Pied-piping and Swiping

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Pied-piping in Chol (Coon 2007) and swiping in English (and Northern Germanic, Merchant (2001)) both involve fronting of a minimal *wh*-element in the pied-piped wh-phrase, therefore it is tempting to analyse both constructions in the same way. In this paper I discuss (possible) analyses of these phenomena and resulting problems for such a unified treatment.

1 The Patterns

As shown in (1), a non-*wh* possessor in Chol obligatorily follows the possessum, which agrees with the possessor by a prefix glossed as A3. *wh*-words, on the other hand, must undergo *wh*-movement to SpecC. Unlike in the case of subjects and adjuncts, out of which *wh*-elements may not be extracted (Coon 2007:166), a *wh*-possessor inside the internal argument of the predicate may either extract out of the possessive phrase, as in (2a), or pied-pipe the possessum, as in (2b-c). In the pied-piping construction, however, as the contrast between (2b) and (2c) shows, the *wh*-possessor must precede the possessum, unlike a non-*wh* possessor as in (1), which must follow the possessum.

(1) Non-*wh* possessors

a.	Tyi	yajl-i	[i-plato	aj-Maria]
	PRFV	fall-ITV	A3-plate	CL-Maria
b.	*Tyi	yajl-i	[aj-Maria	i-plato]
	PRFV	fall-ITV	CL-Maria	A3-plate

'Maria's plate fell'

(2) *wh*-possessors

a.	Maxki$_i$	tyi	yajl-i	[i-plato	t_i]
	who	PRFV	fall-ITV	A3-plate	
b.	[Maxki	i-plato]$_i$	tyi	yajl-i	t_i
	who	A3-plate	PRFV	fall-ITV	
c.	*[I-plato	maxki]$_i$	tyi	yajl-i	t_i

A3-plate who PRFV fall-ITV

In recursive possession constructions, the base-generated non-*wh* structure of which is represented schematically in (3) and in a natural-language example in (4), the *wh*-possessor, if it does not extract out of the DP and then move to SpecC, as in (5a), may either pied-pipe the possessum it directly relates to, as in (5b), or the entire DP may undergo pied-piping, as in (5c). Regardless of whether one or both possessed nouns undergo pied-piping, the *wh*-possessor, in contrast to a non-*wh* possessor as in (4), must precede the possessed noun(s).

(3) [$_{\text{possessum}}$ possessum [$_{\text{possessor}}$ possessum possessor]]

(4) Non-*wh* possessor recursion in Chol

Tyi yajl-i [i-plato [i-ts'i aj-Maria]]

PRFV fall-ITV A3-plate A3-dog CL-Maria

'Maria's dog's plate fell.'

(5) *wh*-possessor recursion in Chol

(6) a. Maxki$_3$ tyi yajl-i [$_{\text{DP}}$ i-plato i-ts'i t$_3$]

who PRFV fall-ITV A3-plate A3-dog

b. [$_{\text{DP}}$ Maxki i-ts'i]$_2$ tyi yajl-i [$_{\text{DP}}$ i-plato t$_2$]$_1$

who A3-plate PRFV fall-ITV a3-plate

c. [$_{\text{DP}}$ Maxki i-plato i-ts'i]$_1$ tyi yajl-i t$_1$

who A3-plate A3-dog PRFV fall-ITV

d. *[$_{\text{DP}}$ [$_{\text{DP}}$ Maxki i-ts'i]$_2$ i-plato t$_2$]$_1$ tyi yajl-i t$_1$

who A3-dog A3-plate PRFV fall-ITV

This pattern resembles that of swiping, i.e. inversion of *wh*-words and prepositions in the context of sluicing. Sluicing, as illustrated in (6a-b), is "an ellipsis phenomenon in which the sentential portion of a constituent question is elided, leaving only a *wh*-phrase remnant" (Merchant 2006).

(7) Sluicing

a. She bought a robe, but God knows for who(m).
b. She bought a robe for one of her nephews, but God knows for which (one).

