# Linearization at PF: Evidence from Malagasy Extraposition
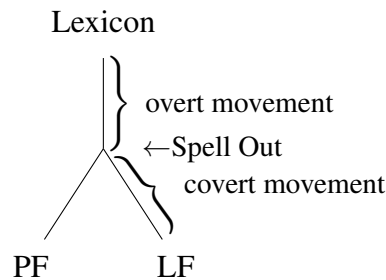
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## 1.     Introduction

Within the Y-model of grammar, (1), movement is widely believed to take place on two branches. OVERT MOVEMENT takes place before Spell Out and COVERT MOVEMENT takes place between Spell Out and LF:

(1)     *Y-Model*



Given that movement occurs on two of the three branches, this paper addresses the question of whether movement ever takes places on the third branch, between Spell Out and PF. We will call such movement PHONOLOGICAL/PF MOVEMENT. Precedents in the literature include Japanese prosodic scrambling (Agbayani et al. 2015), extraposition from NP in English (Göbbel 2007), and phenomena in Aoun & Benmamoun 1998 and Sauerland & Elbourne 2002. The goal of this paper is to argue for another instance of phonological movement, extraposition of CPs in the Austronesian language Malagasy.[1]

Basic word order in Malagasy is VOS, with direct objects obligatorily occurring before the clause-final subject, (2). An exception to this generalization is clausal objects, which cannot appear before the subject but must extrapose and appear after the subject, (3) (Keenan 1976). We will use the label CP EXTRAPOSITION (CPEX) as a theory-neutral term to describe the right-peripheral placement of such clauses.

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[1]Law 2007 first proposed that extraposition in Malagasy is PF movement. See Potsdam & Edmiston 2015 for further discussion.

(2)  Nividy    (fiara vaovao) Rabe (*fiara vaovao)
     PAST.buy car    new     Rabe  car   new
     'Rabe bought a new car.'

(3)  Manantena (*fa  hividy   fiara aho)    Rabe (fa  hividy   fiara aho)
     hope        that FUT.buy car  1SG.NOM Rabe that FUT.buy car  1SG.NOM
     'Rabe hopes that I will buy a car.'

Our proposal is that CPEX is PF movement. The displacement of the CP occurs outside of the narrow syntax, during the derivation between Spell Out and PF. In section 2 we describe the semantics of extraposition in Malagasy and show that CPEX has no semantic consequences and, in particular, does not have semantic characteristics of non-clausal extraposition. In section 3 we discuss the syntax of CPEX. We demonstrate that CPEX has no syntactic consequences either. The extraposed CP behaves as though it were in its base position throughout the narrow syntax. Section 4 claims that the movement is phonologically motivated and section 5 gives supporting evidence from certain "defective" CP structures.

## 2.    Semantics of extraposition

Word order in Malagasy can more generally be described as VO(X)S(X), where X is a wide range of non-clausal dependents, including PP complements and adverbials. We assume that the base position of these dependents is before the subject but that they can optionally undergo PHRASAL EXTRAPOSITION (EX) to a clause-final position. An example of optional PP extraposition is in (4).

(4)  Nametraka dite (teo ambonin' ny   latabatra) Rabe (teo ambonin' ny   latabatra)
     PAST.put   tea  LOC on       DET table      Rabe LOC on       DET table
     'Rabe put tea on the table.'

In cases such as this, there are semantic consequences to extraposition (Pearson 2001, Kalin 2009): Extraposed constituents are backgrounded, or presupposed. Due to the backgrounding function of EX, it is correctly predicted that new information such as wh-phrases, as in (5Q), and answers to questions, as in (5A), cannot be extraposed.

(5)   Q: Lasa nody        (oviana) Rabe (*oviana)?
         gone PAST.go.home when    Rabe    when
         'Rabe went home when?'

      A: Lasa  nody       (**omaly    hariva**) Rabe (#**omaly    hariva**)
         home PAST.go.home yesterday evening Rabe    yesterday evening
         'Rabe went home yesterday evening.'

