,961 tokens for analysis. Rhotic tokens were identified and surrounding segments were extracted using Praat scripts (BOERSMA, 2001). Below I present descriptive statistics which present the frequency of rhotic variants in different conditioning environments which allow for a preliminary proposal of the distribution of rhotics in Costa Rican Spanish.

Factor	Levels
Phoneme	/r/, /r̥/, R
Previous & Following Segment	Spanish consonants and vowels
Previous & Following Segment Point of Articulation (PoA)	Labial, Coronal, Velar, Palatal

⁶ The Spanish G2P and acoustic models available from the MFA website include /θ/, which is absent from Latin American varieties of Spanish. In the pronunciation dictionary all instances of /θ/ were replaced with /s/ to reflect Costa Rican pronunciation.

Previous & Following Segment Manner of Articulation (MoA)	Stop, Fricative, Vowel, Approximant, Liquid
Variant	Tap, Trill, Approximant, Voiced Fric., Voiceless Fric.
Style	Conversation, Word List, Short Story
Topic (for conversational style only)	Work, Culture, Travel, Present Day, Childhood, Spanish
Position	Onset, Word-final, Internal coda, Word-initial, Syl.-initial
Categorical Age	Young (<30), middle-aged (30-50), old (>50)
Birth Province/Province of Residence	San José, Cartago, Heredia
Education	High School, College, Masters
Sex	Male, Female

Table 5. Independent Variables

3. RESULTS

The first research question sought to determine the rhotic inventory of Costa Rican Spanish. In addition to the alveolar trill and the alveolar tap of standard Spanish, the assibilated variant [r̥] was also present (due to the spectral characteristics of this variant, and to distinguish it from other fricative variants, it was coded as voiceless fricative). Additionally, two other variants were also attested, and are shown in Figure 4. The left panel shows the spectrogram for the word *carros* /ka.ros/. Analysis of the spectrogram shows no break in the formant structure as well as a drop in F3 going into the rhotic, which has been shown to be a reliable acoustic correlate of rhoticism (LADEFOGED & MADDIESON, 1996). Additionally, the lack of energy in the upper spectrum evidences a lack of frication noise. These acoustic characteristics suggest an approximant realization similar to the English postalveolar approximant /ɹ/. This variant was coded as approximant in the dataset. Finally, a voiced fricative was also present in the data, usually in word initial position, shown on the right. While both this variant and the voiceless variant (discussed in Figure 3) show energy concentrated across the upper spectrum, only the voiced variant shows glottal pulsing with vowel formants visible through the duration of the rhotic. As such, this variant was coded as voiced fricative in the dataset.

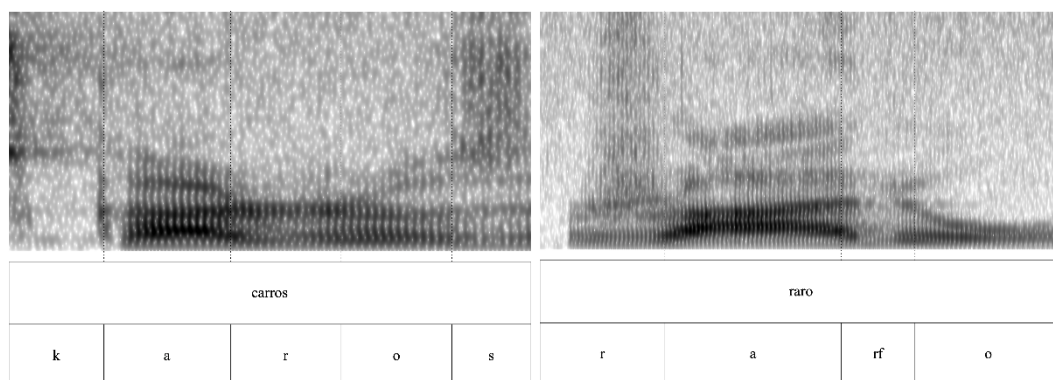


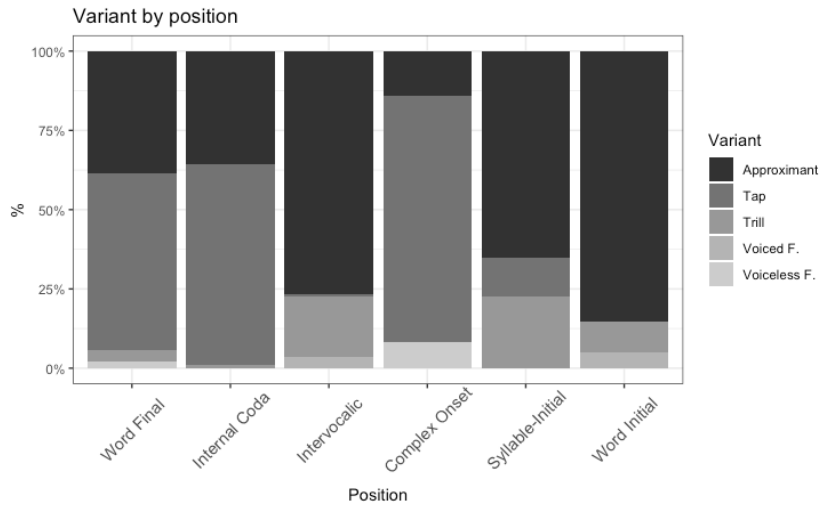
Figure 4. Spectrograms of *carros* /ka.ros/ [ka.ɹos] on the left and *raro* /ra.ro/ [r̥a.ro] on the right.

