Subtractive Morphology as Evidence for Parallelism

Kazutaka Kurisu

1. Introduction

An important issue in recent theoretical phonology is the comparison of parallelism and serialism in Optimality Theory (OT). In the original model articulated by Prince and Smolensky (2004), OT is parallel. GEN is endowed with freedom of analysis, and input-output mapping takes place only once. As a consequence, EVAL selects the global optimum. In recent theories called Harmonic Serialism (HS) and OT with candidate chains (OT-CC), by contrast, OT is derivational. GEN is allowed to add at most one change to the given input (gradualness). The latest output becomes the input on the next pass, and the derivation continues till it reaches convergence. Each derivational step must improve harmony relative to a given constraint ranking (harmonic ascent). Thus, the local optimum is selected at a time, unlike in parallel OT.

The parallel and serial OT models make different empirical predictions. In the previous literature, evidence is in conflict. There is evidence in support of parallelism (Walker 2010, Kaplan 2011, Kurisu 2012, 2015). However, many recent studies offer evidence for serialism (Blumenfeld 2006, McCarthy 2007a, b, 2008a, b, Wolf 2008, Pruitt 2010, Kimper 2011). The goal of this study is to defend parallel OT. As empirical data, I investigate subtractive morphology involved in Lardil nominative formation. I argue that relevant examples are explained with parallel OT while they are not analyzed with HS and OT-CC.

The remainder of the paper is organized as follows. Section 2 presents examples of the nominative formation in Lardil. In section 3, I demonstrate that they are straightforwardly analyzed with parallel OT. Section 4 focuses upon serial OT. I argue that serial segmental deletion does not produce desired output when vowel deletion interacts with consonant deletion. Furthermore, I argue against a serial approach to subtractive morphology that does not appeal to segmental deletion, a proposal advanced by Kimper (2009). Section 5 takes up pseudo-Lardil, a hypothetical language considered by McCarthy (2007a, b). He construes pseudo-Lardil as evidence for serialism, but I argue that his argument is not convincing. Finally, this paper is concluded in section 6.

2. Lardil nominatives

This section presents data of Lardil nominative formation. Relevant studies include Hale (1973), Klokeid (1976), Itô (1986), Wilkinson (1988), Weeda (1992), Blevins (1997), Horwood (1999), Kurisu (2001), and Prince and Smolensky (2004). Examples of interest are given in (1). The examples in (1a) show the fact that Lardil nominatives are formed via final vowel deletion of a stem. Interesting is that final vowel deletion exhibits interaction with consonant deletion. In Lardil, apical (alveolar and retroflex) consonants are tolerated in a coda. Non-apical coda consonants must be place-licensed by the following onset. As a result, consonant deletion is triggered when final vowel deletion creates a word that ends in a non-apical consonant, as illustrated in (1b). This phonological process applies to as many consonants as necessary to satisfy the coda condition. Finally, no segment undergoes deletion when the stem ends in an apical consonant, as shown in (1c). There is another case where no segment is deleted: when the stem is a minimal word. This case is not important for the purpose of this paper.

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[*] Kazutaka Kurisu, Kobe College, kurisu@mail.kobe-c.ac.jp. I thank the audience of WCCFL 33 for invaluable discussion. I also thank four anonymous abstract reviewers for insightful feedback. The author is responsible for all remaining errors.

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(1)		*Stems*	*Nominative*	*Gloss*
	a.	jalulu	jalul	flame
		wiwala	wiwal	bush mango
		majara	majar	rainbow
		kaŋkaɽi	kaŋkaɽ	father's father
	b.	wulunka	wulun	fruit
		jukarpa	jukar	husband
		murkunima	murkuni	fighting stick
		t̪aputʲi	t̪apu	older brother
		muŋkumuŋku	muŋkumu	wooden axe
		tʲumputʲumpu	tʲumputʲu	dragonfly
	c.	kentapal	kentapal	dugong
		ket̪ar	ket̪ar	river
		jaraman	jaraman	horse
		ŋampit	ŋampit	humpy
		mijaɽ	mijaɽ	spear

3. Parallel analysis

The goal of this section is to demonstrate that classic parallel OT can deal with the data of Lardil nominative formation presented in (1). The following analysis is a slightly revised version of Kurisu (2001). To get the analysis off the ground, I assume the four constraints in (2). As the driving force of subtraction, I assume Realize Morpheme (RM). The basic schema of subtractive morphology is RM » Max. Max is specialized to nominatives such that rampant deletion is prevented.