CPEX behaves differently from EX. In contrast, CPEX does not background the extraposed CP and so extraposed CPs can serve as answers to wh-questions, (6). This is unsurprising given that CPEX is mandatory. If it backgrounded the CP, there would be no

way to assert the content of an embedded clause. Nonetheless, we take this as evidence that CPEX is semantically vacuous, in contrast to EX.

(6)     Q: Inona no   notenenin-dRabe      momba ahy?
           what  FOC PAST.say.PASS-Rabe about    1SG.ACC
           'What did Rabe say about me?'

        A: Niteny   (***fa   miasa tsara ianao**)    Rabe (**fa   miasa tsara ianao**)
           PAST.say    that work  well 2SG.NOM Rabe  that work  well 2SG.NOM
           'Rabe said that you work hard.'

## 3.     Syntax of CPEX

This section explores the syntax of CPEX in more detail. Section 3.1 presents some basic assumptions about Malagasy clause structure and proposes two derivations for CPEX examples. Sections 3.2 and 3.3 provide arguments showing that CPEX is syntactically vacuous; the CP behaves as though it had never moved from the complement position.

### 3.1    Malagasy clause structure

Malagasy clauses as in (7) have a bipartite structure consisting of a clause-initial predicate and a clause-final subject. There is significant evidence for this constituency, which we do not repeat here (see Keenan 1976, 1995).

(7)     [Hamaky ilay  boky] [ny  mpianatra rehetra]
        FUT.read DEM book  DET student     all
        'All the students will read that book.'

We adopt a PREDICATE FRONTING analysis of this VOXS word order, as shown below (see Rackowski & Travis 2000, Pearson 2001, and others). The base order is SVO, established within a projection that we label simply YP. The subject occupies the specifier of YP and the predicate (PredP) is the complement of the head Y. PredP then undergoes leftward movement to the specifier of a higher projection, FP. We assume that PredP reconstructs to its base position at LF (Potsdam 2007).

(8)
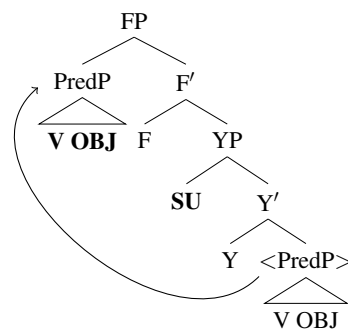
Given this basic derivation, we propose two ways in which a CP complement could extrapose to the clause-final position. In the first analysis, SYNTACTIC EXTRAPOSITION, the CP moves in the narrow syntax, before Spell Out. This is illustrated in the tree in (9). When the predicate is still in its base position, the CP moves leftward to a position outside of the predicate. PredP then undergoes predicate fronting as part of the derivation of VOS, as discussed above. In the second analysis, PF MOVEMENT, the CP remains *in situ* throughout the narrow syntax. The rightward position of the CP is determined later, during the derivation to PF, as shown in (10).
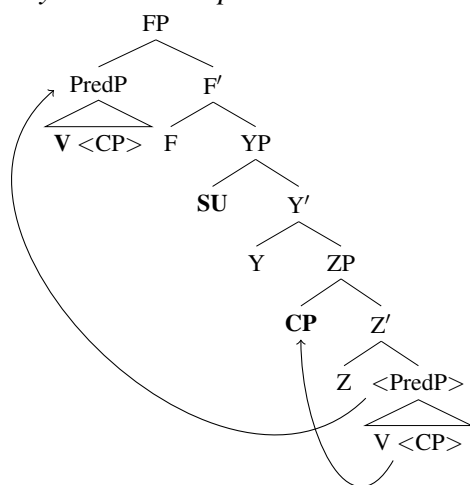
(9)     *Syntactic Extraposition*           (10)     *PF Movement*
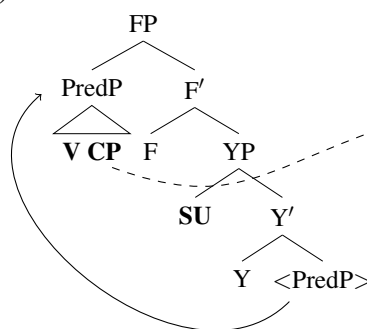