The frequency of the different rhotic variants in the dataset is shown in Table 6. Here the data is separated into 3 phonemic categories based on standard Spanish: /r/, which includes syllable-initial and intervocalic environments, /r/, which occurs in complex onsets, and an unspecified /R/ which recognizes the inherent variability in coda position (word-internally and word-finally). There are several observations here worth highlighting. First, in phonemic trill environments, the trill is realized as an approximant more than 80% of the time, with the trill surfacing in only 13% of expected environments. This is similar to Umaña Aguiar’s (1990) reporting of the approximant variant surfacing in more than 90% of phonemic trill environments. Additionally, in terms of the phonemic tap in onset position, the approximant variant surfaces in 14% of cases and the voiceless fricative surfaces in just over 8% of cases. Finally, we see that the voiced fricative is limited to contexts with an underlying trill, and that both fricative variants comprise a minority of overall rhotic realizations.

Variant	/r/	%	/R/	%	/r/	%
Approximant	740	81.7%	816	36.9%	259	14.0%
Tap	7	0.8%	1327	60.0%	1431	77.6%
Trill	120	13.2%	49	2.2%	1	0.1%
Voiced Fricative	39	4.3%	0	0.0%	0	0.0%
Voiceless Fricative	0	0.0%	18	0.8%	154	8.3%
Total	906	100.0%	2210	100.0%	1845	100.0%

Table 6. Rhotic variant by phoneme. Underlying trills are realized as approximants in over 80% of cases. Underlying taps are realized as approximants in 25% of possible environments.

Because the phonemic status of rhotics is sometimes unclear, and because there is variation in rhotic realization depending on position, Graph 1 presents the frequency data broken down by phonological context. Here we observe that in word-final position and in word-internal codas—the two environments where both taps and trills may occur—the tap is the preferred variant, followed by the approximant, with the trill appearing infrequently in each category and the voiceless fricative rarely surfacing in word-final position. This suggests that in these variable positions, the rhotic patterns similarly with the phonemic tap, which reflects data on standard Spanish showing that the trill tends to surface in these contexts in emphatic speech only.

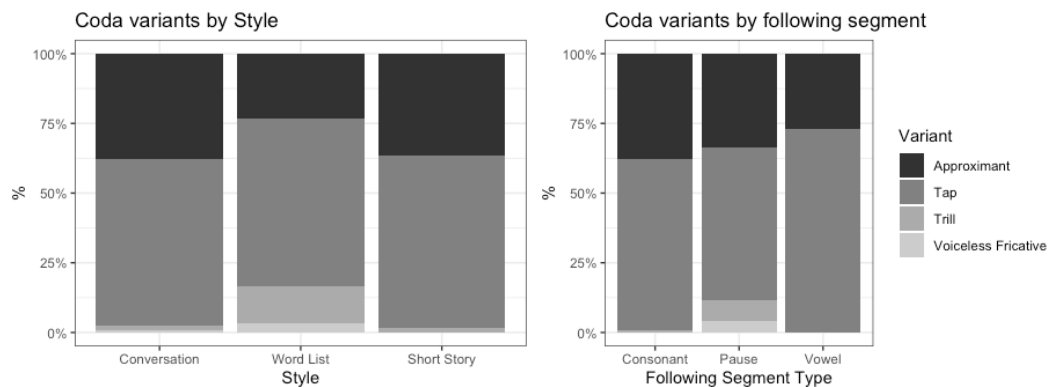


Graph 1. Rhotic variants by position.

The following sections further explore rhotic variants across the categories discussed above.

