Regional Variation and Edges: Glottal Stop Epenthesis and Dissimilation in Standard and Southern Varieties of German*

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Abstract

Edges of prosodic and morphological constituents often behave differently from non-edge positions, but it is not always clear how such edge-effects are brought about. This paper is a case study of an edge-phenomenon in different varieties of German. Thus, glottal stop epenthesis is limited to edges of morphemes in Southern German, but not in Standard German and insertion of a dissimilatory feature in /sC/ clusters is limited to root edges in Standard German, though not in some Southern varieties. I argue that an analysis in terms of optimality theory (Prince/Smolensky 1993) based on ranked, violable constraints can best account for these facts: high ranking of a constraint banning domain-internal epenthesis (O-CONTIGUITY) with respect to insertion triggering constraints can explain the restriction to edges, low ranking of the same constraint will result in application of epenthesis or dissimilation also inside the specified domain. Moreover, the implementation of the analysis in terms of optimality theory can shed light on this typical pattern of variation among closely related varieties of the same language: the difference between the variety where a process takes place everywhere and the variety where the same process applies only at edges will be analyzed as a minimal difference in faithfulness of the two grammars involved.

1. Introduction

At the edges of prosodic and morphological categories often phonological processes take place that do not happen elsewhere, or, conversely, phonology that happens elsewhere fails to take place. The question of why this is so and which phenomena are, so to speak, edge-specific is not always clear. Alignment theory (McCarthy/Prince 1993) has shown how certain phenomena at edges are the result of aligning prosodic and morphological categories with each other.

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Beckman (1998) demonstrates that positions at the left edge of words are often more faithful to the underlying representation than non-edge positions. This means, for instance, that in the first syllable of the word segments can appear that do not surface in non-initial positions. Steriade (1997) presents cases where laryngeal contrasts are neutralized in certain positions that might look like edges of prosodic constituents but, as she claims, are better analyzed as positions where phonetic cues are not strong enough to implement a contrast. In this paper I want to present yet another circumstance under which edge effects occur, the case when they appear as a consequence of the faithfulness constraint O-CONTIGUITY.[1]

This paper is a case study of glottal stop epenthesis and s-dissimilation in Standard and Southern German. The two processes take place in different contexts in the two varieties. Epenthetic glottal stops are inserted before an onsetless syllable at the beginning of a root or a prefix in both varieties but, additionally, before an onsetless stressed syllable in Standard German:

(1)	Southern German	Standard German	
	ʔO.á.se	ʔO.ʔá.se	'oasis'

Alveolar /s/ and postalveolar /ʃ/ are neutralized to [ʃ] before non-velar consonants at the beginning of a root in Standard German, but also word-medially in some Southern varieties:

(2)	Standard German	Southern German		
	[ʃ]piel	[ʃ]piel	<Spiel>	'game'
	Fen[s]ter	Fen[ʃ]ter	<Fenster>	'window'

Neither of the two cases can be explained as an instance of positional faithfulness in Beckman's (1998) sense. The prominent position at the beginning of the word is in fact particularly unfaithful in the case of glottal stop insertion and the same is true for s-dissimilation, at least if we consider the underlying initial segment in */ʃ/piel* to be /s/. An analysis in terms of alignment is available in the first case, though not readily in the second, but is, in any case, not very satisfying, as I will argue below. An analysis in Steriade's terms is also excluded, because there is no laryngeal contrast to be implemented or failing to be implemented.

In my analysis I want to draw attention to another force that can bring about edge effects. I will analyze the two processes exemplified above in terms of

1 For discussion of CONTIGUITY and its effects in various languages cf. among others McCarthy/Prince (1995), Kenstowicz (1994), Baković (1995), Lamontagne (1996), for discussion of O-CONTIGUITY in particular cf. Alber/Plag (forthcoming).

CONTIGUITY, a constraint family demanding that the adjacency relationships between elements be the same in the input and in the output. Specifically, the constraint O-CONTIGUITY militates against insertion of epenthetic material between elements standing in correspondence, since this would disrupt their adjacency relationships in the output. However, the constraint allows for epenthesis at the edges of a certain domain. Consequently, if a constraint like O-CONTIGUITY is sufficiently high ranked a phonological process will take place only at edges.

A second topic that this paper will address is the problem of regional variation. Variation among closely related languages is expected to be minimal in some sense. Take again the example of the /s/ → [ʃ] mapping given above. In Standard German neutralization takes place only at the root edge, while in Southern German it occurs also word-medially. This means that an input /s/ is parsed faithfully in less contexts in Southern German than in Standard German. In other words, faithfulness is overridden in more contexts in Southern German than in Standard German. Thus, the Southern German grammar concerning this phenomenon is in some sense less faithful than the grammar of Standard German. I will argue that minimal differences in the faithfulness of grammars of related varieties are typical for regional variation and that the degree of faithfulness of a grammar can directly be read off the grammar as implemented by the constraint ranking.

2. Glottal stop epenthesis

Many authors have been interested in the German glottal stop throughout the last one and a half century, among others Rapp (1836), Trubetzkoy (1939), Krech (1968), Wurzel (1970), Kohler (1977), Kloeke (1982), Vennemann (1982), Giegerich (1989, 1999), Yu (1992), Hall (1992), Kohler (1994), Wiese (1996), Scheer (2000), Féry (forthcoming); cf. Minkova (forthcoming) for a historical perspective on the phenomenon. The first of them, Karl Moritz Rapp, notes:[2]

2 Rapp was rediscovered by Heinz Giegerich (1999), who proposes "Rapp's law" for what the OT-community calls ONSET. The translation of Rapp is mine:
"When I say ɔ I have already pronounced two letters, that is, together with the ur-vowel already the primordial ur-consonant is given. This is the law: no vowel sound can sound without being preceded by a consonant, co-sounder, because somewhere the voice that in the glottis passes from the pure realm of sound into the realm of speech, somewhere it must set on, in order to break through as a speech sound and this onset, if it is to happen in the most simple and imperceptible way, is produced directly above the glottis ...."

> „Wenn ich ə sage, so hab' ich schon zwei Buchstaben ausgesprochen, das heißt neben dem Urvocal ist hier auch schon der Urconsonant gegeben. Es ist Gesetz: Kein Vocallaut kann laut werden, ohne einen Mitlaut, Mitlauter vorauszuschicken, denn irgendwo muß die Stimme, die beim Kehlkopf aus dem reinen Tongebiet in das Sprachgebiet herübertritt, irgendwo muß sie ansetzen, um als Laut vorzubrechen, und dieser Ansatz, wenn er am einfachsten, unmerkbarsten geschehen soll, producirt sich unmittelbar über dem Kehlkopf ..."
>
> K. M. Rapp (1836)

2.1 The Data

The problem is that notwithstanding Rapp's most striking insights, he was not precise enough – at least with respect to glottal stop epenthesis in German. In fact, most linguists (but cf. Vennemann 1982) agree that – morpheme-internally – in Standard German (StG) a glottal stop is provided for onsetless syllables only if they are stressed. Thus a glottal stop is inserted in the following words:

(3) StG morpheme-internal ʔ-epenthesis before main stress:[3]

The.ʔó.de.rich	proper name
Jo.ʔá.chim (Kloeke 1982)	proper name
cha.ʔó.tisch (Kloeke 1982)	'chaotic'
Du.ʔá.lis (Kloeke 1982)	'dualis'
Kò.ka.ʔín	'cocaine'
na.ʔív	'naive'
Po.ʔét	'poet'
Klo.ʔá.ke	'sewer'
Mä.ʔán.der	'meander'
ʔA.ʔí.da[4]	'Aida'
ʔO.ʔá.se	'oasis'

3 In order to make it easier to focus on the relevant structures, only phonological details relevant for the analysis such as the glottal stop itself, syllabic and morphological boundaries and stress have been indicated in the transcription of the data.
Whenever possible I have chosen only hiatus contexts where the first vowel is a low or mid vowel. When the first vowel is high, and, to a lesser extent, after a mid vowel, many speakers adopt an alternative strategy to provide an onset: they insert a glide or change the first vowel of the hiatus context into a glide. Thus, we find the following variation:

(i) Hi.ʔá.tus	~	(ii) Hi.[j]á.tus		'hiatus'
Lin.gu.ʔís.tik	~	Lin.g[ʊ]is.tik		'linguistics'

I will not consider the glide strategy in what follows, since it seems to me to be too much speaker dependent. In this sense the data reported is limited to speakers of Standard German who do not use this alternative strategy to provide an onset.

4 See below for insertion of a glottal stop at the beginning of a word before the initial, unstressed vowel in *ʔA.ʔí.da*, *ʔO.ʔá.se*.

Less often mentioned in the literature, but often heard over the radio, are glottal stops before what could be a heavy syllable bearing a secondary stress.[5]

(4) StG morpheme-internal ʔ-epenthesis before (presumed) secondary stress:

Mí.cha.ʔèl	proper name
ʔÍ.sa.ʔàk	proper name
Ká.na.ʔàn	'Canaan'
ʔÍs.raʔèl	'Israel'
ʔÓ.ze.ʔàn	'ocean'

This last set of data is not completely reliable, it varies from speaker to speaker.

The literature again agrees on the fact that morpheme-internal onsetless syllables that are clearly unstressed are not subject to ʔ-epenthesis. For speakers that don't allow for glide insertion I assume that the relevant syllable does not have an onset in these cases:[6]

(5) No ʔ-epenthesis before unstressed syllables:

Jó.a.chim	*Jó. ʔa.chim	proper name
Thé.o.dor	*Thé.ʔo.dor	proper name
Bó.a	*Bó.ʔa	'boa'

---

5 Glottal stops before secondary stress are common with many speakers two syllables after main stress. Sometimes glottal stops can also be heard one syllable after main stress, as in the following examples:

i.	Chá. ʔòs	'chaos'
	Lá.ʔòs	'Laos'
	Né.ʔòn	'neon'
	Gé.ʔòrg	proper name

However, glottal stops are less frequent in this context, presumably because in this case a secondary stress on the final syllable creates a stress clash with the main stress.