## 3.2    "Reconstruction" arguments

This section presents arguments in support of the claim, first made in Law 2007, that extraposed CPs are in their base, complement position at some point in the narrow syntax derivation. Under the Syntactic Extraposition analysis, the CP reconstructs to its base position after Spell Out. For the purposes of the discussion, it is not important how Reconstruction is formally modeled, only that the CP is able to end up back in the complement position at LF. Under the PF Movement analysis, the facts are accounted for because the CP is always in its base position in the narrow syntax. These facts are compatible with both the Syntactic Extraposition and PF Movement analyses and do not serve to distinguish them. They nonetheless show that such analyses are on the right track.

### 3.2.1   Variable binding

As a number of researchers have noted (Zribi-Hertz & Mbolatianavalona 1999, Law 2007), an extraposed CP can contain a pronoun bound by the matrix subject or object. In (11), the quantified object in the fronted predicate binds a pronominal variable inside the extraposed CP. On the assumption that variable binding requires c-command, the quantified noun phrase does not c-command into the CP unless the CP is inside the predicate at some

point. It either reconstructs there, as in the Syntactic Extraposition analysis, or it is there throughout the narrow syntax derivation, as in the PF Movement analysis.

(11)  Niteny    tamin' ny   zaza tsirairay$_i$ aho **fa   nidera azy$_i$ Rasoa**
      PAST.say PREP   DET child each      1SG that praise  3SG Rasoa

      'I told each child$_i$ that Rasoa praised him$_i$.'

### 3.2.2  Binding Principles

Binding Principles also support the claim that the CP is in its base position at some point (Law 2007). Binding Principle C in particular requires that R-expressions, such as names, be free everywhere. An R-expression inside an extraposed CP can trigger a Principle C violation with respect to the matrix subject or object. In (12a), the name *Rabe* inside the CP cannot be coindexed with the object. The reverse order, (12b), is fine with coreference.

(12)  a.  Nampahatsiahy azy$_{*i,k}$ aho **fa   efa  nahita    an-dRabe$_i$ Rasoa**
          PAST.remind    3SG   1SG that PFV PAST.see ACC-Rabe  Rasoa

          'I reminded him$_i$ that Rasoa already saw Rabe$_{*i,k}$.'

      b.  Nampahatsiahy an-dRabe$_i$ aho **fa   efa  nahita    azy$_{i,k}$ Rasoa**
          PAST.remind    ACC-Rabe 1SG that PFV PAST.see 3SG   Rasoa

          'I reminded Rabe$_i$ that Rasoa already saw him$_{i,k}$.'

Such facts are easily explained if the CP must be inside the predicate at some point so that the R-expression can trigger a Principle C violation.

### 3.2.3  Subextraction

The final piece of evidence indicating that the CP must be in its base position at some point comes from subextraction. The observation is that extraposed CPs are not islands to extraction (Law 2007). (13) is a long-distance adjunct question, with the wh-phrase *rahoviana* 'when' originating inside the extraposed CP. The embedded interpretation is forced by the morphology: The wh-phrase *rahoviana* 'when.FUT' is marked for future tense; however, the matrix verb is in the present tense. Thus, the wh-phrase can only correspond to the embedded clause, which is also in the future tense.

(13)  Rahoviana$_i$ no   mihevitra  Rabe [**fa hividy   fiara t$_i$ Rasoa**]?
      when.FUT   FOC PRES.think Rabe that FUT.buy car      Rasoa

      'When does Rabe think that Rasoa will buy a car?'

The challenge that (13) poses is that the extraposed CP appears to be in a derived position and extraction from this position should violate some version of Huang's (1982) Condition on Extraction Domains (CED), which prohibits extraction from a phrase that is not properly

governed. Instead, the example can be accounted for by assuming that movement is taking place from the CP when it is still in a predicate-internal position.[2]

## 3.3    Non-movement arguments

This section presents data distinguishing Syntactic Extraposition from PF Movement. Two arguments show that extraposed CPs have not moved at all in the syntax and are in fact in their base position at Spell Out, in support of the PF Movement analysis.