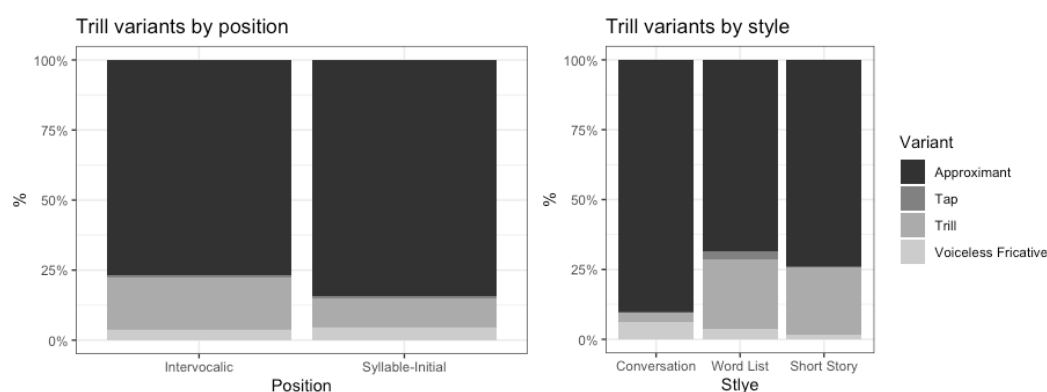
3.1. CODA POSITION

As explained above, in standard Spanish both the tap and the trill may appear in coda position, with the tap usually appearing pre-vocally and the trill appearing before pauses and consonants and in emphatic speech. Graph 2 shows percentages for variants in coda position across speech styles, and before consonants, vowels, and pauses. In this dataset the tap is the preferred variant in coda position, and the trill is essentially confined to word list style and appearing in less than 25% of cases. Additionally, the tap is the preferred realization regardless of the identity of the following segment, with the trill surfacing only occasionally before pauses.



Graph 2. Rhotic variants in coda position by style and by following segment.

Graph 3 shows the variation of the phonemic trills in intervocalic and syllable-initial position. As discussed above, trill variation is expected across speech styles, with higher rates of trills expected in more careful speech. The right panel shows variant percentages across conversational, word list, and short story styles. In this dataset, the surface trill is almost entirely absent from conversational speech and occurs only in approximately 25% of expected contexts in word list and short story styles. Additionally, the voiced fricative variant appears rarely and decreases in frequency as the speech moved from a more informal context (conversation) to more careful styles (word lists and short story). Finally, the left panel shows similar patterning in intervocalic and syllable-initial position, with an overwhelming preference for the approximant variant.⁷



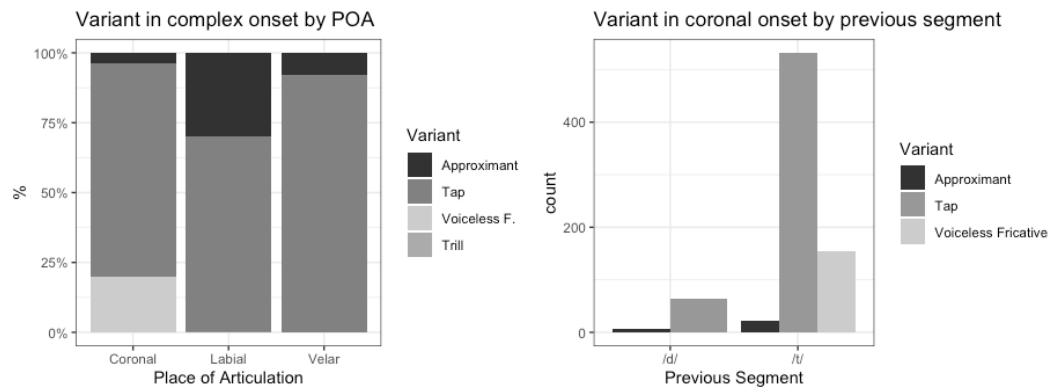
Graph 3. Trill variants by position and style.

3.2. COMPLEX ONSETS

As was shown above, in this dataset phonemic /r/ is usually realized as a tap but does vary with the approximant and the voiceless fricative variants. As mentioned in the literature review, rhotics in consonant clusters have been shown to demonstrate considerable variation. The left panel of Graph 4 shows the frequency data for tap variants in complex onsets across different places of articulation. It is evident that the surface tap is the preferred variant for these consonant clusters, and that voiceless fricatives surface only after coronal consonants, a pattern that has been observed in Ecuadorian Spanish as well (BRADLEY, 1999, 2006). However, the Costa Rican data is more complex than other varieties given that, as opposed to a two-way alternation between the tap and the fricative, in Costa

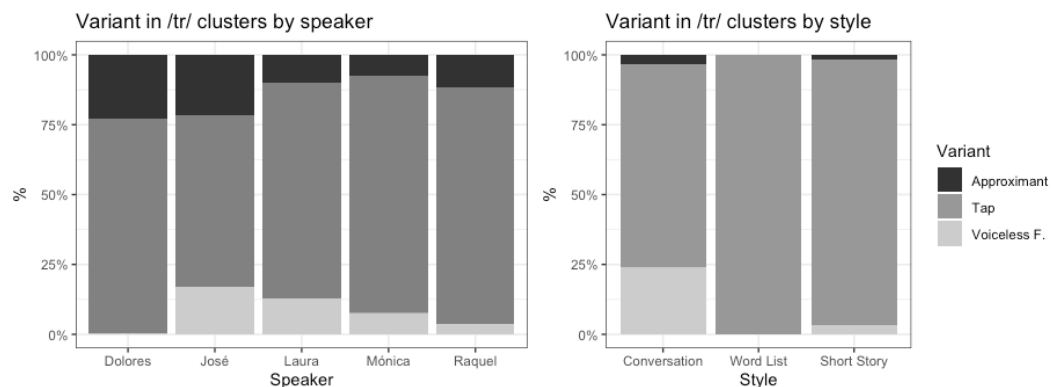
⁷ It is notable that the tap surfaces in a few contexts with underlying trills. However, while these taps appear as single occlusions in the spectrogram like those for underlying /r/, they are likely “single-occlusion” trills as opposed to a phonological process whereby the underlying /r/ surfaces as [r]. As mentioned above, trills are a relatively complex articulatory gesture, and a trill with a single occlusion could be the result of an accelerated speech rate or other factors that did not produce the aerodynamic conditions necessary for sustained vibration of the tongue tip.