At first glance it would seem that there are clearer cases for glottal stop insertion before secondary stress in the case of morphologically complex words. Thus, a glottal stop is commonly inserted in words such as *dúrch-ʔarbeiten* 'work without interruption' and this could erroneously be taken as evidence for the fact that the first syllable of the root bears secondary stress. However, glottal stops are commonly inserted at vowel-initial morpheme boundaries regardless of stress, as we will see below. This means that glottal stops at morpheme boundaries cannot in general be taken as evidence for the presence of secondary stress.

6 Glottal stops before unstressed vowels can occasionally be heard in the pronunciation of actors from the thirties and forties who still cultivate the *Bühnenaussprache* (stage pronunciation). Thus Marlene Dietrich sings: "Ich bin die fesche Lola, der Liebling der Nation, ich hab ein *Pì.ʔa.nó.la*, in meinem klein' Salon". The *Bühnenaussprache*, as codified by Theodor Siebs, recommends 'festen Stimmeinsatz' ('strong onset of voice') before all vowels at the beginning of a word (cf. e.g. Siebs 1900) and trained actors might have extended this recommendation to all onsetless syllables, even if the vowel is not stressed.

B´ö.e	*B´ö.ʔe	'gust'
sáh.en	*sáh.ʔen	'see' (past, 1st/3rd pl.)
sáu.er	*sáu.ʔer	'sour'
Tá.o	*Tá.ʔo	'Tao'
krè.a.tív	*krè.ʔa.tiv	'creative'
Rè.ak.tíon	*Rè.ʔak.tíon	'reaction'
thè.a.trá.lisch	*thè.ʔa.trá.lisch	'theatrical'
Thè.o.rie	*Thè.ʔo.rie	'theory'
Kà.o.lín	*Kà.ʔo.lín	'kaolin'
Mà.o.ʔíst	*Mà.ʔo.ʔíst	'Maoist'
Bá.o.bab	*Bá.ʔo.bab	'baobab'

The examples considered so far were all cases where a glottal stop was inserted inside a morpheme. Let us now turn to morphologically complex cases.

A glottal stop can appear in one last context: at the left edge of vowel-initial morphemes. More precisely, a glottal stop is inserted at the left edge of vowel-initial roots (6a) or prefixes (6b). Interestingly, no glottal stop is inserted at the morpheme boundary before a suffix. Here either resyllabification with a preceding consonant occurs (6c) or, if no consonant is available, the syllable remains onsetless (6d).[7]

(6)	a. ver.-ʔánt.wor.t-en	'to take the responsibility'
	b. ʔán.-ʔer.-kèn.nen	'to acknowledge'
	c. Tá.g-ung	'conference'
	d. Dróh.-ung [dro:ʊŋ]	'threat'
	e. % ve.r-ánt.wor.t-en	

Resyllabification at root and prefix boundaries, as e.g. the /r/ in (6e), is not completely impossible (as % is to indicate), but characteristic of faster speech and may also be more easily found in Southern varieties of German rather than in Northern varieties. (7) shows more examples for glottal stop epenthesis at the left edge of roots and prefixes and their (fast speech) resyllabified counterparts:

(7)	ʔ-epenthesis before vowel-initial roots and prefixes:		
	slow:	fast:	
	ʔEr.-ʔéig.nis	ʔE.r-éig.nis	'event'
	ʔum.-ʔár.men	ʔu.m-ár.men	'to embrace'
	ʔer.-ʔár.bei.ten	ʔe.r-ár.bei.ten	'to obtain by work'

7 Cf. Giegerich (1989). See also Giegerich (1999) for discussion and analysis of similar asymmetries between prefixes and suffixes in English and German. The suffix *-artig* seems to be an exception to the generalization that vowel-initial suffixes are not preceded by a glottal stop, cf. *bös.-ʔartig*, 'malicious'.

ʔin. ʔÚn.garn	ʔi.n Ún.garn	'in Hungary'
zum. ʔÁn.fas.sen	zu.m Án.fas.sen	'to touch'
beim. ʔÉs.sen	bei.m És.sen	'while eating'

The possibility of resyllabification seems in part to be dependent on stress as well. If resyllabification is at all possible in the examples in (7), the speech rate has to be rather fast. In the following examples, where the glottal stop appears at the morpheme edge before syllables not bearing main stress, resyllabification is more easily obtained, even though the difference between a slow register (with epenthesis) and a fast register (with resyllabification) remains. There might also be variation among speakers in accepting integration of the clitic in the last four examples:

(8) ʔ-epenthesis before roots and prefixes not bearing main stress:

slow:	fast:	
ʔán.-ʔer.-kèn.nen	ʔá.n-er.-kèn.nen	'to acknowledge'
ʔáuf.-ʔer.lè.gen	ʔáu.f-er.-lè.gen	'to impose on'
ʔún.-ʔer.-gie.big	ʔú.n-er.-gie.big	'unproductive'
ʔán.-ʔor.gà.nisch	ʔá.n-or.gà.nisch	'inorganic'
ʔin. ʔEu.ró.pa	ʔi.n Eu.ró.pa	'in Europe'
zum. ʔÀ.me.ri.ká.ner	zù.m A.mè.ri.ká.ner	'to the American'
beim. ʔÌ.ta.lié.ner	bèi.m I.ta.lié.ner	'at the Italian'
den. ʔEr.-z'äh.ler	dè.n Er.-z'äh.ler	'the (acc.) narrator'

The influence of stress on glottal stop epenthesis at morpheme edges is already mentioned in Wurzel (1970: 261) and has recently been investigated in a phonetic study by Kohler (1994). Kohler's analysis of 3,470 vowel-initial words in connected, read speech confirms the impressionistic description given above. Of the 1,159 vowel initial words beginning in a (main) stressed syllable only 62 (5,35 %) had neither a glottal stop, nor glottalization on the vowel. Of the 2,311 vowel-initial words beginning in an unstressed syllable 656 (28,38 %) did not show any sign of glottalization. This means, first of all, that glottal closure at morpheme edges is a reality, regardless of stress. It means also that stress can favor the presence of glottal closure, though it is less clear whether the difference between stressed and unstressed syllables is strong enough to be integrated into a phonological analysis.

In what follows I will therefore assume that a glottal stop appears in Standard German at the left morpheme edge, but I will not consider the difference between stressed and unstressed syllables in this position.

The question why an onset at the left edge of roots and prefixes is provided through epenthesis and – at least in the slow register – not through resyllabification will not be discussed in any detail in this paper since the main focus of it is the distribution of glottal stop epenthesis in morphologically simple words. I just

want to mention that several possibilities to address this issue are promising and some of them have already been successfully implemented. Thus, an analysis in terms of lexical phonology can explain the impossibility to resyllabify across a root/prefix boundary through cyclic application of the glottal stop insertion rule (cf. Giegerich 1989, 1999). An analysis in terms of output-output faithfulness (cf. among others McCarthy 1995, Benua 1995, 1997, Kenstowicz 1996) could propose that the glottal stop and the syllable structure of e.g. *ver.-ʔánt.wor.-ten* 'to take the responsibility' are due to a faithfulness constraint that demands identity to the output base *ʔánt.wor.-ten*. Finally, McCarthy/Prince 1993 analyze German glottal stop insertion between roots and prefixes in terms of alignment between morphemes and syllables: since left root and prefix edges have to align with syllable edges, resyllabification is impossible.

The asymmetry between prefixes and suffixes with respect to resyllabification will not be discussed here any further either, but I am confident that the approaches just cited will be able to account for it (cf. Giegerich 1999 for a proposal).[8]

For the purpose of this paper, the morphologically complex examples in (6), (7) and (8) show that hiatus contexts with stress on the second vowel are not the only contexts where glottal stops appear. Glottal stops appear also before unstressed vowels, outside of a hiatus context, *if* this vowel stands at the edge of a certain morphological boundary (i.e. a left root or prefix edge).[9] I will therefore assume that glottal stops are inserted in the following examples not because we have some foot boundary coinciding with the insertion side (cf. Yu 1992, Wiese 1996 and discussion of these approaches below), but because the relevant syllable coincides with the left edge of a morphological boundary:

(9)	ʔEu.ró.pa	'Europe'
	ʔA.mé.ri.ka	'America'
	ʔI.dée	'idea'

8 An interesting aspect of the prefix/suffix asymmetry is that this asymmetry cannot be reduced to the fact that suffixes can undergo syllabification while prefixes and roots cannot. The possibility of vowel initial suffixes to take as an onset a consonant of the preceding morpheme (e.g. *Tä.g-ung* 'conference') cannot be the only reason for the absence of a glottal stop at the left edge of suffixes since the glottal stop is not inserted in this context even when no resyllabification can take place because the suffix attaches to a vowel-final stem (e.g. *Drohung* [dro:ʊŋ] 'threat')

9 As one reviewer notes, the context for glottal stop insertion characterized here in morphological terms could also be reanalyzed in terms of prosodic constituents, specifically, the prosodic word. Thus, the context for insertion could be specified in the cases just discussed as being the left edge of a prosodic word. A set of alignment constraints would then have to generate the mapping from morphological to prosodic categories and guarantee a prosodic word boundary at the left edge of each root and prefix boundary, though not at the left edge of suffixes. Since nothing crucial in the following analysis hinges on a reanalysis of this kind I won't pursue it here.

In sum we can say that a glottal stop appears in Standard German in the following two contexts: at the left edge of a vowel-initial stressed syllable and at the left edge of a vowel-initial root or prefix.

Things are different in the Southern varieties of German (SoG). The contexts determined by morphological factors (as in (6) through (8)) remain the same, maybe with some regional preference for resyllabification in some of the contexts mentioned above. But what strikes the Southern speaker in hearing the Standard variety is the difference in glottal stop epenthesis in morpheme-internal hiatus contexts. In fact, Southern speakers do not insert any morpheme-internal glottal stops in the following examples nor in any other morpheme-internal context mentioned above:[10]

(10) Lack of morpheme-internal ʔ-epenthesis in Southern varieties of German:

The.ó.de.rich	proper name
cha.ó.tisch	'chaotic'
Du.á.lis	'dualis'
Kò.ka.ín	'cocaine'
na.ív	'naive'
Po.ét	'poet'
Klo.á.ke	'sewer'
Mä.án.der	'meander'
ʔA.í.da	'Aida'
ʔO.á.se	'oasis'
Mí.cha.èl	'proper name'
Ká.na.àn	'Canaan'
Ís.ra.èl	'Israel'

Summarizing, glottal stops appear in onsetless syllables at the left edge of roots and prefixes both in Southern and Standard varieties of German and before stressed syllables in the Standard varieties.