(2) a. Realize Morpheme
Every morpheme must receive overt phonological exponence.
b. Max$_{\text{NOM.}}$
No segment may be deleted in the nominative formation.
c. CodaCond
If not an apical, a coda consonant must be place-licensed by the following onset.
d. Anchor-R(C,Stem)
The stem-final (not rightmost) consonant of input must be the final segment in its output.

The examples in (1a) are analyzed in (3). In order to fulfill RM, the final vowel is elided at the cost of a Max$_{\text{NOM.}}$ violation. Roughly speaking, RM requires that output be phonologically different from its input, so final vowel elision contributes to the satisfaction of RM.

(3)

		/jalulu/$_{\text{NOM.}}$	CodaCond	Anchor-R	RM	Max$_{\text{NOM.}}$
a.		ja.lu.lu			*!	
b.	☞	ja.lul				*
c.		ja.lu				**!

Examples as in (1b), where one or more consonants are subject to deletion, are analyzed as in (4). Deletion of the final vowel produces the form in (4b), but it violates CodaCond fatally. I assume that a CodaCond violation mark is assigned for each non-apical non-place-licensed coda consonant.

(4)

		/muŋkumuŋku/$_{\text{NOM.}}$	CodaCond	Anchor-R	RM	Max$_{\text{NOM.}}$
a.		muŋ.ku.muŋ.ku			*!	
b.		muŋ.ku.muŋk	*!*			*
c.		muŋ.ku.muŋ	*!			**
d.	☞	muŋ.ku.mu				***
e.		muŋ.kum	*!			****

Finally, the ranking of ANCHOR-R(C,Stem) » RM accounts for the fact that no segment is deleted when the given stem is closed by an apical consonant. This is illustrated in (5). The crucial ranking of CODACOND » ANCHOR-R(C,Stem) is justified by the fact that a non-apical final consonant is subject to deletion (e.g., /waŋalk/→[waŋal] 'boomerang').

(5)

		$/\text{kentapal}/_{\text{NOM.}}$	CODACOND	ANCHOR-R	RM	$\text{MAX}_{\text{NOM.}}$
a.	☞	ken.ta.pal			*	
b.		ken.ta.pa		*!		*

This completes the parallel analysis. We can imagine other parallel analyses, but pursuing the best one is not my concern here. The point of this section is that the Lardil examples in (1) are handled with classic parallel OT that allows GEN to apply multiple changes to the given input. As will be clear in the next section, this property of classic parallel OT is the key to a successful analysis of the data in (1).

4. Serial analyses

This section turns to application of serial OT (HS and OT-CC) to the examples in (1). I discuss two serial approaches. In section 4.1, I discuss serial segmental deletion. It turns out that this analysis does not generate desired output when vowel deletion and consonant deletion interact. In section 4.2, I apply Kimper's (2009) proposal to Lardil nominative formation. He proposes to analyze subtractive morphology with prosodic circumscription and delinearization. This approach generates correct forms in (1). However, this analysis is misled because there is evidence that segmental deletion is invoked in subtractive morphology.

4.1. Serial segmental deletion

Serial segmental deletion is the straightforward counterpart of the parallel analysis developed in section 3. As stated in section 1, gradualness is a key property of HS and OT-CC, so the definition of gradualness must be made explicit. The most standard and widely accepted definition of gradualness is such that only one violation of a single faithfulness constraint is incurred in a gradual step (McCarthy 2008a). In the context of segmental deletion, only one segment may be elided at one time. I assume this definition of gradualness in the subsequent discussion.

We can conceive several serial deletion analyses, and I start by applying the same constraints and ranking as those in section 3. The tableau in (6) demonstrates the first round of competition, assuming that the rightmost segment is deleted iteratively until the derivation converges. The candidate in (6b) should win for the derivation to succeed, but the faithful form performs better. This suggests that the derivation reaches convergence as early as on the first pass.