Rican Spanish there is a three-way alternation between the tap, the fricative, and the approximant. Additionally, when the coronal onsets are further divided according to preceding segment, it becomes clear that the voiceless fricative surfaces only after *voiceless* coronal consonants, as evidenced in the right panel in Graph 4.



Graph 4. On the left, variants in complex onsets by point of articulation. On the right, evidence that the voiceless fricative surfaces only after *voiceless* coronal consonants in complex onsets.

Finally, there is also variation in onset realization across speakers and styles. Graph 5 shows variant frequency in /tr/ clusters by speaker and by style. Notably, one speaker, Dolores⁸, does not use the voiceless fricative, while the other four speakers use it to varying degrees (but never in more than 25% of cases). In terms of style, the voiceless fricative is used most frequently in conversation and is entirely absent from word list style, where the tap is used categorically.

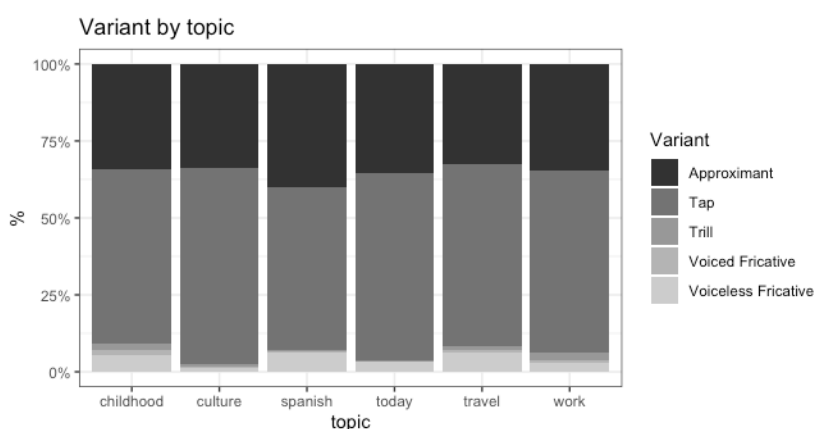


Graph 5. Variant in /tr/ clusters by speaker and style.

⁸ All names are pseudonyms. Dolores is the youngest participant, and I hypothesize that her behavior here can be explained by an age effect, with younger speakers avoiding the fricative variant and as such suggesting a change in progress. However, the homogenous nature of my sample precludes me from drawing conclusions at this time. In the future a larger sample with more young participants may shed more light on this phenomenon.

3.3 TOPIC

To conclude the results section, Graph 6 shows variant choice frequency in different conditioning environments according to topic. The topics *work* and *childhood* show the highest percentage of the voiced fricative variant, as well as the trill, and the tap is the preferred variant across topics, followed by the approximant which surfaces in slightly more than 25% of cases. While the small sample size precludes making conclusions about topics, the data do not seem to suggest topic-based effects. This finding will be further discussed in the following section.



Graph 6. Variant by topic across different phonemic environments.

4. DISCUSSION

The aim of the present study was to reexamine rhotic variation in Costa Rican Spanish and to expand previous work by incorporating preliminary acoustic analysis. The first research question sought to determine the rhotic inventory of Costa Rican Spanish and the distribution of these variants. Five variants were observed in this dataset: the alveolar tap [r] and the alveolar trill [r], an approximant [ɹ], and two fricative variants, voiceless [ɹ̥] and voiced [ɹ̄]. To summarize, the distribution of these variants is shown in Table 7, alongside data from Ecuadorian, Peninsular, and Standard Spanish to facilitate comparison. The approximant may appear syllable-initially where it alternates with the trill, the tap appears in onset position where it alternates with the voiceless fricative, and in coda position all variants are possible with the exception of the voiceless fricative. In what follows, I offer preliminary conclusions regarding the factors that may help to explain this distribution and offer ideas for future research that should continue to explore the nature of rhotic variation in Costa Rican Spanish.

	Ecuadorian	Peninsular	Costa Rican	Standard
Syllable-initial	[r̄]osa En[r̄]ique	[r̄]osa En[r̄]ique	[ɹ]osa En[ɹ]ique	[r]osa En[r]ique
Complex onset (coronal) (labial) (velar)	[t̄r̄]es [p̄r̄]emio [ḡr̄]ande	[t̄r̄]es [p̄r̄]emio [ḡr̄]ande	[t̄r̄~ɹ]es [p̄ɹ]emio [ḡɹ]ande	*[tr̄]es [pr̄]emio [gr̄]ande
Internal coda (labial) (velar)	*cue[r̄p]o *ga[r̄g]anta	*cue[r̄p]o *ga[r̄g]anta	cue[ɹ~rp]o ga[ɹ~rg]anta	cue[r~rp]o ga[r~rg]anta

Table 7. Distribution of rhotics in Ecuadorian, Peninsular, Costa Rican, and Standard Spanish. Ecuadorian and Peninsular data from Bradley (1999).