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10 I am not sure how far North this regional variety of German reaches. I know that glottal stops are limited to the left edge of roots and prefixes in my variety of regional German spoken in Tyrol at the southernmost borders of the German speaking area. As for the varieties spoken in Austria, the references in the literature are rather vague and never consider all relevant contexts. Luick (1904: 35) states that the glottal stop is altogether 'foreign' to Austrian speech, while Lipold (1988: 41) notes that the 'new onset' is absent from the beginning of roots and prefixes only in sloppy (= fast?) pronunciation. He does not mention morpheme-internal hiatus contexts. My informants confirm the pattern described as 'Southern' here for the Austrian varieties (Katia De Gennaro p.c.) and the Swabian dialects (Fabian Heck, p.c.). The Alemannic dialects of Switzerland, however, seem to lack the phenomenon of glottal stop insertion altogether and resort to resyllabification, if possible (Peter Gallmann, p.c.).

2.2 Analysis

In Southern German as well as Standard German there are syllables whose onset is provided through epenthesis of a glottal stop. I assume that what triggers epenthesis in at least some of these cases is the constraint requiring syllables to have an onset:

(11) ONSET: syllables must have an onset
(Prince/Smolensky 1993)

Since there are cases where this constraint is satisfied through epenthesis ONSET must dominate the anti-epenthesis constraint DEP:

(12) DEP: every segment of the output has a correspondent in the input
(McCarthy/Prince 1995)

Let us consider first Southern German. The partial ranking ONSET ≫ DEP can account for the cases of glottal stop epenthesis found in these varieties:

Tableau 1

Input: Amérika	ONSET	DEP
☞ (a) ʔAmérika		*
(b) Amérika	*!	

However, the ranking is not sufficient to account for the lack of epenthesis morpheme-internally. Why is there no epenthesis of a glottal stop in cases like the following?

(13)	cha.ótisch	(SoG)	'chaotic'
	ʔO.áse	(SoG)	'oasis'
	Tá.o	(SoG and StG)	'Tao'

We cannot take the positional faithfulness route here. As Beckman (1998) has shown, in some languages first syllables are more faithful to the input than non-initial syllables. But the insertion of a glottal stop is an act of unfaithfulness in a prominent position.

My proposal is to analyze the absence of morpheme-internal glottal stops in Southern German as the consequence of the constraint CONTIGUITY, specifically, O-CONTIGUITY, following McCarthy/Prince (1995):[11]

(14) O-CONTIGUITY ('No Intrusion'):
The portion of the output standing in correspondence forms a contiguous string

(15)

	(a)	(b)
input:	/ o_1 a_2 z_3 $ə_4$ /	/ o_1 a_2 z_3 $ə_4$ /
	| | | |	| | | |
output:	[ʔo_1 a_2 z_3 $ə_4$]	[ʔ o_1 ʔ a_2 z_3 $ə_4$]
	No morpheme-internal epenthesis	morpheme-internal epenthesis
	√ O-CONTIGUITY	*O-CONTIGUITY

The mapping under (a) respects O-CONTIGUITY. All segments standing in correspondence are contiguous in the output: 1 is contiguous to 2 is contiguous to 3 is contiguous to 4. In (b), on the other hand, we see that word-internal epenthesis leads to a violation of O-CONTIGUITY since segment 1 and 2, which stand in correspondence to an input segment, are not contiguous in the output. Thus, O-CONTIGUITY penalizes domain-internal epenthesis, but allows epenthesis at edges. This is exactly what we find in Southern German. The following ranking can therefore be established:

(16) O-CONTIGUITY ≫ ONSET ≫ DEP

Tableau 2: Lack of morpheme-internal ʔ-epenthesis in SoG

Input: Oase	O-CONTIGUITY	ONSET	DEP
☞ (a) ʔO.á.se		*	*
(b) ʔO.ʔá.se	*!		
(c) O.á.se		**!	

11 McCarthy and Prince oppose O-CONTIGUITY to I-CONTIGUITY where O-CONTIGUITY requires *output* contiguity of elements standing in correspondence, while I-CONTIGUITY requires *input* contiguity. Thus, O-CONTIGUITY amounts to a ban on intrusion into a domain, while I-CONTIGUITY will penalize domain-internal deletion of underlying elements.

We have the typical "except when" situation (cf. Prince/Smolensky 1993): a syllable is provided with an epenthetic onset (a vs. c), except when this would mean inserting an epenthetic element into the word (a vs. b). In other words, the driving force behind the insertion cases just discussed is the constraint ONSET requiring all syllables to have an onset, but the force of this constraint is limited in certain contexts by the requirements of another constraint, O-CONTIGUITY.

The established hierarchy can account also for part of the phenomenon of glottal stop insertion in Standard German, but note that here a second "except when" situation occurs. Also in Standard German glottal stops are inserted word-initially and are absent word-internally - *unless they precede a stressed vowel.*

Where stress is no issue, StG, as well as SoG, disallows morpheme-internal epenthesis following the pressure of O-CONTIGUITY, as the following tableau shows:

Tableau 3: Lack of morpheme-internal ʔ-epenthesis before unstressed vowels in SoG and StG

Input: Ta.o	O-CONTIGUITY	ONSET	DEP
☞ (a) Tá.o		*	
(b) Tá. ʔo	*!		

Let us now turn to the cases where StG and SoG differ, i.e. morpheme-internal hiatus contexts where the second vowel is stressed:

(17) SoG: ʔO.á.se
StG: ʔO.ʔá.se

I want to propose here that stressed syllables are in special need of an onset, hence subject to the following constraint:

(18) ONSET (STRESS): stressed syllables must have an onset

The phonetic correlates of stressed syllables are commonly thought to be longer duration, pitch changes and increased vocal effort (intensity). Sluijter (1995) shows that the last correlate is particularly important in the production and perception of Dutch and American English stressed syllables. Increased vocal effort results in increased subglottal pressure and hence in a different glottal

pulse characterized, among other things, by more rapid glottal closure (Sluijter 1995: 129).[12]

If a salient correlate of stress is subglottal pressure then a consonant preceding the stressed vowel might be useful in building up this pressure. Hence the preference of stressed syllables for having onsets and the legitimacy of ONSET (STRESS). Furthermore, this explains to some extent the higher variability of glottal stop epenthesis before the less intense secondarily stressed syllables under (4). Secondarily stressed syllables arguably exhibit less subglottal pressure and therefore can be thought to have less need for an onset.[13]

We can now analyze the cases that distinguish Southern and Standard varieties of German: ONSET (STRESS) plays an active role in the Standard variety, while it is of subordinated importance in the southern part of the German speaking area. The respective hierarchies are as follows:[14]

(19) Standard German: ONSET (STRESS) | O-CONTIGUITY | ONSET | DEP

Southern German: O-CONTIGUITY | | ONSET (STRESS) ONSET | DEP

12 The case of German is not so clear. Dogil (1999) mentions that the phonetic correlates of word stress in German have not been extensively investigated and that the studies vary in methods and results. His own measurements lead him to conclude that duration is the main correlate of German word stress and that intensity does not play any role. Jessen/Marasek/Schneider/Clahßen (1995), on the other hand, list intensity as a significant parameter at least with lax stressed vs. lax unstressed vowels. The authors claim, however, that duration and closure duration of the onset of the stressed vowel are more reliable correlates of stress. It seems that further research is needed to clarify the role of intensity as a correlate of German stress.

13 For the purpose of this paper I will take ONSET (STRESS) to refer both to main and secondary stress. Since the data in (4) is subject to variation among speakers it might be necessary to split the constraint in a more detailed analysis.

14 Domination of a constraint by another constraint in the ranking tree indicates that there is evidence for a ranking between them. The tree makes also clear that in the SoG grammar there is no evidence for the ranking between ONSET (STRESS) on the one hand and ONSET and DEP on the other. This information is lost in the tableaux, where I put ONSET (STRESS) in the highest position it can possibly occupy.

The difference between the two varieties stays in the different ranking between ONSET (STRESS) and O-CONTIGUITY. In Standard German contiguity can be violated in order to provide a stressed syllable with an onset, in Southern varieties it cannot. Compare the evaluation of the two examples

(20) SoG: ʔO.á.se
StG: ʔO.ʔá.se

Tableau 4: Evaluation of /Oase/ in SoG

Input: Oase	O-CONTIGUITY	ONSET (STRESS)	ONSET	DEP
☞ (a) ʔO.á.se		*	*	*
(b) ʔO.ʔá.se	*!			**
(c) O.á.se		*	**!	

Since ONSET (STRESS) is ranked below O-CONTIGUITY it cannot force word-medial epenthesis, as in (b). ONSET (STRESS) has no influence on word-initial epenthesis either. It does not matter whether the first syllable is stressed or not, since in this context epenthesis is already triggered independently by the ranking of ONSET over DEP.

Tableau 5: Evaluation of /Oase/ in StG

Input: Oase	ONSET (STRESS)	O-CONTIGUITY	ONSET	DEP
(a) ʔO.á.se	*!		*	*
☞ (b) ʔO.ʔá.se		*		**
(c) O.á.se	*!		**	
(d) O.ʔá.se		*	*!	*

The situation is different in Standard German. Here the high ranking of ONSET (STRESS) leads to epenthesis of a glottal stop before a stressed vowel in word-medial position and hence to a contiguity violation in candidate (b). The tableau shows an additional candidate, (d), neglected so far. In this candidate the glottal stop is inserted *only* before the stressed syllable. Candidate (d) fails because low-ranked ONSET demands epenthesis whenever this is compatible with O-CONTIGUITY. Thus the reason that Standard German has a glottal stop before vowel-initial first syllables, even when they are unstressed, has the same

explanation as glottal stop insertion in the Southern varieties: ONSET can show its influence at edges.