### 3.3.1   NPI licensing

The first argument, from Negative Polarity Item (NPI) licensing, relies on two assumptions. First, NPIs must be in the scope of negation to be licensed and, second, this must occur at surface structure (Spell Out). NPIs are not licensed at LF (Lasnik 1972, Merchant 2000, and others). The English examples in (14) support these assumptions. In particular, (14b, c) show that NPIs must be c-commanded by negation at surface structure. They cannot be licensed by reconstruction after Spell Out.

(14)    a.    I don't believe that he is sick *at all*.

      b.    *That he is sick *at all* wasn't believed (by anyone).

      c.    *That he is sick *at all*, I don't believe.

(15) shows that an NPI is licensed in an extraposed CP in Malagasy. Only the PF Movement analysis correctly predicts that the NPI is allowed in (15). Under the Syntactic Extraposition analysis, (15) should be ungrammatical. To see this, we need to know more about the position of negation in Malagasy and to look at the structures under the two hypotheses.

(15)    *Tsy* mino    aho    **fa**  **marary** *velively* **izy**
       NEG believe 1SG.NOM that sick    at.all   3SG.NOM
       'I don't believe that he's sick at all.'

    Negation in Malagasy is a preverbal particle *tsy*. Two pieces of evidence indicate that it is inside the fronted predicate and cannot scope outside of this constituent. First, Paul (2005) shows that subject NPIs are disallowed, unless licensed by genericity or modality. They are not licensed by negation, (16).

(16)    *Tsy   nanongo    an'   i Koto n'iza n'iza
       NEG PAST.pinch ACC Koto   anyone
       ('No one pinched Koto.')                                        (Paul 2005:363, (13a))

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[2]The argument is weakened by the claim (van Urk & Richards 2015) that clausal extraposition generally does not block, and sometimes feeds, subextraction. Law 2007:778 gives the following relative clause to illustrate: *the man Op$_i$ that John said yesterday [that Mary kissed t$_i$].*
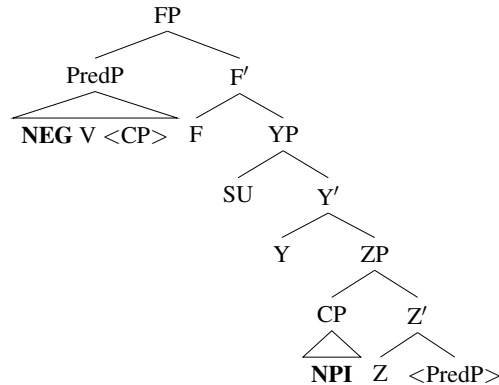
Second, coordination facts show that negation forms a constituent with the verb, (17). This indicates that it is inside the PredP constituent that undergoes predicate fronting and does not c-command outside that constituent at Spell Out.

(17)  [[Tsy  mety] sy  [tsy  mifanaraka amin' ny  lalana]] ny  ataony
        NEG ok    and NEG agree      with  DET law    DET do.PASS.3SG
      'What he does is wrong and does not follow the law.'

Under the Syntactic Extraposition analysis, the surface structure of (15) is (18) and the NPI is not licensed, as it is not c-commanded by negation. Under the PF Movement analysis, the surface structure for (15) is (19). Because the CP is in its base position, the NPI is licensed. Thus, only the PF Movement analysis accounts for NPI licensing in extraposed CPs.

(18)  *Syntactic Extraposition*          (19)  *PF Movement*
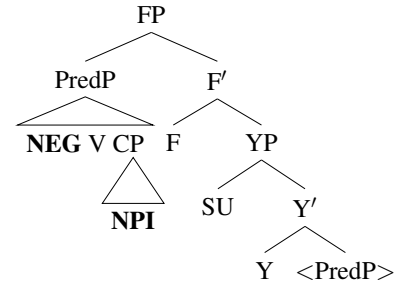


### 3.3.2  Islands

The second argument for PF Movement comes from islands. Malagasy is well-known for its strict restrictions on extraction: only matrix subjects and some adjuncts can be questioned with fronting (Keenan 1976, 1995, a.o.), (20a, b). Objects and constituents inside objects cannot be questioned in this way, (20c, d). Observationally, objects are islands.