(6)

		$/\text{muŋkumuŋku}/_{\text{NOM.}}$	CODACOND	ANCHOR-R	RM	$\text{MAX}_{\text{NOM.}}$
a.	☞	muŋ.ku.muŋ.ku			*	
b.	☹	muŋ.ku.muŋk	*!*			*

We can imagine some revisions of the analysis presented above. I have assumed that the rightmost segment is deleted iteratively. (6b) incurs fatal violations of CODACOND, so one may suppose that two velar consonants undergo elision before final vowel deletion, as illustrated in (7).

(7) /muŋkumuŋku/→[muŋ.ku.mu.ŋu]→[muŋ.ku.mu.u]→[muŋ.ku.mu]

This derivation fails. Provided that /k/-deletion fulfills RM on pass 1, [muŋ.ku.mu.ŋu] fares better than [muŋ.ku.muŋ.ku]. An issue arises on pass 2. As demonstrated in (8), /ŋ/-deletion violates $\text{MAX}_{\text{NOM.}}$ uselessly. It removes no markedness violation incurred by [muŋ.ku.mu.ŋu]. Lardil permits onset [ŋ], so the /ŋ/-deletion is not motivated phonologically. In order to block iterative morphological deletion, RM should refer to the initial input (i.e., /muŋkumuŋku/), so the /ŋ/-deletion is not for satisfying RM.

(8)

	/muŋkumuŋku/$_{NOM.}$	CODACOND	ANCHOR-R	RM	MAX$_{NOM.}$
Pass 1	muŋ.ku.mu.ŋu *is better than*				*
Pass 2	muŋ.ku.mu.u *gets worse*				*

As an alternative analysis, we may posit the derivation depicted in (9), where one velar consonant is deleted before final vowel deletion and the other velar deletion is ordered after final vowel deletion.

(9) /muŋkumuŋku/→[muŋ.ku.mu.ŋu]→[muŋ.ku.muŋ]→[muŋ.ku.mu]

As illustrated in (10), the desired output on pass 2 (i.e., [muŋ.ku.muŋ]) deteriorates harmony since it violates undominated CODACOND. This issue is essentially the same as the one in (6). The derivation given in (9) is impossible.

(10)

	/muŋkumuŋku/$_{NOM.}$	CODACOND	ANCHOR-R	RM	MAX$_{NOM.}$
Pass 1	muŋ.ku.mu.ŋu *is better than*				*
Pass 2	muŋ.ku.muŋ *gets worse*	*			*

Another conceivable revision of the serial analysis is to rerank CODACOND and RM. As shown in (11), there are two ramifications here. In the ranking in (11a), RM is promoted over CODACOND. RM is undominated, so segmental deletion is always expected. This prediction is falsified by the fact that no deletion occurs when the stem ends in an apical consonant. In the ranking of (11b), CODACOND is demoted below RM. A wrong prediction is made here too. ANCHOR-R(C,Stem) is undominated, so any stem-final consonant would be protected. As stated above, however, a stem-final non-apical consonant undergoes elision. Both constraint hierarchies in (11) make erroneous predictions, so reranking is not a successful revision of the serial deletion analysis.

(11) a. RM » CODACOND » ANCHOR-R(C,Stem) » MAX$_{NOM.}$
b. ANCHOR-R(C,Stem) » RM » CODACOND » MAX$_{NOM.}$

One way that makes serialism succeed is revising the definition of gradualness. I have assumed so far that only one segment may be deleted at once. Exactly the same analysis as the parallel approach in section 3 would apply to HS and OT-CC if we view multiple violations of a faithfulness constraint as a gradual step because more than one segment may be deleted at one time. It turns out that this revision is undesirable. McCarthy (2007a, b) argues that the revised definition makes wrong predictions. He gives two arguments related to metathesis. Summarizing the gist, he argues that unattested types of multiple metathesis would be expected if the loosened definition of gradualness is accepted. McCarthy (2007a, b) considers the lack of such overgeneration as an advantage of serialism. Adopting the less restrictive definition of gradualness is undesirable although it is in harmony with the data in (1).

