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RESEARCH

Syntax-phonology mapping and the Tongan DP

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Tongan, a Polynesian language, is almost entirely head-initial. There are some exceptions to this, including Demonstrative enclitics and the so-called Definitive Accent (Churchward 1953), which appears to be a stress-shift operation, typically in the rightmost word of the DP.* One question that arises here is: where does the morphophonological status of being an enclitic come from – particularly in a rather radically head-initial language? By investigating the distributional properties of the Definitive Accent, it will become clear that this is the result of syntactic and phonological structures proceeding without any direct appeal to morphophonological properties.

A new formal analysis presented here derives the positions of the Definitive Accent and possible prosodic phrasings, appealing to independently motivated phonological constraints applying to structures with three cross-linguistically supported movement operations. It is shown that achieving this requires neither including morpheme-indexed constraints, nor having lexemes pre-specified with morphophonological properties such as "enclitic" or "prefix".

Finally, Tongan Definitive Accents raise important issues about the immutability of phases. Specifically, it must be that Phonology may access and manipulate previously spelled out material in a way that Syntax cannot, which is in fact exactly what a Minimalist architecture predicts.

Keywords: Tongan; Syntax; Phonology; Morphology; Interface; Prosody

1 Introduction

Tongan (Malayo-Polynesian, Austronesian; Blust 2013) is, like related languages, a syntactically ergative verb-initial language. Phonologically, Tongan has a relatively small phonemic inventory (twelve consonants and five vowels[1]), vowels have been said to contrast in length,[2] and all its syllables are open with an optional simplex onset (i.e., (C)V).

As a primarily head-initial language, Tongan makes use of prepositions, prenominal case markers and determiners, and pre-clausal complementizers. Despite this general head-initiality, there is a small set of elements that appear to be exceptions to this.[3] One such apparent exception in Tongan is a determiner-like head that occurs in a head-final configuration: the Definitive Accent (DefAcc). DefAcc is a morpheme which Churchward (1953) defines as the "stressing of the final vowel for the sake of definiteness, of greater definiteness." Of importance for an analysis of this head-final configuration is the fact

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[1] The phonemic inventory consists of /p, t, k, ʔ, f, v, s, h, m, n, ŋ, l, i, u, e, o, a/.

[2] More recent research indicates that so-called long vowels are in fact vowel-vowel sequences involving identical vowels (e.g., Taumoefolau 2002; Anderson & Otsuka 2006).

[3] Such exceptions are neither surprising nor uncommon, across languages.

that DefAcc exhibits variable word order with the post-nominal relative clauses of the language. This is exemplified in (1).[4,5]

(1) a. te u ʻaka ʻa e tangata-ná -a [naʻe ʻuma kia
FUT 1.SG kick ABS the man -DEM-DEFACC PST kiss DAT
Mele ʻaneafi]
Mary yesterday

b. te u ʻaka ʻa e tangata-na [naʻe ʻuma kia Mele
FUT 1.SG kick ABS the man -DEM PST kiss DAT Mary
ʻaneafí]-i
yesterday -DEFACC
'I will kick that man who kissed Mary yesterday.'

Investigating the structural properties of sentences like those in (1), I show that in both cases the DefAcc morpheme occurs in a fixed structural location, and it is the relative clause that may occur in variable positions. This fixed placement of DefAcc in the syntax is a crucial first component for deriving its prosodic properties.

I build upon previous work on the internal structure of DPs (Zamparelli 1995; Cinque 2005; Leu 2008) and argue that there are at least two determiner projections in the DP-domain, which are hierarchically rank-ordered as (2).[6,7]

(2) *ʻe/ʻa* [**Case**] ≫ (*h*)*e* [**High D**] ≫ *ni/na* [**Dem.**] ≫ DefAcc [**Low D**] ≫ NP

In fact, further structural decomposition is necessary in order to account for the fixed positions of other functional elements, including numerals, quantifiers, and possessors; see Macdonald 2014 for such a decomposition.[8]

Following previous works in which relative clauses are CPs introduced as the complement of a D-head (Kayne 1994; Bianchi 1999; Ishizuka 2008; *inter alia*). I argue that the D head that introduces the CP is DefAcc and that its positional variability with relative clauses arises from the interactions of three movement operations, each of which has intra-linguistic evidence and independent cross-linguistic support.

Moreover, these movements that derive the word order variability also have observable effects on the prosodic phrasing of relative clauses. Under an OT-style constraint-based approach, only four rank-ordered constraints, typical of Syntax-Prosody interface work (as in Selkirk 1996; Truckenbrodt 1995, 1999; *inter alia*), are able to predict seven attested prosodic patterns with relative clauses, while also ruling out a number of unattested patterns. In addition, a more highly articulated constraint set (again drawing only from common constraints in the literature) derives the enclitic status of the DefAcc, without stipulation of a property such as "(en)clitic" for it in the lexicon.

[4] Abbreviations used in this paper follow the Leipzig glossing conventions, with the exceptions of the following two: DEFACC: definitive accent; KO: pan-Polynesian predicate marker (Potsdam & Polinsky 2011).

[5] Some orthographic conventions used for (non-IPA-transcribed) Tongan data: an open apostrophe <ʻ> indicates [ʔ], the <ng> digraph indicates [ŋ], and the acute accent <ˊ> indicates a word-level stress.

[6] The definite determiner has two allomorphs, *he* and *e*, which appear to be morphologically conditioned.

[7] Here, and throughout this paper, I use "NP" as a cover term that envelops a range of structure that may include adjectives, reduced relative clauses, (and perhaps more,) as well as the N's arguments and the N itself.

[8] MacDonald's analysis of the structural decomposition differs from the one presented in (2). It is likely the the source of the different analyses is that our respective consultants' data differ on some critical points. Further work on the variation would likely lead to a more complete understanding of the structural decomposition of the (Tongan) DP.

The rest of this paper proceeds as follows. First, in Section 2, I examine some of the functional elements in the DP, and I argue for a syntactic analysis of the word-order facts within the Tongan DP. Section 3 then introduces the question of the structural position of relative clauses in Tongan, for which I provide a syntactic analysis. With an understanding of relative-clause syntax, Section 4 shows that the prosodic phrasing and the enclitic status of the DefAcc result from the syntactic structure and the transparent phonological constraints that act upon it. Following this, Section 5 discusses how this analysis of DefAcc impacts our understanding of the Syntax-Phonology interface, more broadly. Finally, I present open questions in Section 6 and conclude in Section 7.

2 Exploring the Tongan DP

In this section, I begin an investigation of the Tongan DP and the elements that occur within it. All data, unless indicated otherwise, comes from consultant work with two native speakers, one female and one male, both in their late 50s. Both were living in the Los Angeles area, but reported communicating in Tongan on a regular daily basis with other native speakers. The nature of the data collection varied, and included conversations between the two speakers and elicited speech. A large portion of the data was recorded as audio files for the purposes of checking prosody and ensuring proper transcription.

2.1 Demonstrative Enclitics

In the Tongan nominal domain, a portion of functional morphemes follow the noun, including the DefAcc which we have introduced already, as well as demonstrative enclitics (henceforth Dems) *-ni* and *-na*. Some example data containing a Dem are provided below.

(3) a. ‘oku lele ‘a e kumaa ‘i he fale -ni.
PRS run ABS the mouse LOC the house-DEM
‘The mouse is running in this house.’

b. ‘oku lele ‘a e kumaa ‘i he fale fo‘ou-ni.
PRS run ABS the mouse LOC the house new -DEM
‘The mouse is running in this new house.’

c. *‘oku lele ‘a e kumaa ‘i he [$_{NP}$ fale -ni fo‘ou]
PRS run ABS the mouse LOC the house-DEM new

It is first notable that Dems are enclitics, obligatorily following the head noun (Churchward 1953: 150). In the contexts in which it is discussed in most previous works, it is not obvious how Dems are ordered with regard to other post-nominal material. What (3b) and (3c) show is that the Dem is a *phrasal* enclitic, and they follow an NP constituent that includes any attributive adjectives, genitives or NP-internal PPs.[9]

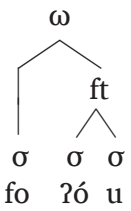
In addition, Dem is grammatically constrained in that it can only occur definite grammatical contexts, such as following proper names or in the context of a definite determiner,

[9] Macdonald (2014) provides two examples with modifiers following the Dem, and suggests that perhaps phonological heaviness can play a role in determining appropriate linear orders. It is notable that McDonald’s (54) involves modifiers that may have a relative clause syntax (*lanu pulu*, ‘color blue’, and ‘*e nima* ‘COMP five’), and that her (55) shows that her consultant allowed both [N Adj Dem] and [N Dem Adj] orders (though the consultant preferred the latter order in the elicitation context). The consultants I worked with were more rigid in their ordering, correcting orders like [N Dem Adj] to be as [N Adj Dem]. It is possible that information structural properties like focus may influence ordering, as is known to be the case more generally with adjective ordering. It is also possible that different dialects/idiolects contribute to different ordering possibilities. I will continue with the data provided by my consultants, while noting the need for deeper investigation that manipulates variables (including information structural and sociolinguistic ones) more carefully.

(h)e (Churchward 1953). This lack of complementary distribution implicates that the definite determiner and the Dem do not head the same XP. From this we can already see that Tongan allows multiple D-like morphemes for a single head noun; we will return to more of the syntactic details of Dem in Section 2.4.

In addition to their syntactic properties, these Dems have clear effects in the phonology as well. Tongan word-level primary stress is calculated based on a right-aligned trochaic foot[10]—the prosodic word's primary stress falls on its penultimate vowel (Taumoefolau 2002; Anderson & Otsuka 2006; Kuo & Vicenik 2012; Garellek & White 2015). As such, when the phonology builds these right-aligned trochaic feet, a given prosodic word such as *fo'ou* is assigned a prosodic structure in (4).[11]

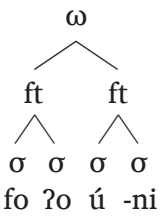
(4)



Given this structure, stress will fall the second [o]—the prosodic word's penultimate vowel. (Throughout this paper, I use acute accents to indicate word-level primary stress.)

The Dem enclitics *-ni/-na* form a single prosodic word with their host. As such, *fo'ou* and *fo'ou-ni* are each single prosodic words, but each has a distinct prosodic structure. Contrast (4) with (5), the prosodic structure of *fo'ou-ni*. Because of this difference in prosodic structure, the primary stress falls on [u] for *fo'ou-ni*, the penultimate vowel of this prosodic word.

(5)



In this way, *-ni/-na* have the apparent phonological effect of shifting stress, while maintaining the normal pattern of right-aligned trochaic stress. Note that this analysis of the Dem's prosodic behaviors is purely phonological in nature, and requires nothing of the syntactic or morphological properties of its host; the Dem cliticizes to whatever the syntax happens to place it after, even an NP-final adjective like *fo'ou* in (3b).

2.2 The Definitive Accent

As already mentioned, the Definitive Accent (DefAcc) is like Dem in that it is a post-nominal functional morpheme. Previous literature has treated DefAcc as marking definiteness/specificity/uniqueness, though the exact semantic contribution of the DefAcc is of some debate.[12] At first blush, DefAcc appears to be entirely suprasegmental, as reflected in its

[10] Not all feet are right-aligned. Left-aligned feet also occur in native words of 5 or more syllables; this has the effect of having secondary stress on the left-most syllable in such words (Zuraw, p.c.). Primary and secondary stress are marked differently, phonetically (Garellek & White 2015).

[11] Unfooted syllables, like [fo] in (4) are simply adjoined to the prosodic word.

[12] See, for example, Churchward 1953, Chung 1978, Hendrick 2005, and Abner & Burnett 2010. Abner and Burnett's semantic analysis is briefly discussed in Section 2.3.

name. Compare the location of the stress in (6a), without a DefAcc, with the location of stress in (6b), with a DefAcc.[13]

(6) a. he fále
the house
'the house'

b. he falé
the house.DEFACC
'the house'

Since stress appears to fall on its final vowel —instead of the normal penultimate vowel— in contexts with DefAcc, DefAcc has been treated as a stress-shift process (Churchward 1953). Thus the DefAcc's effects may be as in (7b), with an arrow representing the movement of the stress.