(20)  a.  Iza  no  hividy  boky?          b.  Rahoviana no  hividy    boky Rabe?
          who FOC FUT.buy book               when.FUT  FOC FUT.buy book Rabe
          'Who will buy a book?'             'When will Rabe buy a book?'

      c.  *Inona no  hividy   Rabe?
          what  FOC FUT.buy Rabe
          ('What will Rabe buy?')

      d.  *(Momba) Inona no   hividy    boky (momba) Rabe?
          about       what FOC FUT.buy book about     Rabe
          ('What will Rabe buy a book about?')

Nonetheless, CPs can, and must, move from within a complex object, such as a noun like *faniriana* 'desire' that takes a CP complement, (21). Extraposition cannot be syntactic if it freely violates constraints on movement. This argues in favor of PF Movement.

(21)  Nanambara *ny   fanirian-dRabe* (*fa  hanambady ny  faravaviny   aho*)
      PAST.reveal DET desire-Rabe      that FUT.marry   DET daughter.3SG 1SG.NOM
      Rasoa (*fa  hanambady ny  faravaviny   aho*)
      Rasoa  that FUT.marry   DET daughter.3SG 1SG.NOM
      'Rasoa revealed Rabe's desire that I marry his daughter.'

## 4.     Prosodic motivation

The previous section argued that CPEX in Malagasy is PF Movement, taking place on the branch of the derivation from Spell Out to PF. In this section, we propose that, in line with this conclusion, CPEX is prosodically-motivated. Section 4.1 first introduces a current view of the syntax-prosody interface (Match Theory) and a brief picture of Malagasy prosody. Section 4.2 then shows how these assumptions motivate PF Movement of the CP.

### 4.1     Match Theory and Malagasy prosody

Match Theory (Selkirk 2011, Elfner 2012) is a theory of how prosodic structure is built from syntactic representations. It assumes a hierarchy of prosodic constituents in (22) and Match principles in (23).
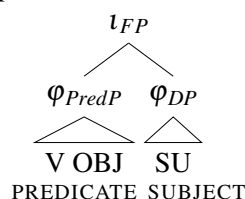
(22)   Intonational Phrase ($\iota$) > Phonological Phrase ($\varphi$) > Phonological Word ($\omega$)

(23)   a.    Match Clause: an intonational phrase ($\iota$) corresponds to a clause (highest node in the extended projection of TP)

       b.    Match Phrase: a phonological phrase ($\varphi$) corresponds to a syntactic phrase (maximal projection)

       c.    Match Word: a prosodic word ($\omega$) corresponds to a head

Given Malagasy clause structure repeated in (24), the Match principles yield (25). The highest clausal node, FP, maps to an intonational phrase, while each non-clausal phrase maps to a phonological phrase. Intermediate X′ projections in the syntax do not correspond to any node in the prosodic structure, which is consequently flat in comparison.
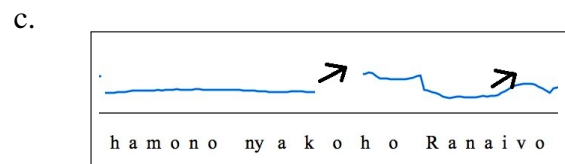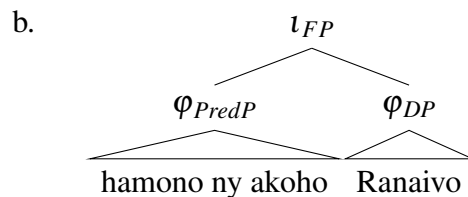
(24)   *syntactic structure*
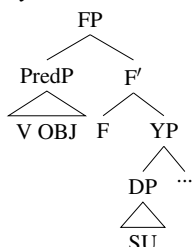
(25)   *prosodic structure*

This prosodic structure accords well with descriptions of Malagasy intonation (Rafitoson 1980, Raoniarisoa 1990, and Frascarelli 2010), which indicate that the clause is composed of two phonological phrases corresponding to the predicate and the subject. These phrases are demarcated by a primary rising tone on the last word of the predicate and a secondary rising tone on the last word of the subject. (26) gives a concrete example. (26a) is a simple VOS clause and (26b) illustrates the prosodic structure. The rising tones at the ends of the phonological phrases can be seen in the pitch track in (26c).