The results of this study suggest a number of linguistic factors that condition rhotic variation in Costa Rican Spanish. A main finding is the confirmation that, in this variety, the approximant variant [ɹ] is preferred in phonemic trill position, with the surface trill surfacing in only 13% of expected cases. Additionally, trills were more likely to surface before pauses when compared to contexts with a following vowel or consonant, and were more likely intervocalically than syllable initially, although taps were still the preferred variant overall. These environments have been found to favor trills in other varieties as well. The higher frequency before pauses may have an aerodynamic explanation. As noted above, trills require both a sufficiently narrow constriction and sufficient airflow in order to create the aerodynamic conditions necessary for vibration to occur. In rapid speech before vowels and consonants, the time between word-final rhotics and the following segment may not be sufficient for the creation of these aerodynamic conditions, yielding surface approximants or taps. Future studies could explore duration measures of rhotics word-finally to test this hypothesis.

With regards to the higher percentage of trills intervocalically, this can potentially be explained by the increased “functional load” of the rhotic in intervocalic position; since this is the only position in which the tap and trill contrast, maintaining a surface distinction may be more important in this position than elsewhere. However, this explanation is not entirely satisfactory, as the minimal pairs that contrast taps and trills are few, and are usually of different type (*caro* /ka.ro/ ‘expensive’ vs. *carro* /ka.ro/ ‘car’), as Hammond (1999) has noted. Additionally, this explanation does not account for the overall preference for the approximant variant in intervocalic position. Future studies could also explore duration measures in intervocalic position to determine if trills and approximants have similar durations and if these differ significantly from taps in the same position.

In terms of rhotics in complex onsets, the main finding of this study is that the tap is the preferred variant, but that it does alternate both with the approximant and a voiceless fricative. However, the fricative variant was shown to be confined to clusters with voiceless coronal consonants. Bradley (1999, 2006) observed a similar distribution for Ecuadorian Spanish and offered an articulatory explanation. Here I propose a similar solution and rely

on the same four assumptions in Bradley (1999) regarding phonemic taps in Spanish, namely: (1) the tap is an approximant gesture, evidenced by the fact that the closure is rarely complete (RECASENS, 1991); (2) approximants and fricatives are identical in constriction degree but differ in duration alone (ROMERO, 1995⁹); (3) gestures on the same articulatory tier are blended, and (4) the assibilated rhotic is a result of gestural blending and a resulting increased duration of the flap gesture, yielding frication (p. 66). To this list I include an additional assumption: increased duration of the tap after a consonant on a different articulatory tier together with a lack of sufficient constriction to create frication noise yields a surface approximant in heterorganic clusters as opposed to the assibilated variant in homorganic clusters. This proposal is illustrated schematically in Figures 5 and 6.

Figure 5 shows an articulatory diagram for heterorganic consonant clusters, adapted from Bradley (1999). On the left, the coronal consonant is fully released before the rhotic gesture begins. Due to the open glottis the intrusive vowel surfaces with a formant structure approaching that of the vowel that appears on the other side of the rhotic closure. On the right, the rhotic gesture begins earlier and increases in duration. Repeating Bradley's assumption that the tap is an approximant, and that approximants and fricatives differ in duration only, the increased duration allows for frication. Additionally, since the consonant and the rhotic are on the same articulatory tier, the gestures blend, causing assibilation.¹⁰

9 Romero's (1995) dissertation rejects the traditional view that approximants and fricatives differ in constriction degree and instead suggests that they differ in terms of duration alone, with fricatives being significantly longer than approximants. While the details lie outside the scope of this paper, Romero demonstrates that *s*-aspiration and spirantization rules in Andalusian Spanish produce voiceless fricatives that alternate with approximants that have the same point of articulation but differ by duration alone.

10 A question that remains to be answered is why assibilation happens after voiceless /t/ but not after voiced /d/ in this data set. One reviewer, a native speaker of Costa Rican Spanish, expressed surprise at this result, reporting that assibilation after /d/ occurs with equal frequency as assibilation after /t/. As such, it is possible that this result is simply a consequence of the small sample size, and that post-/d/ assibilation would appear in additional recordings. Another potential explanation may be a difference in place of articulation for /t/ and /d/. Agüero Chaves (2009) suggests that /t/ is alveolar before /r/ but that /d/ is dental, which may explain the lack of assibilation after /d/. Mid-sagittal imaging techniques applied to the Costa Rican variety could confirm this hypothesis.