(7) a. he fale fo'óu
the house new
'the new house'

b. he fale fo'oú
the house new.DEFACC
'the new house'

Under this sort of analysis, the words with and without the DefAcc are identical in terms of their prosodic structure, and the sole phonological difference is in the placement of stress. For this reason, the duration of the final vowel [u] in (7b) is predicted to be greater than the final [u] in (7a) only inasmuch as stress increases vowel duration. (Stressed vowels are about a 30ms longer than unstressed ones; Garellek & White 2015.)

Clark (1974) also offers a historical analysis that would lead to this stress shift operation. Like enclitic Dems *-ni* and *-na*, the DefAcc was historically an enclitic vowel **-a*. For a time, this **-a* underwent regular assimilation with the preceding vowel of the base, causing stress 'shift' in the same way as the cliticization of any other Dem (cf. (5)). As a final step, Clark proposes the final long vowels underwent a shortening process, in this way matching Churchward's description of the final vowel as short. However, in his footnote 8, Clark explains that some scholars (including a native speaker of Tongan) do not share this description of the final vowel as short, and admits that this final step need not have taken place.

A synchronic stress-shift analysis is not the only analysis which predicts prominence on the final syllable. Schütz (2001) analyzes the DefAcc as prominence being added at a level of prosodic structure above the word. The DefAcc is essentially a phrase accent, which manifests on the final vowel of that phrase. In this way, Schütz argues that the word-level stress has not moved, but the additional and stronger phrase-level accent gives rise to the mere appearance of a stress-shift operation. As with stress-shift operation analyses, Schütz's analysis does not treat the final vowel as a phonemic long vowel.

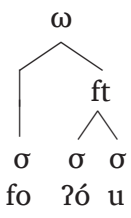
A third analysis offered by Taumoefolau (2002) is that the DefAcc is a moraic vowel (which will be abbreviated V_{μ}) and it cliticizes to the preceding prosodic word. This V_{μ} is underspecified in its segmental features, and those features are valued by the final vowel of the word to which the DefAcc cliticizes. (This feature-sharing will be discussed further in Section 4.3.) Under this analysis, the stress pattern observed is consistent across the language, including with DefAcc: stress always fall on the penultimate vowel. It only seems that the final vowel is stressed with DefAcc, because the penultimate and final vowels are segmentally identical.

The phonetic literature offers insight to help decide between these analyses with its explorations of the length of final vowels with and without the DefAcc (e.g., Anderson & Otsuka 2006; White 2010). The finding is that the length of vowels with DefAcc, like the final [u] in (7b), are shown to be about 110ms longer than a final [u] without the DefAcc,

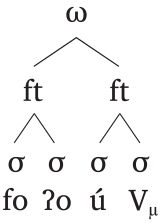
[13] Recall that acute accents are used in this paper to indicate word-level primary stress, and should not be confused with the Tongan orthographic representation the DefAcc.

as in (7a). In this way, final vowels of words with the DefAcc are equivalent in length to other long vowels that occur word-finally (Anderson & Otsuka 2006: 32), and not to stressed short vowels. This supports the analysis of Taumoefolau (2002), and provides evidence against the former two types of analyses. Thus the representation of *fo'óu* (without a DefAcc) and *fo'oú* (with a DefAcc) would be (8a) and (8b), respectively.[14]

(8) a.



b.



As a result of V_{μ}'s cliticization, the final vowel of its host (e.g., the [u] of *fo'ou*, above) becomes the penultimate vowel of the prosodic word. This is entirely parallel with the Dem discussed in the previous section.[15]

Crucially, the DefAcc is a *phrasal* enclitic, the host for which is determined by the syntactic structure, similar to the Dem. This is briefly demonstrated with (9), where the V_{μ} cliticizes to whatever is to its left but must occur outside of the NP.

(9) a. he [NP falé]-V_{μ}
the house -DEFACC
'the house'

b. he [NP fale fo'oú]-V_{μ}
the house new -DEFACC
'the new house'

c. *he [NP falé -V_{μ} fo'ou]
the house-DEFACC new
Intended: 'the new house'

Below are some additional examples demonstrating that DefAcc is indeed a phrasal enclitic, from Churchward (1953: 99, 276).

(10) a. he [NP saalioté]-V_{μ}
the cart -DEFACC
'the cart'

b. he [NP saaliote'a Feletí]-V_{μ}
the cart POSS Feleti -DEFACC
'Feleti's cart'

c. he [NP saaliote'a Feleti mo Sioné]-V_{μ}
the cart POSS Feleti -DEFACC
'Feleti and Sione's cart'

d. he 'ene [NP fakahaofi kinautolú]-V_{μ}
the 3SG.POSS rescuing 3PL -DEFACC
'His rescuing of them'

[14] It could be that the feet are based upon moras rather than syllables. If words like *foo* with a long vowel are represented as a single syllable, then it would need to be that feet are moraic. See Taumoefolau (2002) for further discussion.

[15] As such, the facts align with Clark's historical analysis, albeit without the hypothetical diachronic step of shortening.

In each of these cases, the DefAcc falls on the final word of the NP, regardless of what that word is, essentially adding a vowel to these words and "shifting" their stress.

That said, there are some restrictions on the distribution of the DefAcc. In particular, it cannot occur with nominal phrases that consist entirely of proper names or pronouns, as in (11).

(11) a. Na'e lea 'a Sione(*-V_{μ})
PST speak ABS Sione(*-DEFACC)
'Sione spoke.'
b. Na'e lea 'a kinautolu(*-V_{μ})
PST speak ABS 3PL (*-DEFACC)
'They spoke.'

Compare the blocked DefAccs in (11) to the grammatical ones in (10b–d). In (10b–d), the DefAcc forms a *prosodic* unit with the proper names and pronouns (causing apparent stress-shift), while forming a *syntactic* unit with the much larger NP in which those names/pronouns occur.

Perhaps the fact that DefAcc is blocked in (11) can be understood when considering the broader generalization that DefAcc can only occur in the context of the definite determiner (*h*)*e*.[16] (This is similar to Dem, though DefAcc is more restrictive.) This generalization also describes the fact that DefAcc cannot occur in a DP that is headed by an indefinite determiner *ha*, demonstrated in (12).

(12) a. Na'e lea 'a e tamaiki (-V_{μ})
PST speak ABS the children(-DEFACC)
'The children spoke.'
b. Na'e lea ha tamaiki (*-V_{μ})
PST speak INDEF children(*-DEFACC)
'Some children spoke.'

This generalization about the distribution of DefAcc and the types of words it can form constituents with is, as we will see, the result of a straightforward syntactic analysis. No other conditions (phonological, morphological, or otherwise) are necessary for determining the host for the DefAcc. As a result of the structure produced in Syntax, the DefAcc will occur in a certain linear position, and then constraints in Phonology will effect a prosodic structure in which the DefAcc is cliticizes to the prosodic word occurring to its left and causes and apparent stress shift.

As a final general point about DefAcc, it must be that the DefAcc and the Dems *-ni* and *-na* are treated as different by the grammar. Though both Dem and DefAcc share many grammatical similarities (i.e., they are head-final elements in the DP, they are phrasal enclitics that "shift" the stress of their host, and both only occur in a subset of definite DPs), they do not instantiate the same syntactic position. The two of them can co-occur, and when they do, the order is fixed.

[16] The one 'exception' to this generalization is when the pronominal is "used as a determiner", as in:

(i) 'oku kau kiate kitautolu Tonga -V_{μ}
PRS pertain to 1.PL Tongans-DEFACC
'It pertains to us Tongans.'

In these cases, it might be that the DP is definite in a way that it is not in (11b).

(13) a. he fale fo‘ou-ní -i
the house new -DEM-DEFACC
‘this new house’
b. *he fale fo‘ou-ú -ni
the house new -DEFACC-DEM
Intended: ‘this new house’

The DefAcc necessarily occurs outside of the Dem.[17] (Note that the stress remains entirely predictable, falling on the penultimate vowel—the vowel of the Dem.) While this does not rule out a historical account like Clark’s (1974), where the DefAcc originated as a Dem enclitic, but it does show that, synchronically, DefAcc and Dem are not exponents of the same syntactic category.

As we have already seen, both Dem and DefAcc are *phrasal* enclitics, attaching to a syntactic constituent that is roughly the size of NP. This strongly implicates *syntactic* structure as mediating these word/morpheme orders; we ought not appeal to separate morphological/phonological rules or constraints, if it can be avoided. In the following sections, we turn to the specifics of Tongan’s DP-internal syntax.

2.3 Multiple Functional Layers of the DP

In an example like (13a), there appear to be three independent heads that would be classified as a D-like: (*h*)*e*, *-ni* and -V_{μ}. The first major component of my analysis is that (*h*)*e* and -V_{μ} are both Ds—(*h*)*e* is a HighD and -V_{μ} is a LowD. Additionally, *-ni* is of category Dem which can co-occur with these Ds. There is cross-linguistic support for the idea of multiple D heads within a single “DP”.[18] For example, many languages (e.g., Greek, Javanese, Welsh) express determiners and demonstratives in the same phrase (Leu 2008).[19]

(14) **afto** **to** vivlio (Greek)
this **the** book
‘this book’

Additionally, Swedish marks certain DPs with two morphemes, each of which is associated with a distinct interpretation (LaCara 2011).

(15) **den** gamla häst **-en** (Swedish)
DEF old horse-**DEF**
‘the old horse’

Similarly, other languages have two exponents in *demonstratives*, each with a different contribution to the interpretation. For example, French has a free word Dem, and an NP-enclitic Dem (Bernstein 1997).[20]

[17] Because of Churchward’s (1953) orthographic conventions, it may sometimes seem that the DefAcc can occur inside the Dem – he uses < ´ > to indicate any stress, including the DefAcc. For clarification on his stance, see his sections 38 and 39 on pp. 280–281, where his descriptions indicate that when DefAcc and Dem co-occur, the DefAcc is an enclitic on the Dem.

[18] With an analysis whereby a DP has multiple D-like projections, a question might arise of what I mean by “DP”. I mean this to refer to the projection that dominates all D- and N-related material, and I take it to be the complement of KP (the syntactic projection for Case).

[19] Each of these languages behaves differently with their usage of these multiple Ds – for example, Swedish only uses two Ds under certain circumstances, e.g. when there is an adjective. Neither of the Tongan Ds, on the other hand, depend on modification of any kind, as exemplified in (9).

[20] English has a very similar pattern, with *this here yellow book*, which is formally distinct from *this yellow book here* (Bernstein 1997: 91).

(16) **ce** livre jaune **-ci** (French)
DEM book yellow-**DEM**
'this (here) yellow book'

In each of these cases, both D-like morphemes make unique contributions to the interpretation, supporting the idea that they are each realizations of a distinct head. As distinct heads, each requires its own D-like projection in the syntax. If it is possible to have multiple DP projections in a single DP, what rules out English **this the book*, for example? Zamparelli (1995: 126) proposes the following constraint on the usage of multiple determiners to explain the distribution of multiple Ds, across languages: "two determiners are possible only when each one adds something to the meaning of the other."[21] By this logic, if we are to believe Tongan (*h*)*e* and the -V_{μ} to each head their own DPs, we expect them to make different semantic contributions.

Abner & Burnett (2010) reach this very conclusion, arguing that the DefAcc "anchor[s] the interpretation of the [DP] to the context of utterance." For that reason, the DefAcc is excluded in cases like (17), in cases where the speaker believes that devils don't exist. (Notably, the DefAcc would be acceptable in (17) if the speaker did believe that devils exist, and that there is one outside.)

(17) KO Piúla, 'óku túli 'a e [teevólo 'okú ne túi 'óku
KO Piula, PRS chase ABS the devil PRS 3.SG believe PRS
'i tu'a] (#-a)
LOC outside (#-DEFACC)
'Piula, she is chasing the devil that she believes is outside (but there is no devil).'

On the other hand, the (*h*)*e* HighD *can* appear in (17), regardless of anyone's belief-state, providing support that DefAcc is not just a second exponent of a single D^0.

2.4 A Syntactic Account of Word Order

The approach taken here is that, as in the sentential domain, variable word orders within the DP ought to be derived from the same underlying constituency. I pursue an analysis in the vein of Cinque 2005 (among others), in which movements applied to a universal hierarchy like (18) derive a given language's word order.