(26)  a.  [$_{Pred}$ Hamono ny   akoho] [$_{Subj}$ Ranaivo]
          FUT.kill  DET chicken          Ranaivo

   'Ranaivo will kill the chicken.'
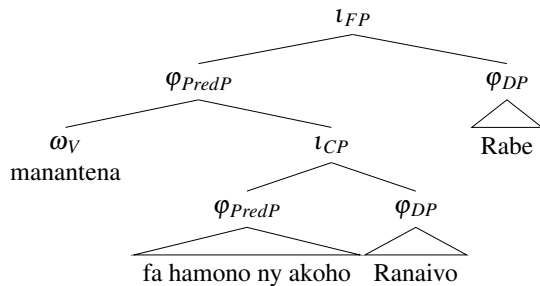
   b.


   c.


## 4.2   Why CPs extrapose

We can now proceed to explain why CPs must extrapose. Consider the ungrammatical example in (27b) in which CPEX has not applied. Its syntactic structure is (28a). The corresponding prosodic structure based on the Match principles is (28b).[3]

(27)  a.  Manantena Rabe [**fa  hamono ny   akoho   Ranaivo**]
          hope        Rabe that FUT.kill  DET chicken Ranaivo

   'Rabe hopes that Ranavio will kill the chicken.'

   b.  *Manantena [**fa  hamono ny   akoho   Ranaivo**] Rabe
          hope        that FUT.kill  DET chicken Ranaivo   Rabe

(28)  a.


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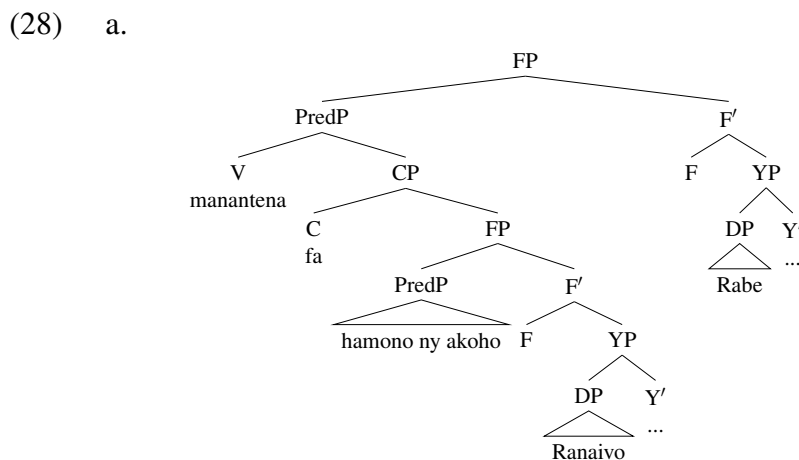
[3]The complementizer *fa* is a functional element that, we assume, does not form a prosodic word on its own. We show it combining with the prosodic phrase to its right.

b.

```
                                    ιFP
                     φPredP                      φDP
              ωV              ιCP                Rabe
           manantena
                        φPredP        φDP
                   fa hamono ny akoho   Ranaivo
```

This prosodic structure violates a central well-formedness constraint on prosody stated in (29). Layeredness (Selkirk 1996, Féry 2015, Bennett et al. 2016) prohibits a prosodic constituent from containing another prosodic constituent that is higher than it on the prosodic hierarchy in (22).