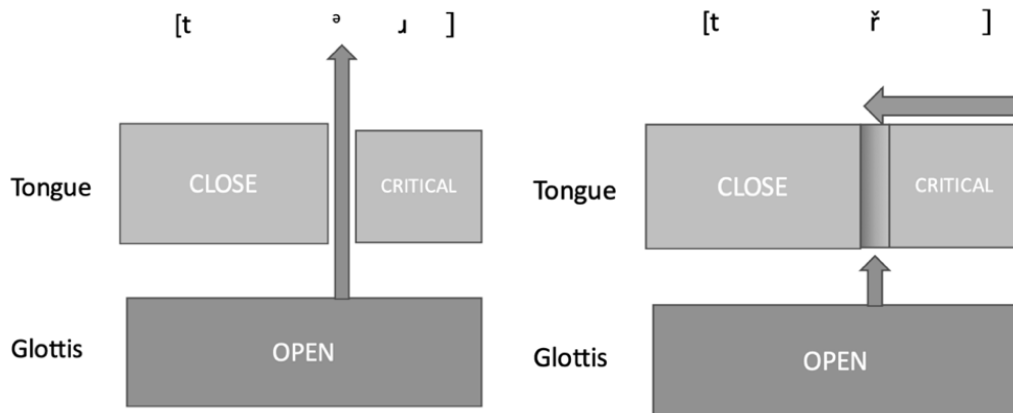


Figure 5. Rhotic variants in homorganic clusters such as /tr/.

Figure 6 demonstrates the same phenomena in heterorganic clusters such as /pr/. The surfacing of the intrusive vowel in these clusters is a result of the same process in homorganic clusters. The surfacing of the approximant on the right is similarly the result of an increase in the duration of the rhotic gesture, which begins earlier. However, importantly, since the consonant and the rhotic are on different articulatory tiers, no blending occurs, and instead of frication as a result of blending, the tap here surfaces as an approximant. These diagrams thus explain the Costa Rican data that shows assibilation in homorganic clusters and approximant rhotics in heterorganic clusters.

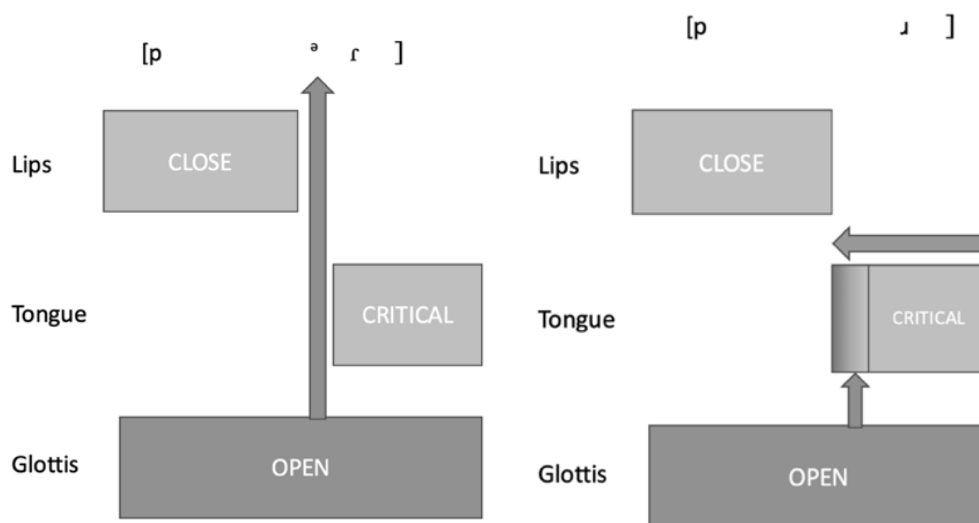


Figure 6. Rhotic variants in heterorganic clusters.

In addition to these phonological factors, it is worth mentioning the effects of style and topic evident in the dataset. Unsurprisingly, more formal styles elicited more “standard” variants across the board. In coda position, the trill was almost entirely absent from conversational speech but did surface in the word-list style (though it should be noted that the frequency is still low, comprising less than 12% of total cases). Trills were similarly absent in conversational speech in intervocalic and syllable-initial position but did surface more frequently in word list and short story styles. Finally, in onset position the voiceless fricative was only attested in conversational style and was entirely absent from the word-list style. Similarly, while the tap was the preferred variant in complex onsets overall, the approximant variant surfaced more frequently in conversational speech than in the other two styles.

This effect of style can potentially be explained by the linguistic attitudes held by Costa Ricans regarding their variety of Spanish. On the one hand, some studies have demonstrated that Costa Rican rhotic pronunciation is evaluated negatively by a majority of Costa Rican speakers. Jara Murillo’s (2006) study of linguistic attitudes of Costa Ricans towards their own variety demonstrated that the pronunciation of /r/ is a salient characteristic and is consistently identified as a defect of Costa Rican Spanish. Participants in her study indicated that “Costa Ricans don’t pronounce the *rr*¹¹ correctly”, and that they “mark it too strongly and make it sound really ugly” (p. 51). Additionally, Costa Ricans recognize the similarity of their pronunciation of [r] with English [ɹ], indicating that their pronunciation is identified immediately by foreigners and revealing a commonly held folk belief that their pronunciation stems from contact with English due to the large numbers of English-speaking tourists in Costa Rica. These sentiments were echoed in my own data:

We drag out the rs. We don’t say them right. Sometimes we say *tres* [tʃes] instead of *tres* [tres]. That’s something that could identify us as a Costa Rican.