(18) Case (KP) ≫ Determiner (HighD) ≫ Demonstrative (Dem) ≫ Determiner (LowD) ≫ NP

Since Tongan NPs occur between HighD and Dem, it must be the case that there is movement. Specifically, I argue that the head-final enclitics here are derived by phrasal movement of the NP, consistent with an Antisymmetric approach to syntax (Kayne 1994). In this way, the phrase in (19) is derived as in (20).[22,23]

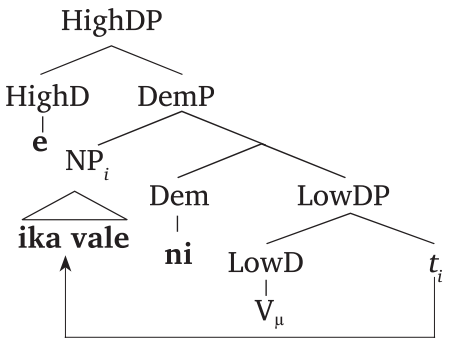
[21] Alternatively, it is possible that a string like *this the book* is ruled out for English because *this* is bi-morphemic, and contains a definite D morpheme *th-*, which cannot occur twice in a DP (*<u>th</u>is <u>th</u>e book*) for structural reasons (e.g. *th-* instantiates a unique head in the DP structure).

[22] One might want to propose a left-branching structure whereby the DemP and LowDP are head-final. Under such an account, Dem would need to be lower than HighD and LowD, for Dem to be an NP enclitic:
(i) $[_{\text{HighD}}$ he $[_{\text{LowDP}}$ $[_{\text{DemP}}$ $[_{\text{NP}}$ ika vale] -ni] -V_{μ}]]
However, this would go against the findings in Ishizuka (2007), which finds evidence for Dem≫D, based on data from Javanese. Moreover, this would require directionality parameters for each XP; see, for example, Kayne (2011) for arguments against these directionality parameters.

[23] For ease of exposition, I represent this NP movement as a single movement from the complement of LowD to the Specifier of DemP. It is may be theoretically desirable that such movement is impossible, and the NP must instead 'stop in' the Specifier of the LowDP 'on its way' to the DemP, in a roll-up movement derivation (e.g. Koopman & Szabolcsi 2000; Cinque 2005; *pace* Abels & Neeleman 2012).

(19) e íka vale -ní -i
the fish stupid-DEM-DEFACC
'this stupid fish'

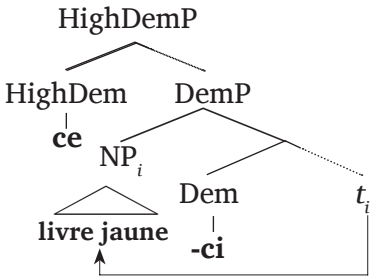
(20)



No words or morphemes have been found to be able to intervene between the NP and the Dem. A reasonable analysis of this fact is that the NP is so syntactically local to the Dem that nothing can intervene—this is achieved through the NP's movement to Spec,DemP; there is no syntactic position between the NP and the Dem.[24] Such an NP-movement operation within the DP has been independently motivated in, for example, French. Consider the derivation promoted in Bernstein (1997) for the French *ce ... -ci/là*.

(21) ce livre jaune -ci (French)
DEM book yellow-DEM
'this (here) yellow book'

(22)



Thus, accounting for the fact that the Dem and DefAcc are head-final in an otherwise robustly head-initial language requires only one, independently attested syntactic movement. As we will see later on, additional support for this movement will come from the distribution of relative clauses and the DefAcc.

2.5 Against Some Non-Syntactic Accounts

In spite of these motivations for a syntactic analysis, one may wonder about some non-syntactic accounts for the presence of DefAcc. One possibility is that a morphophonological process can insert a LowD, like Tongan DefAcc (and perhaps the affixal Swedish D and/or French Dem), as a result of being in the context of a HighD, such as (*h*)*e*. However, any such post-syntactic operation is problematic, since the DefAcc makes its own contribution to the interpretation. In order to be semantically visible, the DefAcc would need to be present at LF. However, morphological insertion processes are modeled as occurring within PF, and have been specifically postulated as such so as not to feed semantics (Embick & Noyer 2001).

[24] Alternatively, the DefAcc may be higher than the HighD. If so, the constituency would need to be as follows:

(i) $[_{\text{HighD}}\ [_{\text{DemP}}\ [_{\text{LowD}}$ he ika vale] -ni] $[_{\text{HighD'}}\ V_{\mu}\ t_{\text{DemP}}\ ]\ ]$

Instead, in order to both contribute to the meaning and have a pronounced form, DefAcc would need to be present in the narrow syntax.

Another alternative for placing morphemes in unexpected positions based on the syntax would be a post-syntactic morphological operation such as Lowering or Local Dislocation, as defined in Embick & Noyer (2001). In these analyses, a morpheme occurs syntactically in one position (feeding semantics), but these morphological operations can re-order that morpheme with other material (feeding phonology). In this way, DefAcc could occur in a pre-nominal head-initial position in the syntax, but the morphology it is moved to become a post-nominal enclitic. However, as a *phrasal* enclitic, the DefAcc's placement would be problematic for each of these operations. Lowering is typically defined targeting *morphological heads* as the landing site for movement—not syntactic phrases. Since DefAcc cliticizes to NPs, and not Ns or As, a Lowering account would seem untenable. On the other hand, Local Dislocation – which applies after Spell-Out—would not be provided with the necessary information about syntactic phrases to be able to have the DefAcc cliticize to the NP.[25]

As a result, a non-syntactic approach to the DefAcc in a post-syntactic domain would fail to capture key structural facts. In addition, we will see that a strictly syntactic solution to the linear placement of the DefAcc will have the advantage of making correct predictions with regard to some of its phonological properties, as well as its variable placement with relative clauses, which we turn to now.

3 Syntactic Properties of Tongan Relative Clauses

3.1 Where are Relative Clauses?

As we have already seen, relative clauses (henceforth RCs) in Tongan are post-nominal. Having established a clearer idea of the basic structure of the Tongan DP and its post-nominal functional material, consider the data in (23) and (24), which are representative of the available word orders for RCs.

(23) a. ʻoku maʻa ʻa e sote (-na) (-a) [naʻa ku foo]
PRS clean ABS the shirt (-DEM) -DEFACC PST 1.SG wash
'That/the shirt that I washed is clean.'

b. ʻoku maʻa ʻa e sote (-na) [naʻa ku foo] (-o)
PRS clean ABS the shirt (-DEM) PST 1.SG wash -DEFACC

c. *ʻoku maʻa ʻa e sote [naʻa ku foo] -na
PRS clean ABS the shirt PST 1.SG wash -DEM

d. *ʻoku maʻa ʻa e sote [naʻa ku foo] -na -a
PRS clean ABS the shirt PST 1.SG wash -DEM -DEFACC

(24) ʻoku fiefia he ahoni ʻa e [tangata faʻutohi [naʻe paakiʻenau
PRS happy the today ABS the authors PST print their
tohi aneafi]] { -i / *-ni }
book yesterday -DEFACC *-DEM
'The/*these authors who printed their book yesterday are happy today.'

[25] An analysis involving Local Dislocation might be successful if we make the appropriate assumptions about Spell-Out domains. Namely, if we assume that DefAcc's phrasal host is a spelled-out phrase which the DefAcc immediately precedes at linearization, Local Dislocation might be able to produce the correct ordering, along the lines of Kramer (2010). However, this solution would rely on stipulations about the morpho-lexical properties of the DefAcc (as distinct from the properties of Dem, for instance), which find no independent support. Instead, this paper shows that such properties need not be stipulated, and that all the investigated properties of DefAcc converge on a strictly syntactic solution to the linear position of the DefAcc morpheme.

As we saw in (3), Dems obligatorily follow adjectives; on the other hand, (23) shows that Dems obligatorily precede RCs; the data in (24) similarly indicate that a Dem cannot follow an RC. This indicates that RCs and adjectives are not in the same syntactic relationship with the NP, contrary to NP-adjunct approaches to RCs (e.g., Ross 1967). If the RC were an NP adjunct, we would predict (25b) to be grammatical in the same way as (25a).

(25) a. [$_{\text{HighDP}}$ e [$_{\text{DemP}}$ [$_{\text{NP}}$ sóte ʻulí] -na t_{NP}]]
the shirt dirty -DEM
'that dirty shirt'

b. *[$_{\text{HighDP}}$ e [$_{\text{DemP}}$ [$_{\text{NP}}$ sóte naʻá ku foó] -na t_{NP}]]
the shirt PST 1.SG wash -DEM
'that shirt that I washed'

In fact, RCs and adjectives have completely different distributions with regard to the Dem and DefAcc.[26]

(26)

		Adjective	Relative Clause
a.	N __ Dem DefAcc	✓	*
b.	N Dem __ DefAcc	*	✓
c.	N Dem DefAcc __	*	✓

This indicates that RCs in Tongan occur in a different structural position than adjectives, and ought not to be treated as adjuncts of NP. At the same time, RCs can appear between the noun and the DefAcc, ruling out DP adjunction for cases like (26b). Thus, consistent with the findings of Chung (1978), we can conclude that RCs in Tongan are indeed a constituent within the DP.

Moreover, investigation with the two native speaker consultants has revealed no correlation between word order and interpretation (e.g. restrictivity). The possible relevance of restrictivity was tested by providing the consultants with different contexts that each lead up to the same string. The first context in (27a) forces a restrictive interpretation of the bracketed relative clause in (27b). On the other hand, the context in (28a) forces a non-restrictive interpretation of the bracketed relative clause in (28b).

(27) Restrictive Relative

a. Naʻe maʻu ʻe Manu ha pousikaati mei hono
PST get ERG Manu INDEF postcard from 3SG.OBJ.GEN
kaumeʻa nofo ʻi Haʻamoa mo ha ngaahi pousikaati
friend reside LOC Samoa with INDEF several postcard
mei hono kau kaainga nofo ʻi Hawaiʻi.
from 3SG.OBJ.GEN CL.PL relative reside LOC Hawaii
'Manu received a postcard from her friend living in Samoa and several postcards from her relatives living in Hawaii.'

b. Naʻa ne fakapuliki ʻa e pousikaati [naʻe ʻomai ʻe
PST 3SG lose ABS the postcard PST give ERG
hono kaumeʻa nofo ʻi Haʻamoa]
3SG.OBJ.GEN friend reside LOC Samoa
'She lost the postcard that her friend living in Samoa sent.'

[26] The table in (26) holds for all adjectives investigated at this point. The table suggests that all adjectives will behave in this way with regard to Dem and DefAcc; however, more work is needed. See Section 6.2.

(28) Non-Restrictive Relative

a. Na‘e ma‘u ‘aneafi ‘e Manu ha pousikaati.
PST receive yesterday ERG Manu INDEF postcard
‘Yesterday Manu received a (single) postcard.’

b. Na‘a ne fakapuliki ‘a e pousikaati [na‘e ‘omai ‘e
PST 3SG lose ABS the postcard PST give ERG
hono kaume‘a nofo ‘i Ha‘amoa]
3SG.OBJ.GEN friend reside LOC Samoa
‘She lost the postcard, which her friend living in Samoa sent’.

Note that the sentences with the relative clause in the (b) examples are identical. That is, the same word order can be used to express either a restrictive or non-restrictive relative clause. Similar findings have been reported for Japanese, where [RC Dem NP] ordering is ambiguous between restrictive and non-restrictive (Ishizuka 2008). In fact, a generalization can be made for both languages: RCs that occur outside of the NP-Dem/Dem-NP sequence allow both restrictive and non-restrictive readings, in both languages.[27]

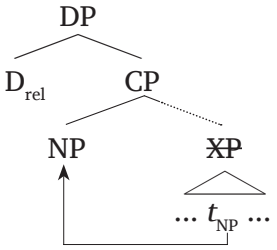
In addition to word order not being a cue for restrictivity, the consultation work done with these same two native speakers revealed no correlation between restrictivity and prosodic possibilities. Speakers reported that an Intonational Phrase prosodic break between the relativized noun (*pousikaati* in this case) and the relative clause was optional in both cases.[28] This is quite unlike the situation for restrictive and non-restrictive relative clauses in English, which may behave quite syntactically and prosodically differently from each other (Ross 1967; Jackendoff 1977). (We return to this in Section 4.)

These facts converge on a single conclusion: that all Tongan RCs must always originate within the DP, even when it appears to be outside of it, as in (26c). My analysis therefore relies on a different theory of RCs, which predicts these behaviors: the promotion analysis of RCs.