(29)   *Layeredness*
       A prosodic constituent of type n may not contain a constituent that is higher on the prosodic hierarchy
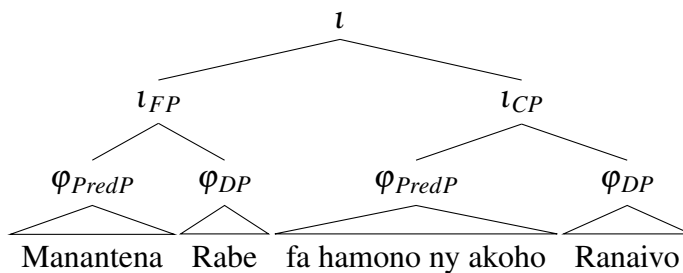
In order to avoid this Layeredness violation, PF provides a displacement operation, which we call PF Extraposition (PFEX), that obviates the problem:

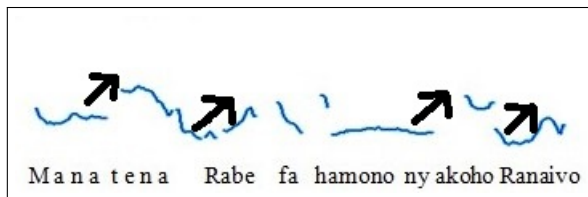(30)   *PF Extraposition* (PFEX)
       Right adjoin a prosodic constituent to the root node

   When PFEX applies, it creates the prosodic structure in (31a), which corresponds to the grammatical example with CPEX in (27a). A pitch track confirming the predicted prosody is shown in (31b). One can see the rising tones signalling the four phonological phrases.

(31)   a.

```
                                ι
                 ιFP                         ιCP
         φPredP       φDP          φPredP           φDP
       Manantena    Rabe      fa hamono ny akoho   Ranaivo
```

   b.



PFEX takes place on the branch from Spell Out to PF in (1), not in the narrow syntax. It thus has no semantic or syntactic consequences, as we showed in sections 2 and 3.

## 5. Supporting evidence: Degenerate CPs

This section provides further evidence that CPEX is prosodically-driven. The analysis in section 4.2 claims that PFEX is driven by a Layeredness violation. If a CP complement in the structure did not violate Layeredness, the expectation from our analysis is that it should not need to extrapose. This is correct for cases involving what we call DEGENERATE CPS. These are CPs that consist of only a single phonological phrase and they include controlled clauses, (32), CPs with Topic Drop, (33), existential clauses, (34), and subject relative clauses, (35). CPEX is indeed optional in these cases.

(32) Manantena (**hianatra teny anglisy *PRO***) Rabe (**hianatra teny anglisy *PRO***)
  hope    FUT.learn word English    Rabe FUT.learn word English
  'Rabe hopes to learn English.'

(33) Milaza (**fa nahita  gidro tany an-tsena  *Ø***) Rabe (**fa nahita  gidro**
  say   that PAST.saw lemur LOC PREP-market   Rabe that PAST.saw lemur
  **tany an-tsena  *Ø***)
  LOC PREP-market
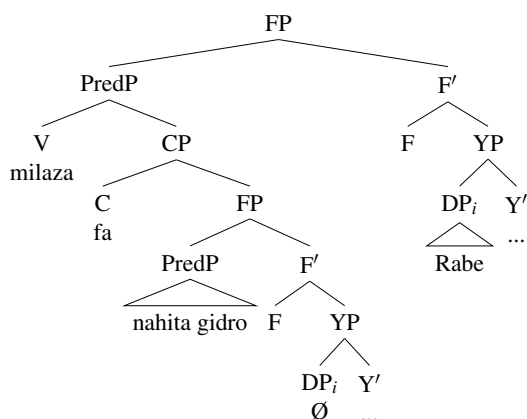  'Rabe says that he (Rabe) saw a lemur at the market.'

(34) Milaza (**fa misy gidro any an-tsena  *expl***) Rabe (**fa misy gidro any**
  say   that exist lemur LOC PREP-market   Rabe that exist lemur LOC
  **an-tsena  *expl***)
  PREP-market
  'Rabe says that there are lemurs at the market.'

(35) Manana alika roa (**izay tsy  mivovo mihitsy**) Rabe (**izay tsy  mivovo mihitsy**)
  have   dog two REL NEG bark   at.all   Rabe REL NEG bark   at.all
  'Rabe has two dogs that don't bark at all.'

Lacking a subject, all of these embedded clauses consist of only a single phonological phrase corresponding to the predicate. We claim that this is a non-optimal prosodic structure. In optimizing the structure, the repair will also eliminate the Layeredness violation. For concreteness, we develop our proposal using the Topic Drop example in (33).