The failure of serial deletion is not contingent on the use of RM as the driving force of subtractive morphology. There are two other constraints adopted in previous studies: ¬MAX (Horwood 1999) and FREE-V (Prince and Smolensky 2004). First, ¬MAX cannot replace RM. Anti-faithfulness constrains are active only in morphologically governed output-output mapping (Alderete 1999). They are inactive in phonological input-output mapping with no morphological condition. This assumption is required to preclude rampant anti-faithfulness effects. In Lardil, stems usually do not surface as they are, so ¬MAX is inactive in the nominative formation.

Second, substituting FREE-V for RM fails when a vowel-final nominative form is created via C_1V deletion. FREE-V militates against parsing of word-final vowels. Because final vowel elision can yield phonological representation that breaches CODACOND, FREE-V should outrank CODACOND, as shown in (12). I continue to assume that CODACOND assigns a violation mark for every illicit coda consonant.

Given this assumption, pass 2 improves harmony. As pointed out by an anonymous abstract reviewer, the same result is obtained by assuming *COMPLEXCODA » ANCHOR-R(C,Stem). A problem arises on pass 4. FREE-V is breached since the input is /muŋ.ku.mu/. Pass 4 degrades harmony, so [muŋ.ku.mu] is not obtained. This problem will be avoided if we allow FREE-V to refer back to the initial input (i.e., /muŋkumuŋku/) since the final vowel of /muŋ.ku.mu/ is not word-final in /muŋkumuŋku/. However, this assumption contradicts the spirit of successive local optimization maintained in HS and OT-CC, so the FREE-V analysis is unsuccessful.

(12)

	/muŋkumuŋku/$_{\text{NOM.}}$	FREE-V	CODACOND	ANCHOR-R	MAX$_{\text{NOM.}}$
Pass 1	muŋ.ku.muŋk *is worse than*		**		*
Pass 2	muŋ.ku.muŋ *is worse than*		*	*	*
Pass 3	muŋ.ku.mu *is better than*			*	*
Pass 4	muŋ.ku.mu *gets worse*	*			

There is an earlier theoretical proposal that appears to salvage the unsuccessful derivation in (12). Kavitskaya and Staroverov (2010) explore interaction of phonological processes in relation of feeding and counterfeeding. They argue that this interaction is accommodated in OT-CC with revisions of the model proposed by McCarthy (2007a). As an empirical case, Kavitskaya and Staroverov consider the interaction of debuccalization and /ʌ/-elision in Tundra Nenets. Dubuccalization turns word-final /t, d, s, n, ŋ/ into [ʔ], and /ʌ/ is elided in _____(ʔ)#. Crucial examples are provided in (13). (13a) shows that debuccalization feeds /ʌ/-deletion. In contrast, /ʌ/-deletion counterfeeds debuccalization. As seen from (13b), opaque output emerges.

(13)

		Underlying	*Surface*	*Gloss*
	a.	tʲim-jʌ-s	tʲimjʔ	it rotted
		wabtʌd	wabtʔ	slope
	b.	xadʌ	xad	snowstorm
		tasʌ	tas	whole

Kavitskaya and Staroverov (2010) propose that markedness constraints can refer to the previous step (PS). PS-constraints punish marked elements inherited from the previous step (i.e., the previous chain member in OT-CC terms), so marked phonological representation or structure is not penalized immediately. There is a grace period, and assignment of a violation mark is suspended until the next step.

Some examples in (1b) suggest that vowel elision feeds consonant deletion and consonant deletion counterfeeds vowel deletion. Applying Kavitskaya and Staroverov's idea, let us assume that FREE-V is a PS-constraint. PS-FREE-V is offended in step *n* if violation of FREE-V in step *n–1* is extant in step *n*. As illustrated in (14), [muŋ.ku.mu] satisfies PS-FREE-V on pass 4. Crucially, [muŋ.ku.mu] vacuously satisfies FREE-V on pass 3 because its input (i.e., /muŋ.ku.muŋ/) does not end in a vowel.