3.2 A Promotion Analysis of Relative Clauses

Under contemporary promotion analyses of relative clauses, a relative clause is a CP introduced by a relativizer D. The relativized NP, which is base-generated in its argument position within the CP and undergoes movement to the CP edge (e.g., Schachter 1973; Vergnaud 1974; Kayne 1994; Bianchi 1999). As a result, post-nominal RC languages (e.g., English) have a relative clause structure like (29).

(29)



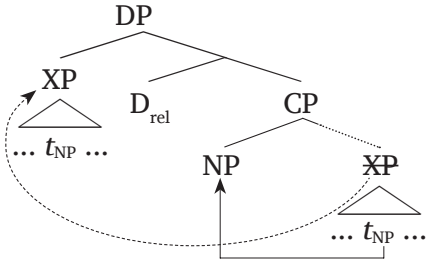
Under an Antisymmetric approach, languages with pre-nominal RCs (e.g., Japanese) involve an additional movement to front the RC. This movement fronts a sub-constituent

[27] It is worth noting that Japanese also allows a second order – [Dem RC NP] – in which only a restrictive reading is available. As we have seen, Tongan disallows a word order where the RC occurs between the Dem and the NP.

[28] As anonymous reviewers have pointed out, past research indicates that the possibility of prosodic variation across speakers is an issue that ought to prompt rigorous testing across a larger number individuals. At the time of writing, running such an investigation has not been possible, and is left to future research opportunities.

of the CP (for arguments, see e.g. Kornfilt 2000; Kayne 2005; Ishizuka 2008), which I label XP.[29] In this way, a pre-nominal RC is derived as in (30).

(30)



While both of these movements are obviously necessary for languages like Japanese, with pre-nominal RCs, I show they are also necessary for languages like Tongan, with post-nominal RCs.

3.3 Syntactic Derivations

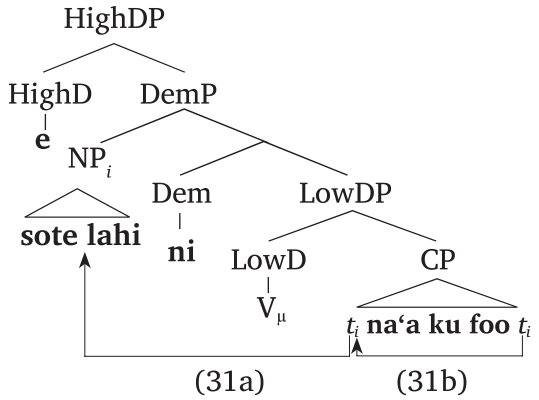
At this point we have seen three DP-internal movements, laid out in (31).

(31) a. NP fronting: Deriving French *ce…ci*, as in (21)
b. NP Relativization: At the heart of the promotion analysis of RCs, as in (29)
c. RC fronting: Deriving Japanese-like relative clauses, as in (30)

Assuming that Tongan DPs always involve (31a) and that all RCs use (31b), we predict straightforwardly the word order in (32) by positing the structure in (33), in which the relativization feeds the NP fronting.[30]

(32) e sóte lahi -ní -i na‘á ku fóo
the shirt large-DEM-DEFACC PST 1.SG wash
‘this large shirt that I washed’

(33)

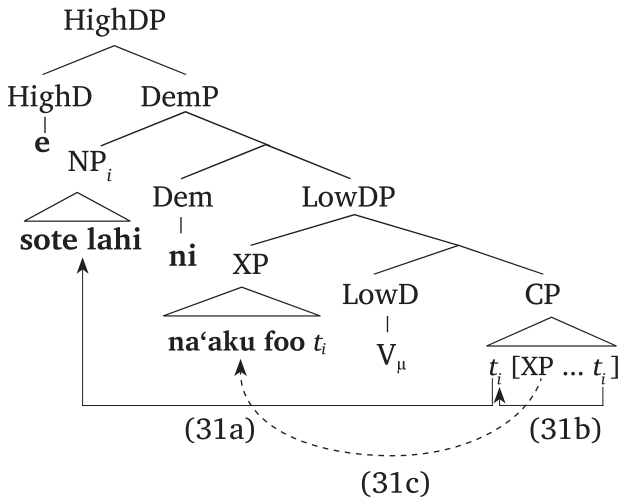


Additionally, if the RC fronting that occurs in some languages is optional in Tongan,[31] we derive (34) – a minimal pair with (32) – with the structure and movements in (35).

(34) e sóte lahí -ni na‘á ku foó -o
the shirt large-DEM PST 1.SG wash-DEFACC
‘this large shirt that I washed’

[29] In these previous analyses, XP is assumed to be TP/IP, though nothing seems to crucially rely on this (only that Tense/Infl is inside the pre-nominal RCs). I do not use the TP/IP label, in order to avoid a commitment to the location of the Tongan Tense/Aspect/Mood morpheme.
[30] Strikingly similarly, in French, the NP must front to the pre-Dem position, out of the RC (Bernstein 1997).
[31] I have not found any evidence that this movement has any interpretational consequences, even though such a consequence would be desirable.

(35)



In these structures, because NPs move to Spec,DemP, RCs cannot intervene between NP and the Dem: there is simply no space for the RC to move to. An NP occupies Spec,DemP just like it does when there is no RC—and the relative clause is either stranded in the complement position of LowD (as a CP in (33)) or has moved to the specifier of LowD (as an XP in (35)).

Thus, based on what has been independently motivated for RCs (crosslinguistically) and for DPs (in Tongan), we straightforwardly derive the (im)possibility of the RC word-orders in (23).

4 Prosodic Breaks

This analysis involving two syntactic derivations of RCs—one with the RC as the complement of LowD and one with the RC moving higher than LowD—finds extra evidence in the distribution of strong Intonation Phrase (IP) level phonological breaks[32] that sometimes separate the NP and the RC. Recall from Section 3.1 that no relationship was found between the necessity of a strong prosodic break and a restrictive/non-restrictive interpretation (unlike languages such as English). The relevant range of data is summarized in the table in (36), which also indicates that the different phrasings correspond to the two derivations we have seen.

(36)

	Prosodic Phrasing	Deriv. (33)	Deriv. (35)
a.	[$_{IP}$ 'oku ma'a 'ae soté -e] [$_{IP}$ na'a ku fóo]	✓	
b.	[$_{IP}$ 'oku ma'a 'ae sote -ní -i] [$_{IP}$ na'a ku fóo]	✓	
c.	[$_{IP}$ 'oku ma'a 'ae sóte] [$_{IP}$ na'a ku fóo]	✓	
d.	[$_{IP}$ 'oku ma'a 'ae sóte na'a ku fóo]		✓
e.	[$_{IP}$ 'oku ma'a 'ae sóte] [$_{IP}$ na'a ku foó -o]		✓
f.	[$_{IP}$ 'oku ma'a 'ae soté -ni] [$_{IP}$ na'a ku foó -o]		✓
g.	[$_{IP}$ 'oku ma'a 'ae soté -ni] [$_{IP}$ na'a ku fóo]	✓	

The following sections provide the details of how each of these two derivations account for the prosodic phrasings above.

[32] Native speaker consultants referred to this kind of break as a 'comma', as opposed to a 'full stop', saying that they consider these utterances to be one sentence and not two. However, the only way found to distinguish the two was native speaker intuition, as the 'comma' does not seem to be measurably different from a 'full stop' – that is, both inter- and intra-sentence prosodic groupings (above the Accentual Phrase, which is irrelevant here) may involve a long pause, an entire pitch reset, and final lengthening (Kuo & Vicenik 2012).

4.1 A Constraint-Based Analysis

To derive the phrasings in table above, let us first be more specific about the model of grammar that is being adopted here. In this model, morphosyntactic structure-building takes place in a single component of grammar (morphological and syntactic structure-building are not separate; a basic tenet of Distributed Morphology; see Marantz 1997 or Siddiqi 2009). At certain points in during the structure-building ("phases"), a portion of the structure is simultaneously sent to Phonology and Semantics ("Spell-Out"), by way of the lexicon (Uriagereka 1999; Chomsky 2001; Collins & Stabler 2016). After semantic and phonological computation terminates, their respective outputs remain active[33] in the derivation, and the morphosyntactic structure-building continues, until the next phase. In this way, the grammar is cyclic as a system, and no single component is cyclic *per se*.

This allows us to treat cyclic phenomena in a classical Optimality Theory (OT) framework (Prince & Smolensky 1993). The prosodic phrasing can be determined by providing the appropriate structure (one like (33) or one like (35)) as input to a four-constraint system as in (37).

(37) a. AFFIXSUPPORT
An affix must not be prosodically separated from its morpho-phonological host. Assign one violation for each prosodic boundary that separates the host and the affix.

b. ALIGN(DefAcc,R;ω,R)
Align the right edge of DefAcc with the right edge of the prosodic word. Assign one violation for each syllable that separates the DefAcc's and the prosodic word's right edges.

c. ALIGN(CP,L;IP,L)
Align the left edge of an Intonation Phrase (IP) to the left edge of a CP. Assign one violation for each syllable that separates the IP's and CP's left edges.

d. ALIGN(LowDP*,L;IP,L)
Align the left edge of an Intonation Phrase (IP) to the left edge of a lexically filled LowDP. Assign one violation for each syllable that separates the IP's and the LowDP*'s left edges.

AFFIXSUPPORT (as defined in Richards 2010) has the effect of ensuring that the DefAcc is parsed as part of the prosodic word of its host; this constraint, alongside the first ALIGN constraint (in the spirit of McCarthy & Prince 1993; Prince & Smolensky 1993; Truckenbrodt 1995; Selkirk 1996; *inter alia*), ensure that the DefAcc morpheme is an enclitic. (We will revisit these first two constraint in Section 4.3.) These two constraints crucially outrank the latter of the two ALIGN constraints, which will be responsible for the prosodic phrasings with the relative clauses.[34] Finally, the ALIGN-CP constraint outranks the ALIGN-LowDP constraint (evidence for which we will see shortly). This ranking is laid out below:

[33] It could be that these phonological and semantic objects are active only in their respective components (the 'radical proposal' of Uriagereka 1999: 256ff), or it could be that they re-enter the syntactic derivation as syntactically simplex pairings of meaning and form (the 'conservative proposal', *ibid.*).

[34] These ALIGN constraints are specific to certain types of syntactic constituents. It is a common view that prosodic phonology has access to the syntactic labels of individual words (and perhaps thereby the label of the maximal projections they head); this view is taken in many works (Clemens 2014; Kaisse 1985; Nespor & Vogel 2007; Smith 2011; Truckenbrodt 2007). However, if Phonology is agnostic to syntactic categories, as has been proposed elsewhere (Hayes 1990; Tokizaki 1999), then these are not well-formed constraints – they would have to be recast in other terms. Perhaps phases could supplant reference to specific category labels, as CP and DP are each possible phasal categories, in contrast to VP and NP.

(38) AFFIXSUPPORT, ALIGN(DefAcc,R;ω,R) ≫ ALIGN(CP,L;IP,L) ≫ALIGN(IP,L;LowDP*,L)

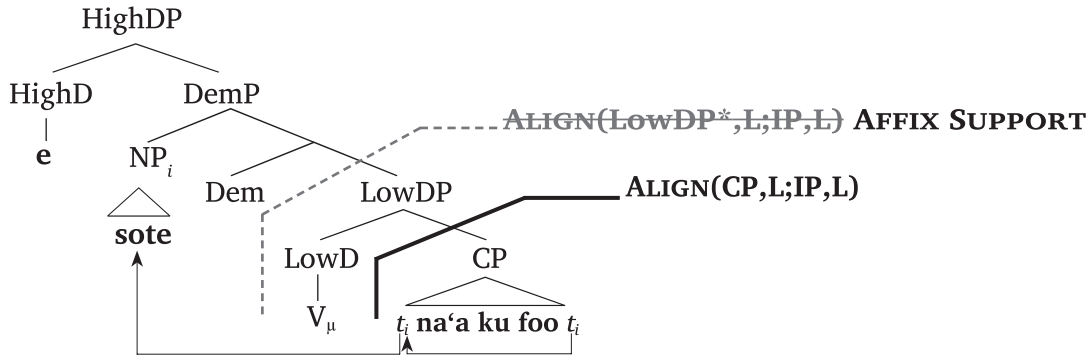
Using some given structure as input, this system dictates how to prosodically phrase the utterance.