Following Merchant (2001), I will take sluicing to be the result of *wh*-movement to SpecC, followed by deletion of TP triggered by an E-feature on C, i.e., by $C_{[E]}$ (but see Merchant (2006) for arguments against a movement account for sluicing). If the remnant *wh*-phrase in SpecC involves a pied-piped preposition, that preposition and the *wh*-word can optionally undergo inversion in English (and in Northern Germanic languages, see Merchant (2001)). As the contrast in (7a-b) shows, only minimal *wh*-elements can be fronted. In regular *wh*-clauses, on the other hand, *wh*-phrase inversion is not possible even with minimal *wh*-elements, as shown in (8):

(8) Swiping
   a. She bought a robe, but God knows who(m) for.
   b. *She bought a robe for one of her nephews, but God knows which (one) for.

(9) Standard *wh*-clauses
   a. *I don't know [whom for] you bought the robe.
   b. I don't know [for whom] you bought the robe.
   c. *I don't know [which nephew for] you bought a robe.
   d. I don't know [for which nephew] you bought a robe.

What pied-piping in Chol and swiping in English (which, following Merchant (2001), also implies pied-piping, namely of a PP) have in common is that a minimal *wh*-element moves to the left edge of the pied-piped *wh*-phrase. Now the question arises if this leftward movement should be analysed in the same way in both constructions. However, a unified treatment of these patterns is not entirely unproblematic, given their distribution: While fronting of a minimal *wh*-word applies obligatorily in every pied-piping construction in Chol, it is optional and limited to sluicing contexts in English – as (8) shows, it is ungrammatical in standard *wh*-clauses.

2 Existing analyses of pied-piping

Coon (2007) proposes an analysis of pied-piping involving a functional head Q independently argued for by Cable (2007) based on evidence from Tlingit (Na-Dene). To account for all three configurations in (5a), (5b) and (5c), Coon assumes that in Chol, this functional head Q can be merged with the *wh*-possessor, as in (5a), with DP_2, as in (5b), or with DP_1, as in (5c). When merged with DP_2 or DP_1, the Q head attracts the minimal *wh*-element, i.e. the *wh*-possessor, to its specifier, yielding a maximal projection QP, which subsequently moves to SpecC.

Crucially, in Coon's (2007) analysis, fronting of the minimal *wh*-element takes place *before* pied-piping. Therefore, if applied to the swiping configuration in English, the analysis predicts swiping to occur not only in sluicing contexts but also in standard *wh*-clauses. However, as

shown in (6), in English, fronting of a minimal *wh*-element is ungrammatical in standard-*wh*-clauses and may only occur in sluicing contexts. Recall further that sluicing, following Merchant's (2001) analysis, implies pied-piping of an XP to SpecC and subsequent deletion of the TP by an E-feature on C. This means that, unless one wants to assume look-ahead, swiping can only take place *after* pied-piping has applied.

Heck (2009) argues that pied-piping is repair-driven rather than feature-driven and results from the ranking of a gradient constraint requiring locality of Agree and constraints on movement. He adopts the Strict Cycle Condition (SCC) adapted from Chomsky (1973), represented in (9), as well as a version of Huang's (1982) Condition on extraction domains (CED) which states that any XP that it is not a complement is an island for movement.

(10) Strict Cycle Condition (SCC): No operation can apply to a cyclic domain δ in such a way as to affect solely a proper sub-domain of δ that is also cyclic.

(11) Condition on Extraction Domains (CED): Movement must not cross a barrier. An XP is a barrier iff it is not a complement.