(14)

	/muŋkumuŋku/$_{\text{NOM.}}$	PS-FREE-V	CODACOND	ANCHOR-R	MAX$_{\text{NOM.}}$
Pass 1	muŋ.ku.muŋk *is worse than*		**		*
Pass 2	muŋ.ku.muŋ *is worse than*		*	*	*
Pass 3	muŋ.ku.mu *is as good as*			*	*
Pass 4	muŋ.ku.mu *converges*				

The tableau in (14) seems to suggest the success of the analysis with PS-FREE-V, but the analysis is not successful. In order for the output on the first pass (i.e., [muŋ.ku.muŋk]) to perform better than faithful [muŋ.ku.muŋ.ku], there must be a step before pass 1. Let us call it pass 0. Prosodic structure is assigned there. Kavitskaya and Staroverov (2010) make the same assumption for analyzing the data in (13). As demonstrated in (15), final vowel deletion would not be expected without pass 0 because the faithful candidate satisfies PS-FREE-V.

(15)

		/muŋkumuŋku/$_{\text{NOM.}}$	PS-FREE-V	CODACOND	ANCHOR-R	MAX$_{\text{NOM.}}$
a.	☞	muŋ.ku.muŋ.ku				
b.	☹	muŋ.ku.muŋk		*!*		*

With pass 0, in contrast, [muŋ.ku.muŋk] fares better than [muŋ.ku.muŋ.ku] on pass 1 because the latter incurs a fatal violation of PS-FREE-V, as illustrated in (16).

(16)

		/muŋ.ku.muŋ.ku/$_{\text{NOM.}}$	PS-FREE-V	CODACOND	ANCHOR-R	MAX$_{\text{NOM.}}$
a.		muŋ.ku.muŋ.ku	*!			
b.	☞	muŋ.ku.muŋk		**		*

The postulation of pass 0 makes [muŋ.ku.muŋk] more harmonic than faithful [muŋ.ku.muŋ.ku] on pass 1, but a new problem arises. As shown in (17), the step from pass 0 to pass 1 does not improve harmony since the output on pass 0 satisfies all the four relevant constraints. Given the tenet of steady harmonic ascent in serialism, [muŋ.ku.muŋ.ku]→[muŋ.ku.muŋk] is an impossible step.

(17)

	/muŋkumuŋku/$_{\text{NOM.}}$	PS-FREE-V	CODACOND	ANCHOR-R	MAX$_{\text{NOM.}}$
Pass 0	muŋ.ku.muŋ.ku *prosodification*				
Pass 1	muŋ.ku.muŋk *gets worse*		**		*

The problem is clear at this point. [muŋ.ku.muŋ.ku] cannot converge on pass 1 since the faithful form would breach PS-FREE-V, resulting in deterioration of harmony. Also, stem-final vowel deletion on pass 1 leads to worse harmony. Therefore, the derivation gets stuck once pass 0 is posited.

4.2. Prosodic circumscription and delinearization

Besides serial deletion, there is another serial analysis to be considered. Kimper (2009) proposes an analysis of subtractive morphology with no appeal to segmental deletion. His idea is that the effect of subtractive morphology can be obtained by combining prosodic circumscription and delinearization. Prosodic circumscription is utilized in the sense of prosodic morphology (McCarthy and Prince 1990, Lombardi and McCarthy 1991).

This proposal is exemplified with Tohono O'odham discussed by Kimper (2009). The examples in (18) illustrate the fact that perfective forms are derived from imperfective counterparts by deleting a final consonant (Hale 1965, Weeda 1992, Fitzgerald 1997).

(18)

Imperfective	*Perfective*	*Gloss*
huhag	huha	hauled
gatwid	gatwi	shot
maak	maa	gave

The derivation is sketched in (19). After the root is spelled out, prosodic circumscription applies. Positive prosodic circumscription is adopted, and the circumscribed material is delinearized on pass 3. No more morphological or phonological operation takes place in (18), so the derivation terminates on the next pass.

(19)	*Pass 1*	Spell-out of the root	huhag
	Pass 2	Spell-out of the {μ} template	huha{g}
	Pass 3	Delinearization	huha	{g}
	Pass 4	Convergence	huha	{g}

The intuition behind this account is that a morph must not be null phonologically. Some exponent should exist in output even if it is not pronounced. Delinearized phonological material is not realized phonetically since its syntagmatic relation with the rest of the phonological string cannot be identified.