As a first demonstration of how this system works, consider the sentence in (36a), which native speakers report as needing to be in two Intonation Phrases:

(39) a. [IP ‘óku má‘a ‘á e soté -e] [IP na‘á -ku fóo]
PRES clean ABS the shirt-DEFACC PAST 1.SG wash
‘The shirt that I washed is clean.’
b. * [IP ‘óku má‘a ‘á e soté -e na‘á -ku fóo]
c. * [IP ‘óku má‘a ‘á e sóte e- na‘á -ku fóo]
d. * [IP ‘óku má‘a ‘á e sóte] [IP e- na‘á -ku fóo]

To derive the word order in (39), we need a structure like (33), in which the RC has stayed within the CP. This structure is given in (40).

(40)



To avoid a violation of ALIGN(CP,L;IP,L), a prosodic break just before the RC is required. To avoid a violation of ALIGN(LOWDP*,L;IP,L), a prosodic break between DefAcc and NP would be required (since LowDP is lexically headed by V_μ). However, this would violate the more highly ranked AFFIXSUPPORT; as such, the break that would be inserted between DefAcc and NP is non-optimal.[35] In other words, the phrasing in (39a) is the optimal phrasing, as shown in the tableau below (which also demonstrates the constraint ranking in (38)):

(41)

	AFFIX-SUPP.	ALIGN-DEFACC	ALIGN-CP	ALIGN-LOWDP*
a. ☞ phrasing in (39a)				*
b. phrasing in (39b)			*!	*
c. phrasing in (39c)		*!	*	*
d. phrasing in (39d)	*!	*		

The prosodic derivation for (36b), which must also be in two IPs in the same way, proceeds in the same way as this.

[35] I do not provide a derivation given here showing a case where the ALIGN(LOWDP*,L;IP,L) has an effect. However, 35 is a case where this align constrain will correctly predict that an IP prosodic break can go to the left of the moved relative clause XP.

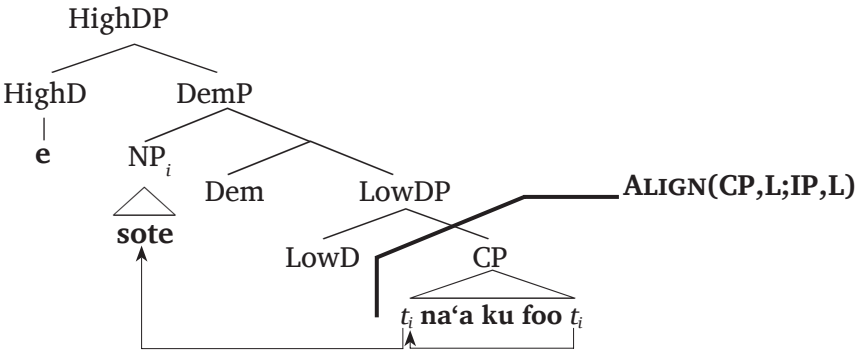
4.2 Accounting for Other Data

Let us now apply this system of constrained derivations to some additional data. Consider the prosodic minimal pair in (42), which repeat (36c&d).

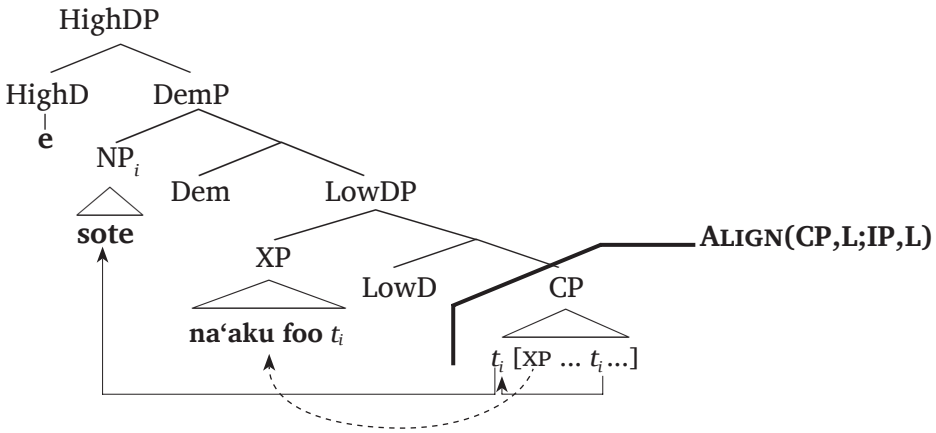
(42) a. [IP ʻoku maʻa ʻa e sote] [IP naʻa ku foo]
PRES clean ABS the shirt PAST 1.SG wash
b. [IP ʻoku maʻa ʻa e sote naʻa ku foo]
PRES clean ABS the shirt PAST 1.SG wash

This prosodic difference is accounted for directly by the two different structures we have seen, one without RC fronting and one with it.

(43) a.



b.



Neither structure incurs any violations of any of the constraints. There is no prosodic phrase boundary at the left edge of the LowDP, but this is not a violation of the ALIGN(LowDP*,L;IP,L) constraint, which only assigns a violation if there is no boundary at the left edge of a LowDP whose head is filled by DefAcc. Similarly, since there is no DefAcc or Dem separated from its prosodic host, no violations of AFFIXSUPPORT or ALIGN-DefAcc are incurred. And finally, in both cases, there is a prosodic break just before the relative clause CP, in accordance with ALIGN(CP,L;IP,L). (Only in (43a) does this make a difference, since there is no pronounced material following the break that gets inserted in (43b).) Thus, though (43a) and (43b) might seem indistinguishable since the additional movement in (43b) is string-vacuous, there is an *empirically measurable effect* on the prosody as a result of the movement. This adds clear support to both the syntactic and prosodic analyses promoted here.

At this point we have seen the prosodic derivations for (36a&b) in (40), and the derivations of (36c&d) in (43). The prosodic derivation for (36g) proceeds in the same way as (43a), and prosodic derivations for (36e-f) proceed in the same way as (43b). Therefore,

these two structures and four rank-ordered constraints account for all the phrasing possibilities in (36).

Under this prosodic analysis, the possibilities in (36) are accounted for by having the prosodic component take two different syntactic structures—which are independently necessary to account for word-order data—as input. This analysis also rules out several unattested phrasings, such as (39b) and (39d), among others.[36] As such, both the syntactic and prosodic structures in the Tongan DP are directly related—a strongly desirable result under modern approaches to the Syntax-Prosody interface.

4.3 Deriving the Enclitic Nature of the DefAcc

In Section 4.1, two constraints derived the fact that the DefAcc must be a enclitic in the same prosodic domain as its host: AFFIXSUPPORT and ALIGN(DefAcc,R;ω,R). The former ensures that DefAcc is a clitic, and the latter ensures that it is an enclitic. This is demonstrated below. (Parentheses indicate the relevant prosodic word boundaries.)

(44) a. [IP ‘óku má‘a ‘á e (ωsoté -e)][IP(ωna‘á -ku) fóo]
PRES clean ABS the shirt-DEFACC PAST 1.SG wash
‘The shirt that I washed is clean.’
b. * [IP ‘óku má‘a ‘á e (ω sóte)] [IP (ω e- na‘á -ku) fóo]
c. * [IP ‘óku má‘a ‘á e (ω sóte) e-] [IP (ω na‘á -ku) fóo]
d. * [IP ‘óku má‘a ‘á e (ω sóte) e] [IP (ω na‘á -ku) fóo]
e. * [IP ‘óku má‘a ‘á e (ω sóte)] [IP e (ω na‘á -ku) fóo]

(45)

	AFFIX-SUPP.	ALIGN-DEFACC	ALIGN-CP	ALIGN-LOWDP*
a. ☞ grouping in (44a)				*
b. grouping in (44b)		*!	*	
c. grouping in (44c)	*!	*		*
d. grouping in (44d)	*!	*		*
e. grouping in (44d)	*!	*	*	

In (44b), the DefAcc is a proclitic and this violates the ALIGN-DefAcc constraint, which is formulated explicitly to cause a prosodic word boundary after DefAcc. The candidates in (44c–e) violate AFFIXSUPPORT as well.

In this way, Syntax can produce whatever structures it likes, without consideration for the phonological needs of any lexical item, and the constraints in Phonology ensure the output will satisfy all the morphophonological properties of each lexical item, such as DefAcc’s need for a prosodic word host to its left (whose stress will then be calculated as normal, after encliticization).

These constraints depend on the language to essentially hard-code the fact that the lexical item, DefAcc, is an enclitic. On the one hand, this seems to follow general conceptions of modern generative grammar, in which properties of lexical items ultimately determine possible outputs (e.g. the Projection Principle, in Syntax). Such lexically determined

[36] There remain some apparent issues with this analysis. See Appendix.

properties of structure complement and supplement the properties that fall out because of a derivation and the principles that guide it—such as the placement of the DefAcc in the linear string. The question that naturally arises is, which properties derive from the lexicon[37] and which derive from the derivation?

On the other hand, instead of relying on such hard-coded morphophonological properties, some approaches to morphophonology attempt to derive the maximum amount of regularity in the language, by removing any direct reference in the constraint set or lexical entries that identifies any particular morpheme as being a prefix / suffix / infix / root. Such approaches (e.g. Prince & Smolensky 1993) tend to rely on morpheme-indexed constraints (constraints whose sole job is to correctly manipulate a specific morpheme) in order to correctly place morphemes relevant to their host or affixes. The ALIGN-DefAcc constraint of (37b) is an example of this.

At the same time, there is a general consensus that morpheme-indexed constraints are too powerful of a tool. Where attempts have been made to remove such morpheme-indexed constraints, such approaches (e.g. Generalized Template Theory, McCarthy & Prince 1995) have leaned on the ability of the lexicon to specify morphemes as specifically a prefix or suffix, proclitic or enclitic, etc. This assumption is manifested in this paper under the guise of the AFFIXSUPPORT constraint.

I revisit these two constraints now, and try to eliminate both types of morphophonological stipulations simultaneously. As I have been assuming throughout this paper, the syntax places the morphemes in the correct linear order through generalized principles. In addition, however, I argue Phonology will combine them into prosodic structures through completely generalizable principles as well (and not morpheme-indexed constraints or lexical specification as an affix). This is in the same vein as other work, such as Trommer 2008 which shows that, though Hungarian has been said to have case-suffixes and postpositions, the two are structurally identical with variable phonological behavior that is derivable from purely phonological generalizations of the language. This kind of approach allows for unification and explanation in a way that a lexical approach cannot.

To this end, this section presents a new grammatical model that achieves the same empirical coverage as the account in (45), but which depends neither on the DefAcc morpheme having any pre-specified morphophonological properties nor any constraints that reference DefAcc directly. The first step towards understanding DefAcc's enclitic nature is to consider exactly what inputs to the phonological system look like, when they contain a DefAcc. In a cyclic model of Spell-Out, the phonology is provided with inputs at certain points during the syntactic derivation (Uriagereka 1999; Chomsky 2001; Kratzer & Selkirk 2007; Pak 2008; Collins & Stabler 2016 among many others). That is, the input to Phonology will typically not be an entire sentence, but some portion of that sentence—these portions of the derivation are called Spell-Out domains. (As we will see in Section 5, these inputs aggregate in such a way that past cycles and current cycles are both visible to Phonology.)

When Phonology gets a new cycle that contains a DefAcc V_{μ}, the constraints end up mandating that it be given segmental features within that phonological derivation. As such, the only candidates for hosts to an V_{μ} must be in the same Spell-Out domain, or in a previous one that has already reached Phonology. Since the DPs are Spell-Out domains,

[37] At this point, a clear definition of 'lexicon' is needed. In one dimension, there is a question of whether the lexicon either excludes functional elements or includes all words/morphemes of the language. In another dimension, there is a question of the complexity of elements stored in the lexicon. There are some conceptualizations of the lexicon in which it stores redundant (i.e. derivable) information about phrases/words/morphemes. The usage of 'lexicon' I employ refers to the set of all lexical items in a language, which still accounts for the range of possible utterances, without being redundant.

this will essentially mean that V_{μ} and any segment that provides it with features will need to be within the DP. This fact is pointed out quite clearly by (Churchward 1953: 278), with examples like (46).

(46) a. ‘i [DP he púha lahí -i]
LOC the box large-DEFACC
‘in the large box’
b. ‘i [DP he puhá-a] fóki
LOC the box -DEFACC also
‘also in the box’

In the case of (46a), *lahi* is within the DP, and thus can provide V_{μ} with segmental features; but *foki* is outside of (perhaps adjoined to) the DP and cannot.