The examples analyzed so far are morphologically simple words but let us turn for a moment to the morphologically complex cases described in (6) through (8). It would seem that in a word like *ʔán.-ʔer.-kèn.nen* 'to acknowledge' (both SoG and StG pronunciation in slow speech) the constraint O-CONTIGUITY is violated by epenthesis of a glottal stop in the second syllable. A violation of O-CONTIGUITY, according to my analysis, is generally impossible in Southern German and possible in Standard German only if the epenthesis site is stressed, which is not the case here. The strongest stress of the word falls on the first vowel, a weaker one on the third vowel, hence the second vowel arguably is unstressed. Thus, morphologically complex words would seem to be the only case of medial insertion of a glottal stop before an unstressed vowel. However, note that insertion in this case is restricted to the left edge of roots and prefixes. Morpheme-internal insertion continues to be excluded also in morphologically complex words. We are therefore dealing here with some sort of 'cyclic effect' : a glottal stop inserted at the beginning of an onsetless morpheme according to the ranking given above (e.g. *ʔer.-kèn.nen* 'recognize') is preserved also under further affixation (e.g. in *ʔán.-ʔer.-kèn.nen* 'to acknowledge').

As already mentioned earlier in section 2.1, there are several possibilities to analyze the preservation of glottal stops in this context in terms of lexical phonology, output-output faithfulness or alignment. I will not pursue this range of facts further in this paper and in this sense the analysis proposed here is limited to glottal stop insertion in morphologically simple words.

2.3 Comparison with previous and alternative analyses

The present analysis shares with analyses such as those proposed by Rapp (1836) and Giegerich (1989, 1999) the idea that glottal stop insertion is triggered by the necessity to provide an onset for an onsetless syllable whenever no underlying segment is present to fulfill this function and whenever resyllabification is not an option. Differently from those analyses however, the constraint requiring onsets is assumed to be violable, a possibility for an analysis in terms of optimality theory, though not available in other frameworks. This approach thus offers a direct answer as to why we find syllables without an onset in StG and SoG *Ta.o* and in the second syllable of SoG *ʔO.á.se*: some other constraint (i.e. O-CONTIGUITY) is higher ranked than ONSET and inhibits activity of the onset principle in these cases.

Here morpheme-initial glottal stop epenthesis is analyzed as being triggered by a different constraint than foot-initial epenthesis (ONSET and ONSET (STRESS), respectively). Other analysts have tried to generalize over the two contexts (cf. Yu 1992, Wiese 1996). The crucial examples that distinguish the two approaches

are those where glottal stops are inserted at the beginning of a word with an initial unstressed vowel as e.g. in the example *ʔI.dee* (cf. (21) below). In a strictly foot-based analysis we have to assume that in these cases the left edge of the word coincides with the left edge of a foot regardless of the fact that it is at least doubtful whether the initial syllable is stressed. If the initial syllable is indeed unstressed, we would have to assume that the relevant foot is an iamb (cf. the foot parsing in (21a)). However, German is usually considered to have trochaic rhythm (cf. Giegerich 1985, Féry 1995, 1998, Alber 1997a, 1997b, 1998) and this would be the only context where iambs appear. If, on the other hand, we take the position that the initial syllable *is* stressed after all, then we have to assume that *ʔI.dee* is parsed into two feet, one consisting of an initial syllable with a single short vowel followed by the foot bearing main stress. This means that we would have to assume a rather undesirable foot at the beginning of the word, a degenerate foot consisting of a single (presumably) light syllable (cf. (21b)) Degenerate feet, though not a complete impossibility, are universally highly marked (cf. Hayes 1995) and German shows in no other context a necessity to parse them.

(21) Possible foot parsings for *ʔI.dée*:

a. (ʔI. dée) 'idea'
   (L 'H)
b. (ʔI).(dée)
   ('L) ('H)
c. ʔI. (dée)
   L ('H)

The present proposal has the advantage that there is no need to assume an undesirable foot structure where the presumably light first syllable is parsed into a foot of its own, or parsed into an iamb, and hence provided with a glottal stop. Rather, glottal stop insertion at the left edge of roots, as in *ʔIdee*, is analyzed here, independently from foot structure, as the effect of general ONSET, not inhibited by O-CONTIGUITY in this case. Simply, word-initial [ʔ] is a subcase of morpheme-initial [ʔ], or, more generally, of the possibility to satisfy the onset requirement in an edge position. Hence, a foot structure without iambs or degenerate feet can be assumed where the first syllable is left unparsed while the second, heavy syllable forms a foot of its own (cf. (21c)).

Thus, the fact that the glottal stop marks morphological edges is just a by-product of it being (largely) excluded from non-edge positions by independent reasons, i.e. the necessity to preserve contiguity relations among corresponding segments. Therefore, the present analysis disagrees with Trubetzkoy's (1939) interpretation of the German glottal stop as a positive *Grenzsignal* (cf. also Kohler 1977). If the glottal stop was just a boundary-marker, it would not

be clear why this boundary signal appears only in the case of onsetless syllables. We could imagine as well a language where vowel-initial morphemes are signaled through epenthesis of a glottal stop and consonant-initial morphemes by the means of an epenthetic vowel. Under the analysis proposed in this paper, instead, glottal stop insertion is similar to Trubetzkoy's negative *Grenzsignal*: it's absence marks the domain of the morpheme in Southern German, and, to a lesser extent, also in Standard German. In other words, in Southern German, a syllable without an onset signals that no morpheme boundary is present at its left edge.

In the analysis proposed here the limitation of glottal stop insertion to edges has been analyzed as the result of a contiguity constraint banning insertion into a morpheme. It might seem appealing to analyze the differences between the two varieties of German in terms of contiguity as well. Standard German – in contrast to Southern German – would not be characterized by an active ONSET (STRESS) constraint targeting stressed syllables but rather by a high ranking O-CONTIGUITY (FOOT) constraint[15] prohibiting epenthesis inside a foot but allowing it at its edges. O-CONTIGUITY (FOOT) thus would permit epenthesis at the left edge of a foot and, of course, also at the edge of a morpheme, giving us the StG pattern. However, there are languages where stressed syllables, and only stressed syllables, show a particular preference for having an onset, but where this need is not satisfied through epenthesis.[16] A solution in terms of contiguity therefore is not viable in these cases. The Central Australian languages Aranda and Alyawarra normally have initial stress but shift stress to a consonant-initial syllable in vowel-initial words:[17]

(22) Aranda:

consonant-initial words:		vowel-initial words:	
ká:puta	'head'	ibátja	'milk'
wáratàra	'place name'	arálkama	'to yawn'
lélantìnama	'to walk along'	ulámbulàmba	'water-fowl'

Alyawarra:

consonant-initial words:		vowel-initial words:	
párriyka	'fence'	ilípa	'axe'
mpúla	'you'	athá	'I (ERG)'

15 CONTIGUITY thus would be limited to a specific domain, the foot, in the sense of domain contiguity proposed in Lamontagne (1996).

16 I want to thank Nicole Nelson for pointing out this problem and indicating the relevant data.

17 In Aranda stress shift is limited to words with more than two syllables. The Aranda data are taken from Takahashi (1994) and Goedemans (1996) who follow descriptions by Strehlow (1942), Alyawarra examples come from Goedemans (1996) following the description by Yallop (1977).

In Aranda and Alyawarra there must be some constraint that triggers stress-shift and, as a consequence, violation of the constraint requiring initial stress. My proposal is that this constraint is ONSET (STRESS): stress wants to fall on a syllable with an onset. The constraint O-CONTIGUITY (FOOT), on the other hand, would not be sufficient as a trigger for stress-shift. It makes no difference for CONTIGUITY (FOOT) whether stress shift occurs or does not occur. The only thing that can violate a constraint such as CONTIGUITY (FOOT), and in this sense be an argument for its existence, is epenthesis, which in this case does not occur. Thus Aranda and Alyawarra show that a constraint similar to ONSET (STRESS) is needed anyway for cases like onset-driven stress-shift, while CONTIGUITY (FOOT) cannot explain these facts. Hence, if we need ONSET (STRESS) in any case, we might use it as well in the cases where the stressed syllables' need for an onset is satisfied through epenthesis, rather than through stress shift. In conclusion, Aranda and Alyawarra provide good evidence against analyzing the preference for feet-initial onsets as the result of contiguity banning (epenthesized) onsets from inside the foot.

Goedemans (1996) analyzes the Aranda and Alyawarra system in terms of alignment. Following an observation by McCarthy/Prince (1993) that ONSET can be restated as the alignment constraint ALIGN (σ, L, C, L),[18] requiring the left edge of a syllable to be aligned with the left edge of a consonant, he proposes to extend alignment of consonants also to other prosodic categories such as the foot or the prosodic word. Hence, what causes stress shift in Aranda and Alyawarra would be the constraint ALIGN (FT, L, C, L). This proposal is interesting and worth considering also for the German cases.[19] Standard German thus could be analyzed as having both a high ranked constraint ALIGN (FT, L, C, L) forcing epenthesis at the foot edge and a high ranked constraint ALIGN (MORPH, L, C, L) leading to epenthesis at the edge of a morpheme. ALIGN (σ, L, C, L), former ONSET, would play a subordinated in role in both Standard and Southern varieties.[20] In the analysis proposed here, in contrast, morpheme-initial epenthesis is interpreted as a subcase of the general ONSET principle, while epenthesis before stressed vowels is seen as the result of ONSET (STRESS). There are some considerations that speak against an analysis in terms of alignment, which regard the nature of the constraints mentioned above. The validity of ONSET is attested through typological observations. All languages prefer syllables with onsets and, everything else being equal, will syllabify a word like *tata* as *ta.ta* and not as *tat.a*. ONSET (STRESS) can receive a plausible explanation

18 In the alignment constraints below L = left, R = right, σ = syllable, C = consonant, Ft = foot.

19 An analysis similar in spirit, even though not explicitly stated in terms of alignment is proposed in Féry (forthcoming).