That thing with the rr, right? It’s really hard for other people to do because it’s something that’s very unique. It’s really funny to me, like when I’ve gone to other countries, and people know you’re from Costa Rica, they really emphasize the rr so that you know they know you’re Costa Rican. But for me it’s like, ‘how weird’...I think for us it sounds a lot more natural.’

Our pronunciation of rr. We drag it out. Sometimes when we travel, in certain places someone will say to us, ‘say rr’. Or say *tres* [tʃes].

As Jara Murillo (2006) notes, while Costa Ricans in general may identify their pronunciation of rhotic sounds as a “defect” of their variety, this does not necessarily mean that speakers will avoid these stigmatized variants. While avoidance may suggest linguistic insecurity on the part of the speaker, the recognition that a variant is evaluated negatively but which continues to be employed in conversational speech may suggest covert prestige of that variant. Aguilar & Prieto (2014) propose precisely this,

11 The grapheme *rr* is used for the underlying trill in intervocalic position. In other positions, the grapheme is a single *r*. This and all other translations from the Spanish original are my own.

and highlight the linguistic security of Costa Ricans, especially when compared with other regional varieties. As they suggest:

It's obvious that Costa Ricans possess a high level of self-esteem towards their variety of Spanish...These positive attitudes...may be explained by the nationalist spirit of Costa Ricans. Even though Costa Rica forms part of what is known as Central America, it is important to point out that the majority of Costa Ricans often feel distinct from the rest of the region...This has created for them a certain superiority complex that translates into excessive pride in everything associated with Costa Rican identity (p. 118).

As such, we may assume that, to a certain extent, the rhotic variants in Costa Rican Spanish are strongly tied to a Costa Rican national identity. This may explain the continued use of non-standard variants and the negative evaluation of the same.¹²

Less clear from this dataset is the apparent lack of topic-based effects. As Nycz (2018) has noted, linguistic variables may become tied to notions of place, and residents of localities which are associated with linguistic variables may then use those variants to project an identity of an “authentic” resident (p. 176). It is clear from the data above that rhotic variation is strongly associated with Costa Rican identity, both by Costa Ricans themselves and by speakers of other varieties of Spanish. As such, my data was coded so as to facilitate the comparison of Costa Rican topics with topics about other localities, with the hypothesis that topics related to Costa Rica would elicit more Costa Rican variants. In the absence of statistical testing it is impossible to rule out topic-based effects. However, a cursory perusal of the data seems to suggest relative homogeneity across topics, with the approximant being the preferred variant in phonemic trill environments and the tap preferred elsewhere.

Nevertheless, there are a number of factors that could explain the lack of topic-based effects. First and foremost, the participants in Nycz's (2018) study were mobile speakers in situations of dialectal contact, and topic-based shifts appeared in contexts when interviewees were discussing one place while physically located in another. Given that all participants in my study were interviewed in Costa Rica and have had varying degrees of exposure to other varieties of Spanish, it is perhaps not surprising that Costa Rican variants were common. Secondly, in Nycz's study, topic-based shifts were strongly associated with the stance that speakers took towards a given locality. In other words, topic alone was not enough to elicit variation; rather the attitudes that the speakers had towards the place they

¹² Given the observation, discussed above, that the rhotic variants under consideration here are largely confined the central valley of Costa Rica, it is reasonable to question the connection between rhotic variation and Costa Rican *national* identity as opposed to *regional* identity. I contend that while rhotic variation is not present across the Costa Rican territory, its connection to national identity is valid it is for two reasons: first, that the speakers in the provinces of San José, Cartago, Heredia, and Alajuela—the provinces where these variants are attested—account for roughly 70% of the total population of the country (INEC, 2011), and second, because it is clear from participant comments that there is an ideological connection between rhotic variants and holistic *Costa Rican* identity as opposed to an identity of someone from the central valley.

were discussing was a better predictor of variation. In my study stance was not included as an independent variable, and as such potential links between topic and stance may have been obscured. Finally, it is possible the levels of topic used for coding in my study are too fine-grained to show topic-based effects. Instead of six categories, recoding topic into broader categories (e.g., Costa Rica vs. elsewhere) could reveal topic-based shifts.

5. CONCLUSION

This pilot study presented preliminary findings regarding rhotic variation in Costa Rican Spanish. The statistics offered here are descriptive and offer an overview of the data, but future work with larger samples should apply statistical testing to other phonological contexts in order to further confirm the significance of the variation outlined above. Given that in Costa Rican Spanish there are alternations between three or more variants, future studies should use multinomial models in order to test the likelihood of all variants concurrently as opposed to standard versus innovative variants. These statistical tests will further elucidate the potential factors that may condition rhotic variation in Costa Rican Spanish.