For this reason, we will need to continue with data in which there is DP-internal segmental material both before and after the V_{μ}, to understand why it is a enclitic. Consider the example below, which is the word order that Syntax will provide to the Phonology at the Spell-Out of the DP.

(47) [DP he soté -e na‘e fóo]
the shirt-DEFACC PST wash
‘the shirt that he washed’

The fact that the DefAcc is an enclitic on *sote* will emerge as the result of (i) the fact that DefAcc is a underspecified vowel, and (ii) the set of OT constraints below, in (48), which is partially ranked in (49).

(48) a. *CODA (in the spirit of Prince & Smolensky 1993)
A syllable must not have a coda.
b. *COMPLEXONS (in the spirit of Prince & Smolensky 1993)
A syllable must not have a complex onset.
c. DEP-IO (in the spirit of McCarthy & Prince 1995)
Do not epenthesize segments.
d. MAX-IO (in the spirit of McCarthy & Prince 1995)
Do not delete segments.
e. FILL(μ) (in the spirit of McCarthy & Prince 1993)
Connect moras to segmental material with an association line.
f. *CROSSL (in the spirit of Goldsmith 1976)
Association lines between segmental features and higher prosodic structure (e.g., moras) do not cross other such association lines.
g. CRISPEDGE(ω) (in the spirit of Itô & Mester 1994)
Do not associate features across a prosodic word boundary.
h. NOSPREAD (in the spirit of McCarthy 2000)
The output should not have segmental features associated to more than one node in the prosodic structure.
i. ALIGN(wd,L;ω,L) (in the spirit of Prince & Smolensky 1993)
The left edge of lexical items should align with the left edge of prosodic words.
j. ALIGN(wd,R;ω,R) (in the spirit of Prince & Smolensky 1993)
The right edge of lexical items should align with the right edge of prosodic words.

(49) *CODA, *COMPLEXONS, DEP-IO, MAX-IO, FILL(μ), *CROSSL, CRISPEDGE(ω) ≫ NOSPREAD, ALIGN(wd,L;ω,L), ALIGN(wd,R;ω,R)

Essentially, DEP-IO, MAX-IO, FILL(μ), and *CROSSL ensure that the V_{μ} must get associated with segmental features from an adjacent segment, which will provide V_{μ} with the appropriate phonological features so it can be pronounced. Additionally, *CODA and *COMPLEXONS prevent V_{μ} from associating with an adjacent consonant, as doing so would either put a consonant in a coda or complex onset. Finally, because of CRISPEDGE(ω), the V_{μ} must cliticize into a prosodic word host which provides it its phonological features. All of these constraints conspire to make the V_{μ} an enclitic, whose features come from the adjacent vowel. Because of this cliticization and feature sharing, the optimal candidate will need to violate the latter three constraints, NOSPREAD, ALIGN(wd,L;ω,L), and ALIGN(wd,R;ω,R).

Using (47) as an example input, we will see a concrete example of how these constraints result in an optimal output in which DefAcc is an enclitic. Let us first consider what would happen if the DefAcc V_{μ} were not parsed into any prosodic word, and was perhaps just adjoined to a higher prosodic constituent (cf. (44d–e)).

(50) The V_{μ} as an Unparsed Mora

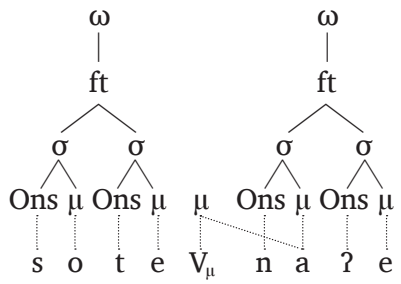
input: /... sote V_{μ} naʔe .../	*CODA	*COMPLEX	FILL(μ)	*CROSSL	CRISPEDGE(ω)	NOSPREAD	ALIGN(wd,L;ω,L)	ALIGN(wd,R;ω,R)
a. ☞ (ω μ.μ́.μ) (ω μ́.μ) sote e naʔe						*	*	*
b. (ω μ́.μ) μ (ω μ́.μ) sote e naʔe					*!	*	*	*
c. (ω μ́.μ) μ (ω μ́.μ) sote a naʔe				*!	*	*	*	*
d. (ω μ́.μ) μ (ω μ́.μ) sote naʔe			*!				*	*

For this first tableau, let us discuss each of the candidates and their violation in some detail. In the winning candidate, (50a), three constraints are violated. The ALIGN-wd-L constraint is violated because the left edge of the DefAcc doesn't align with the left edge of a prosodic word, and the ALIGN-wd-R constraint is violated because the right edge of *sote* doesn't align with the right edge of a prosodic word. The winning candidate also violates NOSPREAD, because the final segment of *sote* has an association line with two nodes in the prosodic structure.

In (50b), the V_{μ} is not in any prosodic word, and it gets its vowel quality features from the final vowel of *sote*. This violates the two ALIGN constraints because neither the left or right edge of DefAcc is aligned with the appropriate type of prosodic word edge. In the same way that (50a) violates NOSPREAD, so does (50b). In addition, (50b) violates CRISPEDGE because the association line between the V_{μ} and the final vowel of *sote* crosses as prosodic word boundary. This additional violation makes (50b) non-optimal, and indicates that CRISPEDGE outranks NOSPREAD and the two ALIGN-wd constraints.

In (50c), the unparsed mora is this time associated with the segmental features of *na'a*'s medial [a]. This similarly violates the two ALIGN-wd constraints, CRISPEDGE, and NOSPREAD. In addition, it violates *CROSSL, as the association line connecting the DefAcc μ to the [a] vowel causes crossing lines. This is more easily seen in the elaborated prosodic structure in (51).[38]

(51)



Finally, in (50d), the unparsed mora again violates the two ALIGN-wd constraints. In addition, it respects NOSPREAD, CRISPEDGE(ω) and *CROSSL by not associating with any segmental features. However, not associating with segmental features violates FILL(μ). Though (μ) is associated with $V_μ$, recall that $V_μ$ is only an *abstract* representation of a vowel, and it lacks segmental features that would satisfy the demands of FILL.

Now let us consider what would happen if it were parsed as a free-standing prosodic word—this will solve all of the ALIGN-wd violations in (50).

(52) The $V_μ$ as an Independent Prosodic Word

input: /... sote $V_μ$ naʔe .../	*CODA	*COMPLEX	FILL(μ)	*CROSSL	CRISPEDGE(ω)	NOSPREAD	ALIGN(wd,L;ω,L)	ALIGN(wd,R;ω,R)
a. ☞ (ω μ.μ́.μ) (ω μ́.μ) sote e naʔe						*	*	*
b. (ω μ́.μ)(ωμ́)(ω μ́.μ) sote e naʔe					*!	*		
c. (ω μ́.μ)(ωμ́)(ω μ́.μ) sote a naʔe				*!	*	*		
d. (ω μ́.μ)(ωμ́)(ω μ́.μ) sote naʔe			*!					

Though the ALIGN constraints go unviolated in (52b–d), these candidates are ruled out by the violations of CRISPEDGE, *CROSSL, and FILL, parallel to (50).

Now if the $V_μ$ were a proclitic, joining the prosodic word that follows it, all the candidates would still violate many of the same constraints as in (52).

[38] If consonants and vowels were on different planes (51) may not represent a violation of *CROSSL (e.g. Clements & Hume 1995), and this constraint would need to be reformulated.

(53) The V_{μ} as a Proclitic

input: /... sote V_{μ} naʔe .../	*Coda	*Complex	Fill(μ)	*CrossL	CrispEdge(ω)	NoSpread	Align(wd,L;ω,L)	Align(wd,R;ω,R)
a. ☞ (ω μ.μ́.μ) (ω μ́.μ) sote e naʔe						*	*	*
b. (ω μ́.μ)(ωμ. μ́.μ) sote e naʔe					*!	*	*	*
c. (ω μ́.μ)(ωμ. μ́.μ) sote a naʔe				*!		*	*	*
d. (ω μ́.μ)(ωμ. μ́.μ) sote naʔe			*!				*	*

There are only two differences between the proclitic and independent prosodic word candidates. The first is that the former violates the Align constraints in a parallel fashion to the winning enclitic candidate. The second is that the independent prosodic word candidate of *sóte á náʻe* in (52c) violates CrispEdge in a way that *sóte anáʻe* in (53c) does not.[39] However, these violations do not result in a candidate more optimal than the enclitic one.

The final option for these candidates is for the V_{μ} to be an enclitic on the preceding word.

(54) The V_{μ} as a Enclitic

input: /... sote V_{μ} naʔe .../	*Coda	*Complex	Fill(μ)	*CrossL	CrispEdge(ω)	NoSpread	Align(wd,L;ω,L)	Align(wd,R;ω,R)
a. ☞ (ω μ.μ́.μ) (ω μ́.μ) sote e naʔe						*	*	*
b. (ω μ.μ́.μ) (ω μ́.μ) sote a naʔe				*!	*	*	*	*
c. (ω μ.μ́.μ) (ω μ́.μ) sote naʔe			*!				*	*

[39] A reasonable question that may arise is "what if the candidate in (53c) were different so that there were no onset in the following word?". Recall that the only words that would be considered for the V_{μ} to cliticize onto would need to be in the same Spell-Out domain—i.e., within the same DP. Thus far, the only words that have been found to follow the DefAcc within the DP are Tense/Aspect/Mood words, which all have onsets. As such, it is not known whether the V_{μ} would be an enclitic or a proclitic in such an environment, and so it will not be investigated further until this is found.

The optimal candidate, as we have seen throughout is the candidate where the V_μ gets its features by associating with a mora that is also associated to the adjacent vowel in its prosodic word.

To this point, we have only considered candidates in which the V_μ remains in the derivation and gets its features from a segment that is in the input. Let us now add DEP-IO (preventing epenthesized phonological material) and MAX-IO (preventing deletion of phonological material) to the constraints, and consider some additional candidates in (55).

(55) Deleted DefAccs and Epenthesized Vowels

input: /... sote V_μ naʔe .../	*CODA	*COMPLEX	DEP-IO	MAX-IO	FILL(μ)	*CROSSL	CRISPEDGE(ω)	NOSPREAD	ALIGN(wd,L;ω,L)	ALIGN(wd,R;ω,R)
a. ☞ (ω μ.μ́.μ) (ω μ́.μ) sote e naʔe								*	*	*
b. (ω μ́.μ)(ω μ́.μ) sote naʔe				*!						
c. (ω μ́.μ) μ (ω μ́.μ) sote i naʔe			*!						*	*
d. (ω μ́.μ)(ω μ́)(ω μ́.μ) sote i naʔe			*!							
e. (ω μ́.μ)(ω μ . μ́.μ) sote i naʔe			*!						*	*
f. (ω μ.μ́.μ) (ω μ́.μ) sote i naʔe			*!						*	*

The highly ranked MAX-IO rules out removal of the V_μ from the representation, and the highly ranked DEP-IO rules out epenthesis of a vowel (e.g. [i]) to associate with V_μ, no matter what prosodic position the V_μ occurs in.

In this section, I have shown that DefAcc's enclitic status emerges out of the grammatical system, without the need for morpheme-indexed constraints or stipulation in the lexicon of properties such as 'enclitic'. In particular we only needed to refer to (i) the purely phonological constraints in (48), (ii) their ranking in (49), and (iii) the output of Syntax. This kind of approach has already been taken for Hungarian case suffixes/postpositions (Trommer 2008), and has now been shown to be possible for Tongan DefAcc as well.

Tentatively, I postulate the following to be about the hosts of affixes and clitics.

(56) Postulate on Morphological Hosts:
Affixes and clitics are placed on the appropriate side of their prosodic host as a result of only (i) the output of Syntax as it goes to Phonology, and (ii) non-morpheme-specific constraints in Phonology

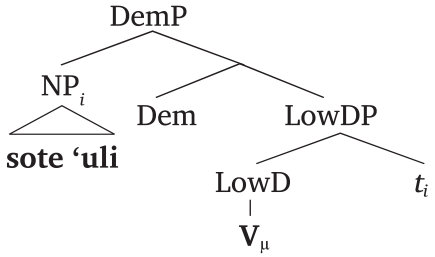
At this point we lack strong evidence for the generality of this postulate. In fact, the present constraint set for DefAcc will not even account for the prosodic hosts of other

Tongan morphemes, such as the enclitic Dems, *-ni* and *-na*. Nonetheless, the enterprise is clear: taking (56) as the Null Hypothesis, we can minimize the number of stipulations and constraints about specific lexical items—perhaps for all affixes and clitics. Alternatives with morpheme-indexed constraints or lexically specified morphophonological properties should only be pursued once a solution conforming to (56) is determined not to be viable.