20 A ranking in terms of alignment should look like this:
StG: ALIGN (MORPH, L, C, L), ALIGN (FT, L, C, L) ≫ DEP ≫ ALIGN (σ, L, C, L)
SoG: ALIGN (MORPH, L, C, L) ≫ DEP ≫ ALIGN (σ, L, C, L), ALIGN (FT, L, C, L)

in phonetic terms (an onset makes it easier to build up pressure for the stressed syllable). The same is not true for the alignment constraints above. In fact, they reduce to a mere description of what happens and with their uniform formal definition obscure the fact that different functional explanations may underlie the preference for onsets of syllables in general, stressed syllables and initial syllables. As they are stated, the alignment constraints imply that there is no particular reason at all for alignment of a consonant to some prosodic or morphological category. But then we might rightly ask why at least two of them, ALIGN (FT, L, C, L) and ALIGN (σ, L, C, L), are not symmetrical, i.e., why right-alignment of consonants to feet and syllables does not seem to be equally widespread as left-alignment.[21] In fact, things are different when we consider alignment constraints in the realm of stress assignment: both ALIGN (FT, L, PRWD, L) and ALIGN (PRWD, L, FT, L) have right-aligning counterparts of equal importance.

There is yet another angle from which to consider the glottal stop. Glottal stop insertion, in some respect, seems to bear similarities to the aspiration of voiceless stops. Aspiration occurs in similar environments as glottal stop insertion, is thought to be sensitive to stress and there is a difference between Standard and Southern varieties. So, naturally, the question arises, whether the regional and contextual distribution of glottal stop epenthesis has anything to do with the laryngeal status of the segment (cf. Giegerich 1989 for a discussion of parallelisms between glottal stop insertion and aspiration). Kohler (1977) describes aspiration in German as a gradual phenomenon, present in all voiceless stops,[22] but particularly strong before stressed syllables. This means that the contexts for aspiration and glottal stop insertion are not identical since aspiration occurs also in coda consonants, but bear some similarity as to their dependence on stress. Interestingly, at least in the Southern varieties of Bavaria voiceless plosives are generally unaspirated (except maybe for /k/). This means that the Southern varieties exhibit both less instances of glottal stop insertion and no instances at all of aspiration. If increased subglottal pressure of stressed syllables can lead to aspiration in Standard German, but not in the Southern varieties, we may conjecture that there is a stronger need in the Standard to build up this pressure with the help of a consonant, leading to a higher ranking of ONSET (STRESS). However, the parallelism between glottal stop epenthesis and aspiration breaks down when we consider morpheme-initial contexts. Glottal stops are epenthesized in this context in both varieties, aspiration, however, occurs only in the Standard:

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21 Right alignment of consonants to the prosodic word has been proposed by McCarthy/Prince (1994), right alignment of consonants to the root by Golston/Wiese (1998).

22 According to Kohler the only context where aspiration may not occur are contexts where the voiceless stop is part of a consonant cluster.

(23)	T^{h}i.t^{h}á.nik^{h}	ʔO.ʔá.se	StG
	Ti.tá.nik^{h}	ʔO.á.se	SoG

I conclude that a glottal stop, and not some other segment, appears in the described contexts not because of its laryngeal nature, but because it makes a good epenthetic element. One line to pursue in this respect is the fact that glottal stops are often considered to be placeless (cf. McCarthy 1988). This means that a glottal stop is chosen as an epenthetic element because it requires less structure to be inserted.

One advantage of assuming violable constraints has already been pointed out at the beginning of this section, but there is yet another argument in favor of an analysis in terms of optimality theory. The analysis presented here makes clear predictions as to the possible cases of onset related epenthesis, at least if we consider only the rather limited set of constraints discussed here. The possible rankings of the four constraints are illustrated in the following table:

Grammars generated by different rankings of ONSET (STRESS), ONSET, O-CONTIGUITY, DEP:

ranking	effects
a. DEP ≫ ONSET (STRESS), ONSET	no epenthesis anywhere
b. ONSET ≫ DEP, O-CONTIGUITY	epenthesis everywhere
c. O-CONTIGUITY ≫ ONSET (STRESS), ONSET ≫ DEP	epenthesis only at edges
d. ONSET (STRESS) ≫ O-CONTIGUITY ≫ ONSET ≫ DEP	epenthesis at edges and before stressed syllables
e. O-CONTIGUITY ≫ ONSET (STRESS) ≫ DEP ≫ ONSET	epenthesis only before stressed syllables at edges
f. ONSET (STRESS) ≫ O-CONTIGUITY, DEP ≫ ONSET	epenthesis only before stressed syllables

The possible combinations of the four constraints above first of all give us languages where onset-driven epenthesis is not permitted at all because of DEP outranking ONSET (STRESS) and ONSET (a). The ranking of O-CONTIGUITY is irrelevant in this case. The Swiss German dialects where glottal stop insertion does not occur could be a case of this type.[23]

On the other hand we should find languages where epenthesis provides onsets to all vowel-initial syllables. These are generated by all the rankings where ONSET dominates DEP and, moreover, O-CONTIGUITY is ranked below ONSET as well

23 But see Ortmann (1998) for a treatment of so-called *Binde-n*, a more restricted case of consonant epenthesis in Swiss German.

(b). ONSET (STRESS) is irrelevant in this ranking since the ranking ONSET ≫ DEP already provides onsets for stressed as well as for unstressed syllables.

Then we find languages where O-CONTIGUITY limits epenthesis to edges, as in Southern German (c). ONSET (STRESS) is ranked below O-CONTIGUITY, but its ranking with respect to ONSET and DEP is irrelevant (cf. the analysis above).

In the rankings a. to c., ONSET (STRESS) has played a subordinated role. If ranked in top position, as in d., we can generate languages with epenthesis at edges and before stressed syllables, as in Standard German.

The hierarchies e. and f. stand for grammars where satisfaction of the ONSET constraint through epenthesis is not possible in general (since DEP ≫ ONSET), but where an epenthetic onset will be provided for stressed syllables. This means, for instance, that a word like *ʔÁr.beit* 'work', with initial stress, will have an initial glottal stop, while *A.mé.ri.ka*, with an initial unstressed syllable, will not. Recall that Kohler (1994), in his measurements of connected read speech observed exactly this difference: vowel-initial words presented glottal closure more often when the initial vowel was stressed than when it was not stressed. If this difference should turn out to be robust, then the rankings in e. and f. could stand for the faster speech pattern as described in (8), under the assumption that a fast speech register is characterized by a ranking minimally different from the ranking of the slow register. The minimal reranking in this case would consist in a demotion of ONSET under DEP (compare c. vs. e. and d. vs. f.). The difference between the rankings in e. and in f. then is that between fast Southern and fast Standard German: in e., the high-ranking of O-CONTIGUITY again limits epenthesis to morpheme edges.

An aspect that would deserve more attention than I can devote to here is the special-general relationship that holds between the constraints ONSET (STRESS) and ONSET. ONSET bans onsetless syllables in general, while ONSET (STRESS) is a constraint that specializes in stressed onsetless syllables. If we reformulate ONSET as {*[$_\sigma$ý, *[$_\sigma$ý̆}[24] and ONSET (STRESS) as {*[$_\sigma$ý} we see immediately that a violation of ONSET (STRESS) entails a violation of ONSET. Prince (1999) points out the intricacies of rankings involving special-general relationships, especially of those where the general constraint dominates the special one (an "Antipaninian ranking", in his terms). This is not the case in the German varieties discussed here, where special ONSET (STRESS) dominates general ONSET in Standard German and a ranking between the two constraints cannot be determined in the Southern varieties. However, special and general onset constraints could prove to be of interest in further investigations of general-special relations. In this sense it would also be worthwhile to see if yet more types of onset requirements can be found across languages and whether the special-general relation between ONSET and ONSET (STRESS) points to a universal scale of the type *[$_\sigma$ý > *[$_\sigma$ý̆ suggesting

24 [$_\sigma$ý = onsetless stressed syllable, [$_\sigma$ý̆ = onsetless unstressed syllable.

that, in general, stressed syllables without onsets are worse than unstressed syllables without onsets. The scale so far contains two elements, stressed syllables and unstressed syllables, but it is not unconceivable that onset requirements might also vary e.g. with respect to vowel quality.[25]

3. Regional variation in s-dissimilation

There is another phenomenon which exhibits similar regional and contextual distribution as glottal stop epenthesis and can be analyzed in terms of contiguity as well.

At the beginning of StG native roots there is a curious gap with respect to the distribution of alveolar /s/ and postalveolar /ʃ/: in this position we do not find [s] if the segment is followed by a non-velar consonant. Thus, the words in (24a) are unmarked German words, while the words in (24b and c) are clearly recognizable as loan words. In fact, as Wiese (1991, 1996) observes, some of the words, namely those in (24b) where [s] is followed by a non-velar stop, are often „nativized" and thus pronounced with initial [ʃ], as e.g. *[ʃ]til, [ʃ]pezies*. (25) shows that an alveolar [z][26] occurs without problems at the beginning of roots when followed by a vowel:

(24) Standard German [ʃ] and [s] root-initially before non-velar consonants:[27]

a.	[ʃ]piel	<Spiel>	'game'
	[ʃ]tein	<Stein>	'rock'
	[ʃ]muck	<Schmuck>	'jewelry'
	[ʃ]lecht	<schlecht>	'bad'
	[ʃ]nee	<Schnee>	'snow'
	[ʃ]rank	<Schrank>	'cupboard'
	ver-[ʃ]tehen	<verstehen>	'understand'
	be-[ʃ]prechen	<besprechen>	'talk over'
b.	[s]pezies	<Spezies>	'species'
	[s]til	<Stil>	'style'
c.	[s]moking	<Smoking>	'dinner jacket'
	[s]lalom	<Slalom>	'slalom'
	[s]nob	<Snob>	'snob'
	[s]ri Lanka	<Sri Lanka>	place name

25 A case in point could be the behavior of schwa- vs. non-schwa-syllables in German. Féry (forthcoming) observes that syllables containing a schwa cannot have as an onset [h] nor [g] if [g] follows [ŋ]. She analyzes these facts as a particularly low ranking of a constraint requiring onsets for schwa-syllables.