Extending Kimper's proposal to Lardil, the derivation of /muŋkumuŋku/→[muŋkumu] 'wooden axe' is shown in (20). The morphological part is essentially the same as in (19). Phonological deletion happens after delinearization of the final vowel. One consonant is deleted at a time, and the derivation converges when CODACOND is satisfied and no more harmonic ascent is achieved.

(20)	*Pass 1*	Spell-out of the stem	muŋkumuŋku
	Pass 2	Spell-out of the {μ} template	muŋkumuŋk{u}
	Pass 3	Delinearization	muŋkumuŋk	{u}
	Pass 4	Phonological deletion of /k/	muŋkumuŋ	{u}
	Pass 5	Phonological deletion of /ŋ/	muŋkumu	{u}
	Pass 6	Convergence	muŋkumu	{u}

The tableau in (21) demonstrates that the derivation in (20) arrives at the desirable output. Pass 1 (spell-out of the stem) and pass 2 (prosodic circumscription) are omitted from (21). Pass 3 completes morphology (delinearization of the circumscribed segment). Deletion of /ŋk/ is purely phonological, so prosodic circumscription and delinearization play no role on passes 4 and 5.

(21)

	/muŋkumuŋku/$_{\text{NOM.}}$	CODACOND	ANCHOR-R	MAX$_{\text{NOM.}}$
Pass 3	muŋ.ku.muŋk	{u} *is worse than*	**		
Pass 4	muŋ.ku.muŋ	{u} *is worse than*	*	*	*
Pass 5	muŋ.ku.mu	{u} *is as good as*		*	*
Pass 6	muŋ.ku.mu	{u} *converges*			

The analysis that combines positive prosodic circumscription and delinearization is not successful although it generates correct output. Evidence suggests that subtractive morphology invokes segmental elision. In Hessian German, final consonant deletion makes a plural form when the last two segments of the singular form are homorganic (Golston and Wiese 1996, Kurisu 2001), as exemplified in (22a). I assume that a vowel bears a dorsal feature. No segment undergoes deletion when final two segments disagree in place, as exemplified in (22b).

(22)		*Singular*	*Plural*	*Gloss*
	a.	hond	hon	dog
		viend	vien	wind
		vɛk	vɛ	way
		gaŋk	gaŋ	walk
		forhaŋk	forhaŋ	curtain
	b.	reef	reef	tire
		brɛib	brɛib	letter
		ʃirm	ʃirm	umbrella
		keil	keil	wedge
		bigil	bigil	pimple

The contrast of (22a) and (22b) follows from high ranked MAX[PLACE], assuming that sequential homorganic segments share the same place feature. In (22a), elision of a final segment does not breach MAX[PLACE] since the place feature associated with the final consonant is still hosted by the preceding segment after final consonant deletion. In (22b), deletion of a final consonant implies deletion of its place feature, so final consonant deletion results in a violation of the MAX[PLACE] constraint.

In Kimper's (2009) approach, delinearized material does not disappear. As a corollary, no place feature is lost. As (23) illustrates, the labial feature associated with delinearized [f] stays in the output representation. It follows that Kimper's approach incorrectly predicts that delinearization would apply to (22a) and (22b) equally.

(23)	r	ee	f	→	r	ee	|	{f}
	|	|	|		|	|	|	|
	[Cor]	[Dor]	[Lab]		[Cor]	[Dor]	|	[Lab]

Concluding this section, combining positive prosodic circumscription and delinearization is not a promising approach to subtractive morphology. It invokes no segmental deletion, but segmental elision is actually involved in subtractive morphology.

5. Pseudo-Lardil (McCarthy 2007a, b)

McCarthy (2007a, b) discusses a hypothetical language (pseudo-Lardil). He attempts to provide an argument in favor of serialism. I show in this section that his argument is not persuasive.

Suppose that the hypothetical language has the constraint hierarchy in (24). CODACOND penalizes coda obstruents. FINAL-C requires that a word be closed by a consonant. CODACOND is not defined in the same way as real Lardil.