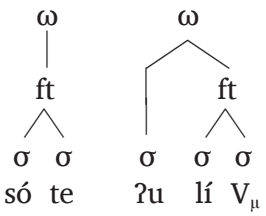
5 Implications for the Syntax-Phonology Interface

Let us return to the heart of the analysis for how the presence of the -DefAcc appears to shift stress. Recall that DefAcc is a phrasal enclitic that forms a part of the prosodic word that it is cliticized to, feeding trochaic footing for stress. Consider the syntactic and prosodic structures of *sote ʻuli-i* (*shirt dirty* -DefAcc):

(57) a.



b.



Note that, in the syntax, the DefAcc forms a constituent with the preceding NP *sote ʻuli*, but in the prosody, it forms a constituent with the final syllable of *ʻuli*. This is the result of the phonological properties of this underspecified mora. This is very much the same as the Saxon genitive *'s*, which forms a prosodic constituent with the final syllable of whatever word it is adjacent to. Thus, syntactic and prosodic structures are not necessarily identical, despite Syntax providing the input to Phonology; the places where they differ are the result of grammatical constraints.[40] For further discussion, see, for example, Selkirk (2011).

Now let us consider a potential issue that is more theoretically complex, involving the mutability of phases. Metrical phenomena like prosodic word and lexical stress are the result of applying phonological constraints to syntactic structures at Spell-Out (Kratzer & Selkirk 2007; Selkirk 2011). As such, it would seem that the DefAcc would have to be within the same Spell-Out domain as its host, in order to build the correct prosodic output. This would appear to be rather straightforward in a case like (57), where there is a Spell-Out domain (DP) which contains both the V_μ and its prosodic host. In the same way that (57) is straightforward, RCs complicate the picture, somewhat. Consider the two phrases in (58).

(58) a. e hu‘akaú -u [$_{CP}$ ná‘e ínu ‘e [$_{DP}$ Sióne]]
the milk -DEFACC PAST drink ERG Sione
‘…the milk that Sione drank…’

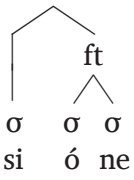
b. e hu‘akáu [$_{CP}$ ná‘e ínu ‘e [$_{DP}$ Sioné]] -e
the milk PAST drink ERG Sione -DEFACC
‘…the milk that Sione drank…’

The former case in which V_μ cliticizes to *hu‘akau* is as (57)—the V_μ is in the same Spell-Out domain as its prosodic host. However, the latter case appears to present an issue. As a result of being nested rather deeply in the relative clause, *Sione* will have been sent to Spell-Out at least once—it occurs inside the DP- and CP-level phases, marked with brackets. As such, the metrical structure of *Sione* ought to be calculated before any

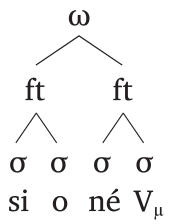
[40] What those constraints can be is constrained by the general architecture of grammar. In standard Minimalist architecture, for example, Phonology cannot interact with structures built at LF.

DefAcc merges, and the relatively late merger of DefAcc will affect the stress placement of a previously spelled out word. In other words, the metrical structure for prosodic word dominating *Sione* at one point of the derivation of (58b) is as (59a), and at a later point, after DefAcc merges, it is as (59b).

(59) a.



b.



At first blush, this seems to be counter-cyclic, in violation of the Phase Impenetrability Constraint (PIC, Chomsky 2000). The problem seems to be that we have already built structure, sent it to Spell-Out, and now we are changing it at a later stage in the derivation. More precisely, this would violate any principle which maintains that material that has already been processed by Phonology (as a result of Spell-Out) cannot be altered later by Phonology (after further instances of Spell-Out).[41] The Phase Integrity principle (Piggott & Newell 2006; Newell & Piggott 2014) in (60) is one formal instantiation of this idea.

(60) Phase Integrity/PF
Conditions on the well-formedness of prosodic categories are imposed on all elements that emerge within a phase α, if the elements are solely within phase α.

The only way in which (60) could hold for (58b) is if the DefAcc were in the same Spell-Out domain as *Sione*, which we have already discussed as problematic. (Recall from (11a) that proper names like *Sione* cannot co-occur with a DefAcc of their own; and so, this DefAcc must originate in a DP that is distinct from the one that consists of just *Sione*.)

The necessary alternative is that previously built metrical structure *can* be modified after being constructed during a previous Spell-Out operation (albeit, perhaps in a constrained way). This raises the question of when previously generated structures are able to change after Spell-Out, and when they are not. The proposal that I make here is entirely consistent with the PIC, as originally defined in Chomsky (2000). While the PIC bars *syntactic* manipulation of spelled out material, the *prosodic* structure of spelled out material can be modified in PF, when motivated on phonological grounds. This kind of model for Spell-Out is laid out briefly below,[42] and directly follows from the original proposals on Spell-Out and the Minimalist model of grammar:

(61) Sketch of the Minimalist Syntax-Phonology Interface
a. PF takes syntactic structure as its input
b. PF operations match abstract syntactic structure to optimal phonological outputs
c. These operations see syntactic objects in the input, but may not effect changes in Syntax (only in Phonology)

[41] The presupposition that the metrical structure is built and then changed might not hold. That is, perhaps Phonology only runs one evaluation of constraints, at the end of the entire syntactic derivation (i.e. Syntax only feeds Phonology once per sentence). If true, then there is no need to change already-built metrical structure. However, if there is only one evaluation of OT constraints, after all instances of Spell-Out, there may be difficulties in matching prosodic boundaries to syntactic ones, as syntactic information like boundary locations and types is said to be lost after Spell-Out. Thus, in order for a global evaluation to work, there the model would need to be adjusted so Phonology can access such information, even for phrases that are embedded in an arbitrarily large number of phases. This may raise interactions with working memory that may be undesirable.

[42] For more, including what PF operations can/cannot see from Syntax, see Collins & Stabler (2016).

This is in fact the spirit of the PIC: the syntax cannot do anything to spelled-out constituents because those constituents are in the hands of PF and LF. Syntax only gives Phonology a "rough draft" of the prosodic structure, and then allows the phonology make as many changes as it wants to it, on the basis of well-formed phonological rules/constraints. (Similar approaches to the Syntax-Phonology interface are pursued elsewhere, including Wagner 2005, 2010 and Ahn 2015.[43])

As a result, later Spell-Outs can override prosodic structures drafted by previous Spell-Outs. In other words, previous phonological outputs (the result of Spell-Out) can re-enter (or are still part of) the phonological derivation and can be compelled to undergo changes despite being previously spelled out (see also Embick 2013 and Dobler et al. *in press*; contra, e.g., Piggott & Newell 2006, Dobler 2008, Samuels 2010, and Newell & Piggott 2014). However, undergoing changes after Spell-Out is not freely available; it violates a faithfulness constraint, FAITH/Phase (see McPherson 2014; McPherson & Heath 2015). This type of constraint (which is motivated quite independently from the issue of Tongan stress, in the domain of Dogon grammatical tone) formalizes the simple idea that the phonological form that results from a previous operation of Spell-Out can be changed, but it is privileged in that there is a constraint against changing it. Specifically, because it is a ranked violable constraint, the cases used to motivate an approach like (60) can still be captured by ranking it highly in the appropriate ways.

Returning now to the apparent problem at hand, the change in structure in (59) does not violate the PIC because it (i) is a change in the phonology (and only the phonology), (ii) is motivated on phonological grounds, and (iii) does not effect change in the syntactic structure. Thus, though stress shifts of the kind in (58b) *appear* to be problematic from the point of view of the PIC, there is no problem because the syntactic structure is indeed preserved. At the same time, a FAITH/Phase constraint will be violated, but a low ranking in Tongan will allow such changes to be possible.

To conclude, phonological items from one Spell-Out domain need to be given the chance to interact phonologically with material from other Spell-Out domains.[44] In this model, PF can manipulate previously spelled-out material because one Spell-Out's primary functions is convert syntactic structure into objects for PF to manipulate. Changing previously spelled-out phonological material in Phonology is a violation of a phonological OT constraint, but it is not a violation of any general principle of phases.

6 Further Directions

6.1 Multiple Definitive Accents

According to native speaker consultants, a DP like (62), in which multiple DefAccs occur with only one obvious NP, is possible. However, it should be noted that such a DP was never produced without direct elicitation.

(62)

e	soté -e	na'a	ku	foó	-o
the	shirt-DEFACC	PST	1.SG	wash-DEFACC	

'the shirt that I washed'

This is unpredicted under this analysis, unless it is possible for a DefAcc to be realized in the DP out of which the NP has relativized:

(63) $[_{\text{DemP}}\ [_{\text{NP}}\ \text{sote}_i\ ]\ [_{\text{LowDP}}\ V_\mu\ [_{\text{CP}}\ t_i\ \text{na'a ku foo}\ [_{\text{LowD}}\ V_\mu\ t_i]]]]$

[43] See Richards (2010) for a similar but distinct formulation of the interface, in which (61c) does not hold.

[44] For the purpose of this problem, it does not matter whether this interaction results from a model in which phonological material is returned to Syntax, or whether phonological material aggregates separately in Phonology. (See footnote 33.) See McPherson (2014) for data that suggests the former.

In this alternative analysis, the DefAcc can appear multiple times within a single noun's functional structure, without any obvious second DP for a DefAcc. Similarly, this alternative analysis makes it easy to understand how to attach a DefAcc to a word at the right edge of a RC – the DefAcc is actually found within the RC.

However, this alternative analysis seems to create more problems than it solves. First and foremost, if the DP remnant is the source of the DefAcc on the RC, we have to explain why other DP functional material besides the DefAcc (Determiners, Case, Demonstrative enclitics) are obligatorily unpronounced. The lack of Demonstrative enclitics is especially problematic since, as DP functional enclitics, they seem to be most similar to DefAccs.

This alternative analysis also faces serious empirical challenges as well. First, if the NP that is relativized is not the final word within the RC, an analysis like (63) predicts the DefAcc should occur RC-medially. No such data has been found. More critically, if a second DefAcc were available within the RC, data like (64) ought to be grammatical – but it is deemed ungrammatical by consultants.

(64) *e sote -ná -a na'á ku foó -o
the shirt-DEM-DEFACC PAST 1.SG wash-DEFACC
Intended: 'That shirt that I washed'

The only way in which the ungrammatical (64) differs from the grammatical (62) is that there is a Dem in the DP (also compare with (23a)). It is not clear how to rule in (62) while ruling out (64) in an analysis like (63).

This alternative approach has more issues than advantages, and is taken to be inferior to the analysis promoted elsewhere in this paper. We are thus left to wonder how to account for data like (62), to the extent that they are truly grammatical in natural Tongan speech.

6.2 Adjectives

Recall our previous generalization on some of the differences between adjectives and relative clauses, which is repeated below:

(26)

		Adjective	Relative Clause
a.	N __ Dem DefAcc	✓	*
b.	N Dem __ DefAcc	*	✓
c.	N Dem DefAcc __	*	✓

Here, adjectives are treated as a homogeneous class, with respect to the DefAcc. This generalization needs to come under further scrutiny, given proposals like Cinque (2010) and Vander Klok (2013), each of which provides evidence for at least two derivational sources of adnominal adjectives. Specifically, they both propose that one source of adnominal adjectives should be more relative-clause like. This raises the question: do adjectives exhibit variable behavior with regard to DefAcc, depending on the syntactic source of the adnominal adjective?

At this point, limited data that can speak to this question has been collected. A prediction that is made, however, is that if (26) is true for adjectives of both structural sources, then you might expect to find certain relative-clause-like structures between the head noun and the Dem. This prediction is upheld in the following data point:

(65) he [ta'u [kuo 'osi]]-na
DET year PERF finish -DEM
'Last year' (Lit. 'that just-finished year')

More work needs to be done to explore how the relative-clause-like element in (65) differs from those that obligatorily follow the Dem.