26 In this context the alveolar sibilant is always voiced in Standard German.

27 Most examples are from Wiese (1996).

(25)	[z]ingen	<singen>	'sing'
	[z]onne	<Sonne>	'sun'

The facts are more complicated if the sibilant precedes a velar stop. Historically, [sk] clusters turned into [ʃ][28] so it is not surprising that no clusters of this type, neither [sk] nor [ʃk], are found in the native German lexicon. However, there are some rather well integrated loans, where /s/ is not changed to [ʃ]:[29]

(26) Standard German [sk] clusters root-initially

[s]kat	<Skat>	'name of card-game'
[s]krupel	<Skrupel>	'scruple'
[s]klave	<Sklave>	'slave'

These loans have [s], not [ʃ], in the initial onset and according to Wiese (1991, 1996) do not show any tendency to change [s] to [ʃ], differently from the loan words in (24b).

The absence of [s] before non-velar consonants is limited to the beginning of a root, as can be seen in the following examples where [s] occurs freely in root-internal clusters before consonants:

(27) Standard German [sC] clusters root-internally:

Fen[s]ter	'window'
La[s]ter	'vice'
Ra[s]pel	'a rasp'
Mi[s]pel	'medlar'
Kon[s]tanz	place name
Wur[s]t	'sausage'
Li[s]t	'cunning'

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28 Cf. (i) OHG: skif > German: [ʃ]iff <Schiff> 'ship'
According to König (1994) the process sk > ʃ took place already from Old High German to Middle High German, as indicated in the orthography of words like *skrīban* (OHG) vs. *schrīben* (MHG), 'to write'. The s > ʃ process at the beginning of roots, instead, took place from Middle High German to New High German (König 1994: 151), as again reflected in the orthography (cf. *smal* (MHG), *schmal* (NHG), 'narrow').

29 An initial [ʃk] cluster is attested in five place names of eastern regions of Germany and thus presumably due to Slavic influences. *Schkeuditz* (Saxony), *Schkölen* (Thuringia), *Schköna, Schkopau* and *Schkortleben* (Saxony-Anhalt) all have initial [ʃk], but note that this has to be indicated explicitly in the orthography, in contrast to words like e.g. *Stein*. If [s] would show any inclination to turn into [ʃ] before [k] the orthographic notation would not be necessary.

Interestingly, these last examples are all pronounced with an [ʃ] instead of an [s] in many Southern varieties of German:

(28) Southern German [sC] clusters root-internally:

Fen[ʃ]ter	'window'
La[ʃ]ter	'vice'
Ra[ʃ]pel	'a rasp'
Mi[ʃ]pel	'medlar'
Kon[ʃ]tanz	'place name'
Wur[ʃ]t	'sausage'
Li[ʃ]t	'cunning'

The precise geographical extension of this phenomenon is not completely clear. Vietor (1884: 115) notes in very general terms that [ʃp] and [ʃt] limited to initial position are characteristic of the 'correct' (Standard) German pronunciation, while [ʃp]/[ʃt] in initial, medial and final position are typical of *Oberdeutsch* (i.e. Southern German). According to him, [sp] and [st] in all contexts are to be found in the Northern varieties of *Niederdeutsch* (cf. the pattern of the Hamburg dialect described below). The *Kleiner deutscher Sprachatlas* is more precise as to geographical extension but unfortunately contains only data with [st]/[ʃt] clusters and only two examples of these. The two isoglosses indicated in it for the pronunciations *Schwe[st]er* and *Schwe[ʃt]er*, and *fe[st]* and *fe[ʃt]* more or less coincide and cut the German-speaking area so as to assign to the *[ʃt]* area the South-Western part of the Bavarian dialects, the Alemannic dialects, *Schwäbisch* (Swabian), *Elsässisch* (Alsatian), *Südfränkisch* (Southern Franconian), the Western part of *Ostfränkisch* (Eastern Franconian), *Rheinfränkisch* (Rhine Franconian) and *Moselfränkisch* (Moselle Franconian).[30] In this sense it would be more precise to speak of a 'South-Western variety' . Of course the isoglosses just mentioned do not guarantee that /s/ always surfaces as [ʃ] in the contexts described above. For the exactness of this pattern I must again refer to my own, (South)-Tyrolean dialect.

Since the contexts exemplified in (24a) lack an [s] also in the Southern varieties we must conclude that we have here a similar case as glottal stop epenthesis discussed in the previous section. One variety exhibits a phonological process everywhere in the root while the other one limits the same process to an edge, here the left root edge. The difference between the two processes is that in this case the Southern varieties display the "everywhere" instance, while the Standard varieties limit the process to a subset of contexts.

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30 For a general overview of the *fe[ʃ]t* isogloss cf. König (1994). The same geographical distribution is also more or less confirmed by the isogloss that divides *let[st]e* and *let[ʃt]e* in the *Wortatlas der deutschen Umgangssprache* (cf. Eichhoff 1977–96). For a list of villages through which the *fe[ʃ]t* isogloss passes cf. Martin (1959).

The analysis I want to propose here therefore runs along similar lines as the one of glottal stop epenthesis discussed above. Some constraint triggering the phonological process is high ranked in the Southern varieties but limited by O-CONTIGUITY in its influence in the Standard varieties, hence applying only at edges.

In what follows I will tentatively adopt Wiese's (1991, 1996) analysis of the /s/ → [ʃ] process. Wiese interprets the absence of initial [ʃ] before [k] as the result of a process of dissimilation. According to Wiese, what distinguishes [s] and [ʃ] is the value for the feature [high] and this is also what distinguishes the consonants following the fricative in (24) from [k]. Thus *Spiel* is pronounced */ʃ/piel* in order to avoid a cluster consisting of [-high] [s] and [- high] [p] and *Skat* is */s/kat* to avoid a [+ high] [+ high] sequence.

This analysis presents certain problems which I will point out in the following.

First, it is difficult to determine whether the sibilant in words like *Skat* does not turn into [ʃ] because this would create a sequence of two identical features or whether *Skat* is categorized in the grammar of the speaker as a loan word that does not participate in a more general process that turns sibilants before *all* consonants into [ʃ]. Are *Stil* and *Spezies* just more integrated than *Skat* and *Skrupel* so that speakers sometimes chose [ʃ] instead of [s]? An answer to this question would require a more extended discussion of the characteristics of the "native" and "non-native" lexicon, far too large an enterprise to even start here.[31] In favor of the dissimilation analysis Wiese states that the sibilant in words like *Skat*, differently from the [s] in words like *Stil* and *Spezies*, does not show any tendency to change to [ʃ]. This claim is supported by what we find in the normative literature on 'correct pronunciation'. Thus, in Siebs (1900, 1901) we find long lists of loan words with initial [sp] and [st] clusters which 'can' be pronounced as [ʃp] and [ʃt], because – as Siebs states – those words are not 'felt as foreign', while similar lists of [sk] clusters are absent, since [sk] 'must' always be pronounced as [sk].[32]

A different problem for the dissimilation analysis is that it is unclear why this process should be limited to [s]. Initial clusters containing other combinations of [-high] consonants are perfectly well-formed (cf. *Platz*, 'place', *Preis*, 'price').

Furthermore, it is not clear why dissimilation does not involve final C + s clusters, neither in Standard nor in Southern German. *Ra[ps]*, 'rape' and *Sa[ts]*

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31 A good point to start would be to find other phenomena that signal whether a loan word has been well integrated into the language. For instance, if a word with initial [sk] undergoes other phonological processes of German, or adjustments to the German vowel inventory but nevertheless preserves the initial [s], then this could indeed be a sign of a dissimilation process being active in German.

32 The later editions of Siebs (e.g. de Boor/Moser 1961, de Boor/Moser/Winkler 1969) explicitly state that initial [sk] clusters in loan words must not be pronounced as [ʃk], while they still contain lists of loan words with initial [sp] and [st] clusters that may be pronounced with the postalveolar sibilant.

'sentence' are well-formed in both varieties. There must be some additional restriction that excludes /s/ → [ʃ] in these cases.

Finally, some speakers of southern varieties of German accept words with instances of [ʃk] clusters, as in the examples *Ma[ʃ]ke*, 'mask' and */[ʃ]krupel*. These last examples indicate that although the initial trigger for the process might have been dissimilation, it is possible, at least in some Southern varieties, that the process has generalized to contexts preceding all consonants.[33]

Notwithstanding the many open questions and pending further investigations I will adopt Wiese's analysis and interpret the process as dissimilation. Note that for the point that I want to make here the details are not really crucial. The point is that here we are dealing with yet another case where a phonological process takes place only at one edge of a domain in one variety of German while it takes place through the whole domain in another variety.

Thus, it is not important exactly which features are involved. What is important is the assumption that an underlying /s/ surfaces as [ʃ] because a feature is inserted that was not there before. This is an obligatory move, if we assume underlying representations underspecified for [-high], as Wiese does. It is a possible move, in any case, if we assume that the trigger for the process is indeed dissimilation destroying a linked structure. This process is illustrated schematically below for both the root edge and the root-internal context:

(29) Dissimilation at the root edge (a) and root-internally (b):

a. # s t → # ʃ t — does not violate contiguity

f_1 f_y f_1

b. X s t → X ʃ t — violates contiguity

f_1 f_2 f_1 f_y f_2

As can be seen from the diagram, insertion of a feature at the edge of the root as in (a) does not violate contiguity. f_1 is contiguous to whatever comes after it in the input as well as in the output. On the other hand, if a feature is inserted root-internally, as in (b), the input contiguity relationship between f_1 and f_2 is destroyed in the output because of the intervening f_y.

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33 A process changing [s] to [ʃ] before (certain) consonants is attested also for other languages as e.g. many dialects of Southern Italy. Radtke (1988) notes that [s] is changed to [ʃ] before [p] in some dialects of Campania, in other Campanian dialects the same process takes place also before [k]. However, [s] → [ʃ] before [t] is not attested. The exclusion of dentals from the triggering contexts is even more mysterious, in this case.