This study also limited its analysis to 6 phonological contexts in an attempt to exhaust the possibilities for rhotic variation. However, some of these categories may be further broken down and as such may yield more information. In particular, Umaña Aguiar (1990) and Calvo Shadid (1995) observe potential variation in the word-final infinitive marker *-r* before clitic pronouns. The present study is limited to phonological contexts, and as such future studies should explore the possible effects that morphological contexts could have on the variation discussed here.

In terms of acoustic analysis, this study attempted to further explore the acoustic characteristics of Costa Rican rhotics by using spectrograms to help identify rhotic tokens as opposed to using purely auditory coding. Spectrograms are useful in distinguishing taps from trills, fricatives from non-fricatives, and approximant variants. However, spectrograms themselves do not provide enough information to be able to reliably distinguish more fine-grained differences among these variants. As Bradley (2006) has noted, many studies of rhotics in Spanish “gloss over what are deemed to be irrelevant, low-level details of phonetic implementation” which prevents elucidating systemic aspects in the patterning of rhotics (p. 16). As such, future studies should seek to further explore acoustic detail. For example, the variant identified as “approximant” in this dataset may have retroflex realizations which can be difficult to distinguish visually and auditorily. Recently researchers have postulated that F4 may serve as a reliable measure to distinguish between bunched and retroflex /r/ in English (THOMAS, 2011). While the

approximant variant in Costa Rican Spanish dataset is not identical to English /ɹ/, it does share acoustic similarities, and as such it would be worth exploring whether F4 may serve as a reliable measure of retroflexion in Spanish as well.

Another acoustic measure that future studies should explore are the spectral characteristics of fricative tokens. In this study fricatives were classified as either voiced or voiceless, with voiceless fricatives surfacing in /tr/ clusters and voiced fricatives alternating with the /r/ syllable-initially and intervocally. However, it may be the case that there are more fine-grained differences within and between these categories than visual and auditory coding alone can distinguish. Thomas (2011) notes that voiceless fricatives are longer than their voiced counterparts, and that voiceless fricatives typically present clearer frication noise, suggesting more energy concentrated in the upper spectrum (comparing the right panels in Figures 3 and 4, this generalization appears to hold in this dataset). Future studies could compare and contrast duration measures of the fricative variants, as well as the duration of the alternates with which they vary, to determine whether the distinction between taps and trills is neutralized when they are realized as fricatives. Other acoustic measures that could be explored are spectral moments, which could facilitate comparison of assibilated rhotics with other Spanish fricatives, as well as amplitude, and other fricative parameters that may provide more detailed information regarding the place of articulation.

Notably absent from the present study is a discussion of extralinguistic factors which could potentially condition variation. This is largely due to the homogenous nature of the sample. Of the 5 participants discussed here, 4 identified as women, all were college educated, and all resided in the central valley of Costa Rica, which is traditionally assumed to be a homogenous dialect zone (CASTILLO VENEGAS, 2013). While there was some age variation, with 5 participants divided into 3 age categories, it is unlikely that age would have emerged as a predictor variable. Additionally, it is possible that individuals like the participants in this study that have completed higher education were more aware of the distinction between standard and non-standard variants and the connotations associated with each. While it was suggested above that Costa Ricans generally possess a high level of linguistic security regarding their variety, Jara Murillo (2006) has reported that many Costa Ricans do consider assibilated and fricative variants to be “ugly,” “inarticulate,” “distorted,” and “incorrect.” As such, the relatively formal nature of the sociolinguist interview when compared to naturalistic speech and the high educational level of the participants may have caused them to avoid fricative and assibilated variants in an attempt to speak “correctly.” Future studies should thus incorporate data from naturalistic speech and seek to recruit more diverse participants in order to further investigate the effects of extralinguistic factors such as age, socioeconomic status, gender, and level of educational attainment on rhotic variation.

The present study has attempted to revisit the issue of rhotic variation in Costa Rican Spanish and to expand on previous work which had yielded inconclusive results and lacked acoustic support for their results. A rhotic inventory was proposed for Costa Rican Spanish which included two fricative variants and an approximant in addition to the tap and trill of standard Spanish. The approximant variant was found to be the most common realization of phonemic trills, and the voiceless fricative was found to surface in consonant clusters after voiceless consonants. Linguistic factors were suggested as possible predictors of rhotic variation: surface trills were more likely intervocally and before pauses due to increased functional load and favorable aerodynamic conditions, and an articulatory explanation was offered for the distribution of the fricative variant after voiceless coronal consonants. Finally, rhotics varied somewhat across styles, with more informal styles favoring non-standard variants. Overall, the research presented above represents an important addition to work on the issue of rhotic variation as it pertains to Costa Rican Spanish in particular and the Spanish language in general and will hopefully serve as a starting point for further research into this topic.

6. ACKNOWLEDGEMENTS

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