(24) CODACOND, FINAL-C » MAX

Consider the following input: /palasanataka/. As illustrated in (25), parallel OT chooses the output that elides as many segments as necessary to fulfill CODACOND and FINAL-C. This massive segmental deletion takes place irrespective of the relative ranking of CODACOND and FINAL-C.

(25)

		/palasanataka/	CODACOND	FINAL-C	MAX
a.		pa.la.sa.na.ta.ka		*!	
b.		pa.la.sa.na.tak	*!		*
c.		pa.la.sa.na.ta		*!	**
d.		pa.la.sa.nat	*!		***
e.		pa.la.sa.na		*!	****
f.	☞	pa.la.san			*****

The tableaux in (26) and (27) are designed to show that serial OT makes a different prediction. No matter how CODACOND and FINAL-C are ranked with respect to each other, massive deletion as in (25) is not expected.

(26)

	/palasanataka/	CODACOND	FINAL-C	MAX
Pass 1	pa.la.sa.na.ta.ka *converges*		*	

(27)

	/palasanataka/	FINAL-C	CODACOND	MAX
Pass 1	pa.la.sa.na.tak *is as good as*		*	*
Pass 2	pa.la.sa.na.tak *converges*		*	

McCarthy (2007a, b) argues that this difference of parallelism and serialism supports serial OT given that massive deletion as in (25) is not attested. However, his argument is not convincing. There are two reasons. First, we are not sure whether the massive segmental deletion as in (25) actually does not exist. Our knowledge about language is largely limited and skewed. It is possible that such massive deletion takes place in languages that have not been described yet. McCarthy's typological argument is based upon an uncertain premise.

Second, even if we accept the absence of languages as in (25), the difference of parallelism and serialism does not constitute a compelling argument for the latter because serialism also predicts the existence of unlikely languages. Assume the constraint hierarchy in (28). Again, CODACOND militates against coda obstruents, and FINAL-C requires that a word end in a consonant.

(28) FINAL-C » CODACOND » MAX

Consider the following three input forms: /pataka/, /patak/, and /patan/. Given /pataka/ and /patak/, EVAL selects output ending in an obstruent, as illustrated in (29) and (30). By contrast, the output of /patan/ is closed by a sonorant consonant, as demonstrated in (31).

(29)

	/pataka/	FINAL-C	CODACOND	MAX
Pass 1	pa.tak *is as good as*		*	*
Pass 2	pa.tak *converges*		*	

(30)

	/patak/	FINAL-C	CODACOND	MAX
Pass 1	pa.tak *converges*		*	

(31)

	/patan/	FINAL-C	CODACOND	MAX
Pass 1	pa.tan *converges*			

The crucial observation is that CODACOND is satisfied only when the input is closed by a sonorant consonant. CODACOND may or may not be satisfied depending on the underlying final segment. To the best of my knowledge, no such language exists. To the extent that this type of language is improbable, McCarthy's (2007a, b) typological argument is not solid since both parallelism and serialism produce improbable languages.

6. Conclusion

I compared parallelism and serialism in OT. Drawing evidence from subtractive morphology in Lardil nominative formation, I argued that parallel OT is superior. It accommodates the relevant data, but serial OT does not. I discussed two serial analyses: serial segmental deletion and the combination of prosodic circumscription and delinearization. The former cannot generate correct output. Problems arise when consonant deletion occurs in addition to vowel deletion. We can imagine many versions of serial segmental deletion analyses, but none of them is successful. The analysis appealing to prosodic circumscription and delinearization produces correct output, but it is fundamentally misled since literal segmental deletion is invoked in subtractive morphology.

This work adds an argument for parallel OT, but previous studies suggest that evidence conflicts. Some evidence favors parallelism, but other evidence supports serialism. The architectures of parallel and serial OT are quite different, so they are not compatible with each other. Our important task is to reconcile conflicting evidence. Major revisions of parallel or serial OT may be able to incorporate it, but a completely new phonological theory may have to be constructed. This issue is beyond the scope of this work, so I relegate it to future research.

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