Under these assumptions it is quite obvious what the analysis of Southern German will be. In Southern German varieties there is a constraint that triggers dissimilation. I will use as a short-hand the term OCP (Obligatory Contour Principle, cf. Leben 1973) for whatever constraint or constraint family account for dissimilation.[34]

(30) OCP: adjacent segments must not be specified for the same feature f

In Southern German this constraint is active at root edges as well as root-internally, therefore it must dominate O-CONTIGUITY, which would otherwise prohibit root-internal insertion of features. The OCP must also dominate some IDENT constraint militating against feature change, otherwise the dissimilating segment /s/ would not be allowed to change its feature at all.[35] Following Wiese's proposal I will assume that the relevant feature is [± high], thus the relevant faithfulness constraint is IDENT (HIGH):

(31) IDENT (HIGH): corresponding segments are identical in the feature [± high]

The hierarchy emerging for Southern German is the following:

(32) SoG hierarchy for /s/ → [ʃ]
OCP ≫ O-CONTIGUITY, IDENT (HIGH)

Tableau 6: Dissimilation at the root edge in SoG

Input: /s/tein	OCP	O-CONTIGUITY	IDENT (HIGH)
☞ (a) [ʃ]tein			*
(b) [s]tein	*!		

Tableau 7: Dissimilation root-internally in SoG

Input: La/s/t	OCP	O-CONTIGUITY	IDENT (HIGH)
☞ (a) La[ʃ]t		*	
(b) La[s]t	*!		

34 For some proposals cf. Yip (1998), Plag (1998).

35 IDENT becomes relevant in the linked structure proposed here, though not in an underspecified structure.

As the tableaux illustrate, dissimilation occurs in Southern German at the beginning of the root as well as root-internally, since the markedness constraint OCP dominates both faithfulness constraints O-CONTIGUITY and IDENT (HIGH).

In Standard German we do have dissimilation as well. This means that also in this variety the dissimilation triggering OCP dominates identity preserving IDENT (HIGH). But dissimilation is limited to the contexts allowed by contiguity. Hence O-CONTIGUITY must dominate the partial hierarchy OCP ≫ IDENT. The hierarchy for Standard German is as below:

(33) StG hierarchy for /s/ → [ʃ]
O-CONTIGUITY ≫ OCP ≫ IDENT (HIGH)

Tableau 8: Dissimilation at the root edge in StG

Input: /s/tein	O-CONTIGUITY	OCP	IDENT (HIGH)
☞ (a) [ʃ]tein			*
(b) [s]tein		*!	

Tableau 9: No dissimilation root-internally in StG

Input: La/s/t	O-CONTIGUITY	OCP	IDENT (HIGH)
(a) La[ʃ]t	*!		*
☞ (b) La[s]t		*	

In Standard German the dissimilating candidate (a) wins only when the sibilant occurs at the left edge of the root. Root-internally the activity of the OCP is inhibited by high-ranking O-CONTIGUITY. Thus, the violation of this latter constraint rules out the dissimilating candidate *La[ʃ]t*.

The two hierarchies listed so far exhaust already half of the six possible rankings among the three constraints since in the Southern German hierarchy the ranking between O-CONTIGUITY and IDENT (HIGH) is irrelevant. The two constraints do not conflict and therefore cannot be ranked among each other, except in a case like (33), where a third constraint stays between them. The remaining possible grammars are given below:

(34) IDENT (HIGH) ≫ OCP ≫ O-CONTIGUITY
IDENT (HIGH) ≫ O-CONTIGUITY ≫ OCP
O-CONTIGUITY ≫ IDENT (HIGH) ≫ OCP

These are rankings where IDENT (HIGH) dominates the OCP. The result is that dissimilation does not take place under any of the three rankings. If no dissimilation occurs, O-CONTIGUITY can have no effect whatsoever and therefore its ranking in the hierarchy is irrelevant. The three hierarchies therefore generate the same, non-dissimilating pattern. We are fortunate enough to find inside the range of German regional dialects a variety that stands for this case. It is the dialect of Hamburg, where dissimilation does not occur root-internally, but neither does it root-initially. Hence we have pronunciations like *[s]piel* and *[s]tein* (cf. Wiese 1996: 42).[36]

Tableau 10: No dissimilation at the root edge in the dialect of Hamburg

Input: /s/tein	IDENT (HIGH)	OCP	O-CONTIGUITY
(a) [ʃ]tein	*!		
☞ (b) [s]tein			

Tableau 11: No dissimilation root-internally in the dialect of Hamburg

Input: La/s/t	IDENT (HIGH)	OCP	O-CONTIGUITY
(a) La[ʃ]t	*!		
☞ (b) La[s]t			

There are still many open questions with respect to the distribution of [s] and [ʃ] in the regional varieties of German. The only point this paper wants to make is the following: if indeed we are dealing here with a process of feature insertion, then we have a case similar to the one of glottal stop epenthesis discussed before. We have a process limited to a morpheme edge in one variety, applying throughout a morphological domain in another variety, not applying at all in a third one. An approach in terms of CONTIGUITY can explain this fact. It can also explain, for certain phenomena at least, why regional variation shows this particular asymmetry that a process applies either at edges, or throughout, but not just inside a root.[37] The German variety where dissimilation occurs only root-internally is not attested. Under the approach presented here this is not surprising. O-CONTIGUITY might be high ranked and thus limit insertion to edges, or it might be low ranked and therefore not inhibit the process, but

36 I do not know, however, how frequently [s] can appear before sonorants, as in *Schnee, Schmuck, schlecht, Schrank* in this dialect.

37 Of course regional variation can display also other patterns. The claim here is that this kind of regional variation is very typical, but clearly not the only one to be observed.

nothing forces insertion to apply only inside a domain, but not at edges. Therefore the hypothetical German dialect exemplified below does not exist:[38]

(35) Not attested German variety:

[s]piel	'game'
[s]tein	'rock'
Fen[ʃ]ter	'window'
Ra[ʃ]pel	'a rasp'
Wur[ʃ]t	'sausage'

One last point has to be clarified before concluding this section. In the analysis above I have always indicated /s/, not /ʃ/, as the input sibilant for Standard and Southern German words like */ʃʃ/tein* and Southern German words like *La/ʃʃ/t*. In fact, even if we assume that the input was /ʃ/[39] in these varieties the proposed rankings would generate the same output: the ranking of OCP ≫ IDENT (HIGH), active in both varieties, would guarantee the preservation of /ʃ/ in clusters with a non-velar consonant. Nevertheless we may ask ourselves what input German speakers assume in a word like */ʃʃ/tein*. Even though there might have been an input /s/ historically, isn't it the case that now the speaker simply assumes an input /ʃ/?[40] We might even go further and ask whether the rankings established so far do have any reality at all at the present stage or if they were active only at some point in history leading subsequently to a reanalysis of /s/ inputs as /ʃ/ in these contexts. It might well be the case that today the input for the sibilant in */ʃʃ/tein* is /ʃ/, but the important question is what would happen to a hypothetical input /s/ in the same context. Is it still mapped to [ʃ]? In other words, are the rankings established for Standard and Southern German still active in these grammars or not? The question is not easy to answer since this is not a case of morphophonological alternation. Some insight can again come from integrated loan words. Take the loan word *stress*. As a technical term of linguistic theory, which arguably is classified by German speakers as a clear loan word, it is

38 The prediction that the 'non-edge only' case does not exist is of course only true if we limit attention to the set of constraints just discussed, a reasonable move since it is plausible that regional variation usually takes place through reranking of a rather limited set of constraints. There are languages which exhibit the 'non-edge only' case, like Axininca Campa, which allows for syllables without onsets, but only in word-initial position, with epenthesis taking place elsewhere. The ban on initial epenthesis is analyzed by McCarthy/Prince (1993) as the effect of a constraint requiring left-alignment of stems and prosodic words, a constraint which does not seem to be active in the varieties of German.

39 If we follow the concept of 'Richness of the Base' (cf. Prince/Smolensky 1993) we have to assume that both /s/ and /ʃ/ are possible inputs.

40 Under the concept of 'Lexicon Optimization' (cf. Prince/Smolensky 1993) we have to assume an input /ʃ/ in these cases.

pronounced as *[s]tress*. However, in its commonly used meaning indicating psychological tension German speakers pronounce it as *[ʃ]tress*. This means that loan words which clearly provide an input /s/ are still subject to the ranking generating a dissimilating pattern, as soon as they are integrated well enough into the native language.[41]

4. Minimal differences between grammars – minimal differences in faithfulness

In the previous sections I have analyzed the grammar of regional varieties of the same language. The differences between these grammars are in some sense minimal. The difference between the varieties is not of any importance for mutual comprehension and, especially in the case of glottal stop insertion, not stigmatized as characteristic of a strictly local dialect. In fact, if we consider the phenomena discussed above, glottal stop insertion and s-dissimilation, it can be observed that Southern speakers often preserve the form that is typical for their variety even when they decide to speak Standard German. But what does 'minimal difference' mean? In this section I will argue that optimality theory can give us a rather precise measure for the difference between grammars, in terms of differences between constraint rankings. And the variation between closely related languages is an ideal testing ground to see what form minimal variation takes.

At first glance it might be attractive to calculate the differences between grammars counting the number of constraint rerankings that take place in passing from one grammar to the other. But this is too coarse a measure. Compare the grammar that accounts for s-dissimilation in Standard German and one possible grammar that accounts for the same phenomenon in the dialect of Hamburg:

(36) StG: O-CONTIGUITY ≫ OCP ≫ IDENT (HIGH)
Hamburg dialect: IDENT (HIGH) ≫ OCP ≫ O-CONTIGUITY

Two constraints, O-CONTIGUITY and IDENT (HIGH), have to be reranked in order to pass from one grammar to the other. Still, the two varieties arguably are minimally different: in StG dissimilation takes place at the root edge while in the Hamburg dialect it does not take place at all.