The syntactic structure of (33) without CPEX is given in (36a). The construction is discussed in Potsdam & Polinsky 2007. The relevant characteristic is that the subject is null, which we represent by Ø, and coindexed with the subject of the higher clause. The Match principles yield the prosodic structure in (36b).

(36)   a.

```
                        FP
           ┌────────────┴────────────┐
         PredP                       F′
      ┌────┴────┐                 ┌───┴───┐
      V        CP                 F       YP
   milaza   ┌───┴───┐                  ┌───┴───┐
            C       FP               DPᵢ        Y′
            fa   ┌───┴───┐           Rabe       …
               PredP     F′
            ┌────┴──┐  ┌──┴──┐
       nahita gidro  F      YP
                         ┌───┴──┐
                        DPᵢ     Y′
                         Ø      …
```

b.

```
                ιFP
          ┌──────┴──────┐
       φPredP          φDP
      ┌───┴───┐        Rabe
     ωV      ιCP
   milaza     │
            φPredP
          fa nahita gidro
```
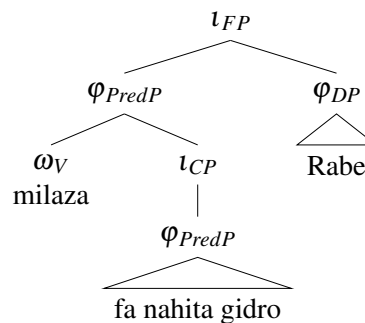
This structure still violates Layeredness and, in addition, the embedded intonational phrase violates the principle of Binarity (Inkelas & Zec 1990, Ito & Mester 1992, Selkirk 2000) in (37).

(37)   *Binarity*
       Optimal prosodic constituents are binary branching

We propose that the phonology makes available a repair mechanism to eliminate the Binarity violation. Féry 2015:32 calls this repair Prosodic Downgrading. An intonational phrase that dominates only a single phonological phrase is eliminated:

(38)   *Prosodic Downgrading*

$$\begin{matrix} \iota \\ | \\ \varphi \end{matrix} \quad \rightarrow \quad \varphi$$
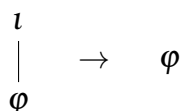
Prosodic Downgrading is a response to a non-optimal unary branching prosodic structure. Malagasy clauses are preferentially two $\varphi$-phrases (predicate and subject). Following Prosodic Downgrading, the prosodic structure is (39b).

(39)   a.   Milaza [**fa  nahita    gidro tany an-tsena    Ø**] Rabe
            say    that PAST.saw lemur LOC PREP-market    Rabe
            'Rabe says that he (Rabe) saw a lemur at the market.'

       b.
```
                ιFP
          ┌──────┴──────┐
       φPredP          φDP
      ┌───┴───┐        Rabe
     ωV      φCP
   milaza  fa nahita gidro
```
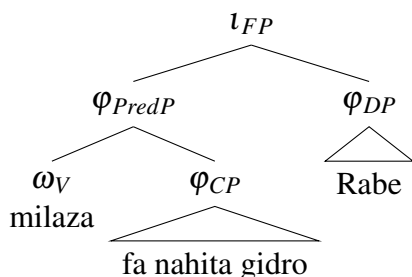
This structure violates neither Binarity nor Layeredess. As such, PFEX is not required. Degenerate CPs, such as clauses containing Topic Drop, do not obligatorily extrapose because they are prosodically deficient and trigger prosodic adjustments that obviate the Layeredness violation that embedded CPs ordinarily trigger and which forces extraposition.

## 6.     Conclusion

This paper provided an analysis of obligatory extraposition of CPs in Malagasy. We argued that the displacement operation applies between Spell Out and PF and is thus an instance of PF Movement. This correctly predicts that it has no semantic or syntactic consequences and is phonologically driven. In particular, we argued that it is motivated by a violation of Layeredness, a constraint against embedding larger prosodic constituents inside smaller ones. Extraposition eliminates this ill-formed structure. We supported our analysis with cases in which extraposition is not required because a Layeredness violation is obviated by another prosodic repair mechanism.

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