7 Conclusions

In this paper, I have demonstrated that the Tongan DP contains multiple functional projections, including HighDP, DemP, and LowDP. Each of these projections is head-initial, and those which appear to be head-final present that word order through independently motivated movement operations. Tongan relative clauses (also post-nominal) exhibit two possible word orders with regard to the DefAcc LowD, and I have shown this variation can be entirely predicted by independently motivated movements on a single underlying structure. Crucially, the data cannot be derived under an NP-adjunct analysis of relative clauses – such an analysis would incorrectly predict adjectives and relative clauses to have the same distribution.

The structural analysis of word order facts argued for in this paper converges with an account of prosodic phrasings for relative clauses in Tongan, whereby the syntactic structures directly feed the prosody, and the prosody is its own domain with its own separate rules and constraints. Though linear word order at times conceals the two surface constituencies, converging evidence in which each structure maps onto different prosody corroborates these two structures (as in (43)).

Moreover, Tongan DPs provide a glimpse into two key abstract formal aspects of grammar. First, we saw in Section 4.3 that the enclitic nature of certain affixes and clitics can be derived without reference to morpheme-indexed constraints or lexical specification of certain morphemes as clitics or affixes. Second, we were able to look more closely at the structure of the Syntax-Prosody interface, and its ability to optimally map syntactic structures onto phonological outputs. Specifically, we showed in Section 5 that phonological outputs from various Spell-Out operations are able to interact with one another in Phonology and, as a result, those previous outputs are candidates for further phonological operations.

Finally, the syntactic and prosodic data lead to an underlying hierarchical structure within the DP, namely: HighD≫Dem≫LowD. This will have implications for our approach to DPs that are multiply marked for definiteness, and prompts a second look at the DP structure in languages with multiple overt Ds, such as Swedish or Greek.

Competing Interests

The author declares that they have no competing interests.

Appendix

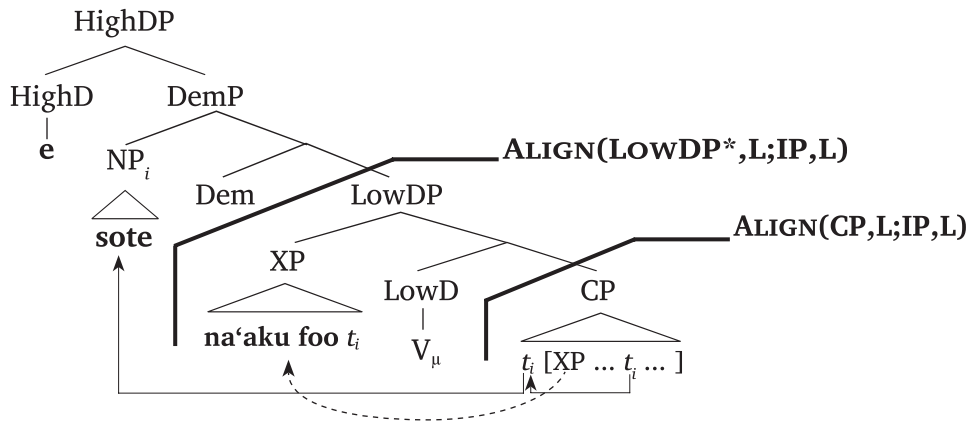
Remaining Prosodic Issues

In (66), the relative clause XP moves to Spec,LowDP causing it to precede the DefAcc: (66b) is grammatical as either one or two Intonational Phrases, but as the derivation in (67) shows, only the phrasing with two IPs is predicted.[45]

(66)	a.	[$_{IP}$	...	e	sote]	[$_{IP}$	na‘a	ku	foo -o	]
				the	shirt		PST	1.SG	wash-DEFACC	
	b. ☹	[$_{IP}$	...	e	sote	na‘a	ku	foo	-o	]
				the	shirt	PST	1.SG	wash-DEFACC		

[45] The ☹ is the standard OT notation used for attested forms that the system doesn't predict; and the 💣 is used for unattested forms that the system (incorrectly) predicts.

(67)



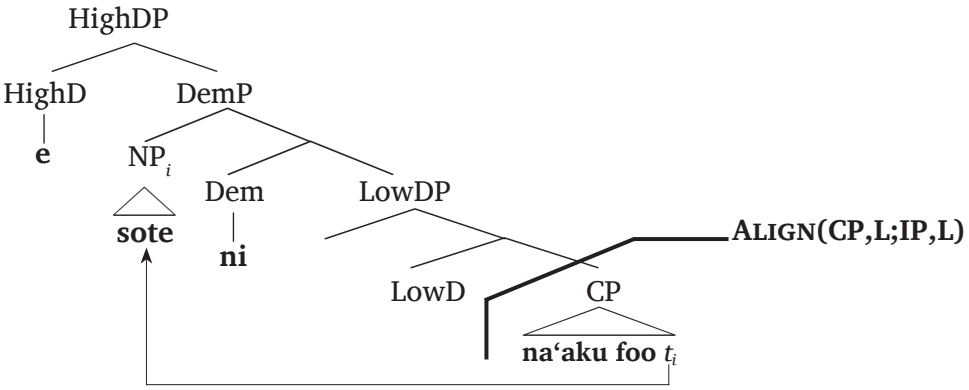
The constraint set only predicts a phrasing in which an IP boundary is introduced at the left edge of the lexically headed LowDP. In order to produce (66b), the ALIGN(LOWDP*,L;IP,L) constraint would have to be violated—perhaps in order to adhere to a yet-unnamed higher ranking constraint. Alternatively, perhaps the prosodic edge aligned with LowDP is not an IP, but something smaller (perhaps an intermediate phrase) which does not *obligatorily* induce pauses, but can optionally do so.

A second, perhaps related issue arises in (68). Our system predicts two possible phrasings for e *sote-ni na‘a ku foo*, both laid out in (68). However, though predicted to be possible, (68b) is in fact ungrammatical.

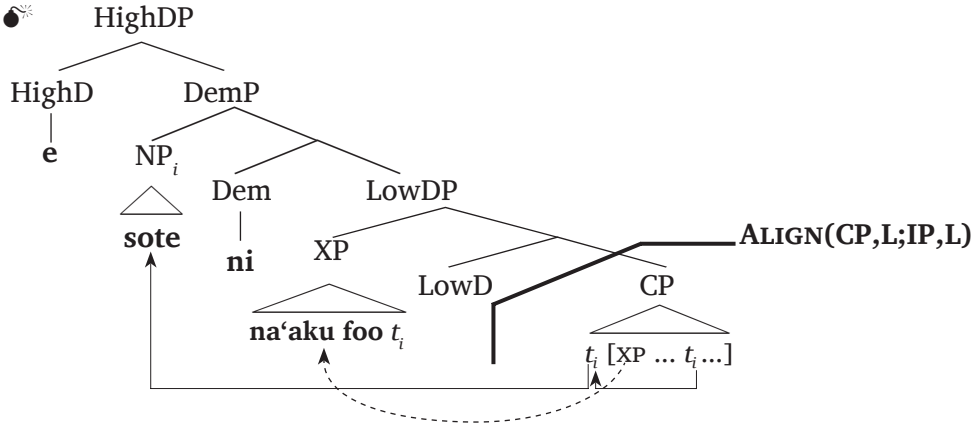
(68)									
a.	[IP	...	e	sote -ni	] [IP	na‘a	ku	foo	]
			the	shirt-DEM		PST	1.SG	wash	
b. 💣	[IP	...	e	sote -ni	na‘a	ku	foo	]	
			the	shirt-DEM	PST	1.SG	wash		

The two-IP phrasing in (68a) is correctly predicted under the structure in (69a), and the one-IP phrasing in (68b) is *incorrectly* predicted under the structure in (69b).

(69) a.



b. 💣



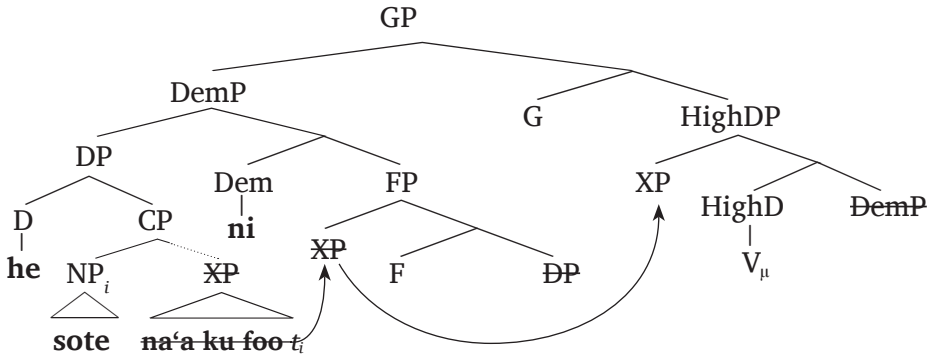
The problem to solve in this case would seem to be in discovering what rules out the movement of the XP in (69b).

Both of these prosodic issues discussed here ought to be investigated further, in hopes of uncovering possible solutions to these apparent problems. In addition, prosodic data ought to be gathered more rigorously, with a greater number of native speakers in a controlled experimental setting, since prosodic variation and judgments have been known to present issues in similar works.

DefAcc as HighD

Alternatively, the DefAcc could the HighD, and (*h*)*e* could be the LowD. Under such an analysis, at least an additional three syntactic phrases and an additional two movements of the RC would be necessary. This is presented below.

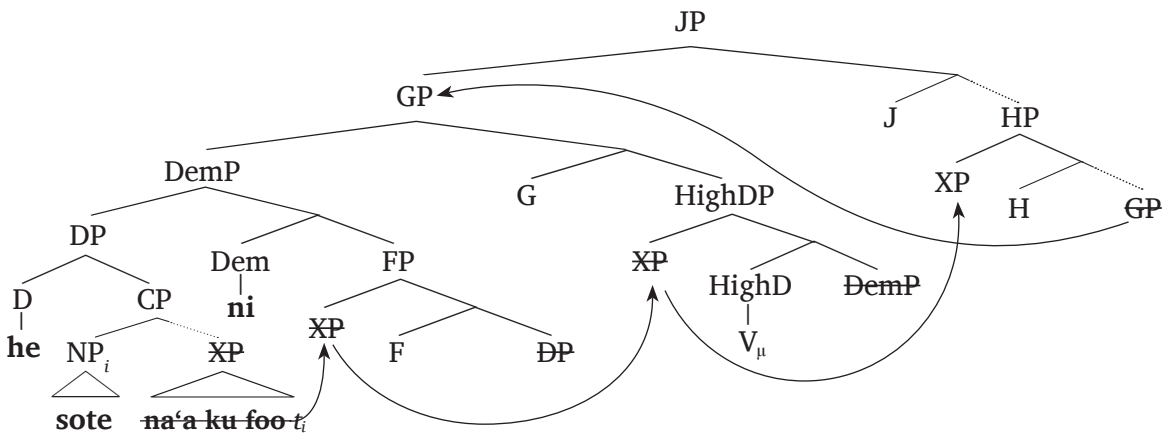
(70)



Here, the relative clause XP moves to FP, like the RC movement in (30). After this, the Dem attracts a DP to its specifier, not unlike the NP movement in (20). This DemP is the complement of the HighD, which will attract the relative clause XP to its specifier before the DemP gets attracted to a higher projection, GP. These movements are necessary so that the relative clause XP can form a constituent with the DefAcc. This constituency is required if the syntax governs the RC and DefAcc being able prosodically phrased as in (36e-f). Moreover, this also allows the DemP to be a constituent, allowing for it to be prosodically phrased as a unit as well.

In addition, there needs to be a way for the relative clause to *follow* the DefAcc. An optional extraposition-like movement would allow for this. To achieve extraposition under an Antisymmetric approach, two more projections are required. First, one is needed for the right-extraposed material to move to: HP. Second, the rest of the DP must move to the specifier of a higher phrase, JP, in order to linearly precede the extraposed RC.

(71)



The syntactic models in (70) and (71) are powerful in that they are compatible with a more direct mapping from syntactic phrases to prosodic phrases, such as Selkirk 2011's

MATCH theory. Moreover, this structure is perhaps more compatible with the semantic fact that the DefAcc has indexical properties, which are merged outside of the definiteness properties of the DP (as proposed by Abner & Burnett 2010).

However, the nature of the syntactic phrases needed for these models (i.e. FP, GP, HP and JP) remains unclear, as do the motivations for the additional movements. As such, these models would lose the independent support found for the analysis ultimately promoted in the body of this paper. Until the appropriate evidence for this alternative is found, I set these models aside for reasons of parsimony.

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