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41 A similar problem arises when we consider the dialect of Hamburg. Here the analysis I proposed predicts that e.g. an input /ʃt/ should surface faithfully as /ʃt/. This prediction is not so easy to test since English, the language where most loan words come from nowadays, does not provide any examples of this type.

If we go back to the two phenomena discussed in the previous sections we see that they share a common characteristic: in both cases some phonological process takes place in certain contexts in one variety and in a subset of these same contexts in the other variety. This difference in contexts of application is at the same time a difference in degree of faithfulness. The StG grammar that generates dissimilating patterns only at the root edge is more faithful than the SoG pattern that generates them everywhere.[42] In other words, the markedness constraint OCP triggering the /s/ → [ʃ] mapping is held in check by faithfulness constraints root-internally though not at the root edge in StG but overrules faithfulness constraints also root-internally in SoG.

The phenomenon of varying degrees of faithfulness is common in regional variation. I just want to mention another case from the domain of Germanic languages and dialects, g-spirantization. In the varieties of Southern Germany the voiced dorsal stop is never spirantized (cf.(37a)). In coda position it is devoiced, but it remains a stop. /g/ is spirantized in Standard German in coda position if following a high front vowel (cf. (37b)). In Northern varieties of German (NoG) /g/ becomes a fricative in the coda of a syllable regardless of the quality of the preceding vowel (cf. (37c)) (cf. Itô/Mester 1999for an analysis). Finally, in a language like Dutch [g] is banned from all positions, codas as well as onsets (cf. (37d)).

(37)	(a)	(b)	(c)	(d)	
	SoG	StG	NoG	Dutch	
/g/ehen →	[g]ehen	[g]ehen	[g]ehen	[x]aan	'go'
weni/g/ →	weni[k]	weni[ç]	weni[ç]	weini[x]	'few'
Ta/g/ →	Ta[k]	Ta[k]	Ta[x]	daa[x]	'day'

Let us assume for simplicity that there is something like a markedness constraint *[g] that bans voiced dorsal fricatives in general. This markedness constraint is fully obeyed in Dutch,[43] in a subset of the Dutch contexts in Northern German, in a subset of those cases in Standard German and nowhere in Southern German. An input /g/ thus is parsed, with respect to the feature [continuant], most faithfully in SoG, less faithfully in StG, even less faithful in NoG and least

42 Note that it is *the grammar* that is more or less faithful, not necessarily the single forms. Thus, if we assume an underlying /ʃ/ for StG and SoG /ʃ/*tein* the mapping /ʃ/*tein* → /ʃʃ/*tein* is perfectly faithful.

43 Probably this is only true for Dutch at some earlier historical stage. Nowadays input /g/s coming into the language in loan words are not spirantized. As in the discussion of the input to /ʃʃ/*tein* above I want to make clear that I do not propose that the initial consonant of a word like *gaan* is actually /g/. I just claim that there was some historical stage where any input /g/ was spirantized in Dutch, in codas as well as in onsets.

faithfully in Dutch. A summary of the contexts for glottal stop insertion, s-dissimilation and g-spirantization indicating the subset relations of the domains of application is given in the next table:

(38)

	SoG		StG		NoG		Dutch
glottal stop insertion:	{[V}	⊂	{[V, V́}				
s-dissimilation:	{ri, rm}	⊃	{ri}	⊃	Ø		
g-spirantization:	Ø	⊂	{i/coda}	⊂	{i/coda, coda}	⊂	{i/coda, coda, onset}

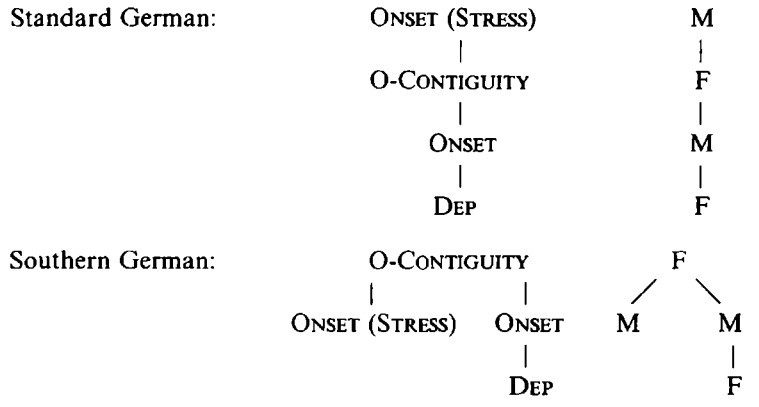
[V = before vowels, at the left edge of roots and prefixes, V́ = before stressed vowels, ri = root-initially, rm = root-medially, i/coda = after high front vowels in coda position, coda = in coda position, onset = in onset position.

In each of the cases illustrated in the table one or more markedness constraints can show their force in a certain context in the variety where faithfulness is relatively weak, but only in a subset of the same contexts in the variety where faithfulness is stronger.

Optimality Theory has the advantage that the various degrees of faithfulness can be read off directly from the constraint ranking. To illustrate this I will turn to the phenomena of glottal stop insertion and s-dissimilation discussed in detail above and translate the proposed constraint rankings into rankings where each constraint is replaced with F, if it is a faithfulness constraint, and with M, if it is a markedness constraint.

Let us start with glottal stop insertion. The rankings proposed for Standard German and Southern German contain the two faithulness constraints DEP and O-CONTIGUITY and the two markedness constraints ONSET and ONSET (STRESS). The rankings of the two varieties, with their translation into M/F terms look as follows:

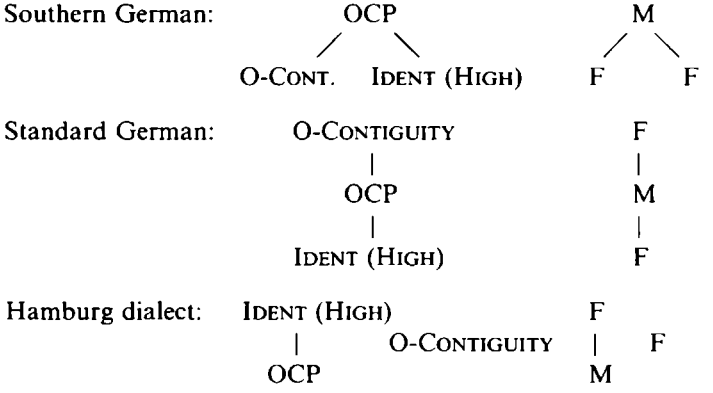
(39) Translation in M/F terms of the partial grammars for glottal stop insertion:



In the StG hierarchy the higher faithfulness constraint is dominated by one markedness constraint, the lower one by two markedness constraints, the overall count results in faithfulness being dominated three times by markedness. In the SoG hierarchy, the higher faithfulness constraint is not dominated by any markedness constraint and the lower faithfulness constraint is dominated crucially only by one markedness constraint (the ranking between ONSET (STRESS) and DEP being irrelevant). The overall count is thus one point on the unfaithfulness scale. The result of summing up how often markedness dominates faithfulness thus reflects what we said above: the StG grammar for glottal stop insertion is less faithful than the SoG grammar.

The same count can be made for the phenomenon of s-dissimilation. Here the faithfulness constraints involved are again two, IDENT (HIGH) and O-CONTIGUITY, but the markedness constraint is only one, namely the dissimilation triggering OCP. Confront the hierarchies for SoG, StG and the Hamburg dialect:

(40) Translation in M/F terms of the partial grammars for s-dissimilation:



The count of markedness constraints crucially dominating faithfulness constraints again reflects the intuitive observation made before. SoG has the most unfaithful grammar with each faithfulness constraint being crucially dominated by a markedness constraint. StG is more faithful since only one faithfulness constraint is dominated by a markedness constraint. Finally, the Hamburg dialect is the most faithful of the three varieties since no faithfulness constraint is crucially dominated by a markedness constraint (the ranking of O-CONTIGUITY does not matter in this ranking).

Of course degrees in faithfulness are not the only value in which closely related languages vary, but, I think, they are a rather typical one. Other typical patterns of minimal variation may be discovered in further research. What the examples just discussed show is that it is important to consider the type of constraints that are involved.

Another aspect that is quite obvious and that emerges from the above patterns is that the constraints involved in reranking often bear similar specifications: in the analysis of s-dissimilation IDENT (HIGH) refers to the feature [high] and the OCP in the cases discussed must also be specified for [high], since it bans only sequences of features with the same value for [high]. Reranking of a constraint like IDENT (HIGH) with, e.g. an OCP constraint specified for [nasal] would of course not lead to the same effects.

5. Conclusions

I have presented two cases of edge effects and argued that they are brought about by the influence of the constraint O-CONTIGUITY. This constraint bans glottal stop epenthesis both in Standard and in Southern varieties of German from applying in all contexts where an onset would be needed. Instead, glottal stops appear at the edge of morphemes. The differences between Standard and Southern German are accounted for by the different ranking of O-CONTIGUITY in the two regional varieties. O-CONTIGUITY is dominated in Standard German, but not in Southern German, by a constraint requiring stressed syllables to have onsets. As a result of the domination of O-CONTIGUITY, the contexts where glottal stop epenthesis takes place in Standard German are a superset of the contexts where the process can be observed in Southern German.

In the case of dissimilation the converse is true, it is the Southern German variety that exhibits domination of O-CONTIGUITY and therefore the domain of dissimilation in Southern German contains the domain of dissimilation in Standard German. The analysis in terms of O-CONTIGUITY thus explains why phenomena as those discussed here are limited to occur at edges in some varieties.

A comparison between the phenomena of glottal stop insertion, s-dissimilation and g-spirantization shows that these typical patterns of variation between closely related varieties can be characterized as a minimal variation in degrees of faithfulness of the grammars involved. The three processes discussed typically take place in certain contexts in one variety but in a subset of the same contexts in a closely related variety. Comparing the grammars of glottal stop insertion and s-dissimilation we see that the degree of faithfulness of a certain grammar can be directly deduced from the constraint ranking itself. Thus, the optimality theoretic grammar, specified as a hierarchy of violable constraints, can give us a measure for minimal variation among languages, at least if the minimal variation concerns minimal variation in faithfulness.

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