Chomsky's (1995:228) assumption that all movement must be driven by the need to check certain features is implemented via a Feature Condition (FC), which ensures a probe is eliminated via checking/Agree with a matching goal, and Last Resort (LR), a constraint banning unmotivated movement by requiring movement to be feature-driven, specifically by a feature [wh] in the case of wh-movement. Heck (2009) furthermore proposes a violable constraint represented in (11) which requires the distance between probe and goal to be minimal and therefore triggers movement of a *wh*-phrase to SpecC in the presence of a *wh*-probe on C. The notion of an active probe, on which the definition of LA in (11) relies, is defined in (12). Note that (11) is assumed to be a gradient constraint: The more phrase boundaries intervene between probe and goal, the more violations are assigned to LA.

(12) Local Agree: If goal γ in Σ matches active probe β, then no XP dominates γ but not β.

(13) Active Probe: A probe β is active iff a. or b. hold.
   a. β is part of Σ.
   b. β is a single in the numeration.

Given these assumptions, a *wh*-phrase, be it minimal (like *who*) or not (as in a possessive *wh*-phrase like *whose dog*) first moves to SpecT to check the EPP feature on T. In a next step, when C is merged, a minimal *wh*-phrase moves to SpecC to check the [wh] feature on C. Being

minimal, the *wh*-phrase checks both the EPP feature and the [wh] feature under sisterhood, so LA is not violated. If the *wh*-phrase is not minimal, as in *whose dog*, it can match the probe on T and check the [EPP] feature under sisterhood, as the probe on T probes for any DP. In the next step, however, when C is merged and the [wh] feature on C needs to be checked, moving a non-minimal *wh*-phrase like *whose dog* to SpecC violates LA, as a DP boundary intervenes between the probe on C and the minimal *wh*-element. However, extracting *whose* from *whose dog* violates the Left Branch Condition (Ross 1967), according to which the leftmost item of an XP cannot be moved out of that XP. Moreover, as *whose dog* has been previously moved to the specifier of T, extracting *whose* would violate the CED in (10), which bans extraction out of non-complements. Ranking LBC and CED higher than LA thus yields pied-piping of *whose dog* to SpecC.

Recursive possession structures as in (5b-c) are derived via LA-driven movement of the *wh*-possessor either to the specifier of the complete DP_1, which results in pied-piping of DP_1, as in (5c), or to the specifier of the embedded DP_2, as in (5b). In both (5b) and (5c), the pied-piper is in the specifier of the topmost moved DP, incurring only one LA violation (as only one DP boundary intervenes), whereas pied-piping of recursive specifiers, as in (5d), would result in one additional LA violation per embedding.

Like Coon's (2007) approach, Heck's (2009) analysis relies on the assumption that fronting of the minimal *wh*-element takes place *before* pied-piping and is therefore not applicable to swiping. As mentioned above, LA is responsible for both pied-piping and minimal *wh*-fronting in pied-piping contexts, and the order of these operations follows from LA being relevant even if the probe is not yet present in the syntactic structure as long as it is present in the numeration, as well as a tacitly assumed version of the Earliness Principle (cf. e.g. Pesetsky 1989), which requires any operation X to be carried out as soon as the structural description for X to apply is given. In this case, as soon as the *wh*-phrase to be pied-piped is built, provided that there is a *wh*-probe in the numeration, the structural description for LA-driven operations is given under the assumption of (11b). Now one of the LA-driven operations relevant here, namely pied-piping to the specifier of the head containing the *wh*-probe, cannot yet apply as the head is not yet present in the syntactic structure, therefore the other relevant operation, movement of the minimal *wh*-element to the specifier of the respective XP, must take place. Note that this ordering also follows from the Strict Cycle Condition (SCC, represented in (9)): When pied-piping to SpecC takes place, the current cyclic domain δ must be CP, of which the pied-piped XP is a proper subdomain. Subsequent movement within that XP would therefore affect solely a proper subdomain of δ and violate SCC. If one abandons the analysis of minimal *wh*-fronting

as movement within the pied-piped XP and instead assumes it to involve movement from the pied-piped XP to an outer SpecC, one still runs into problems. Movement to an outer SpecC would imply an additional C' projection intervening between the minimal *wh*-element and the probe on C, and thus possibly incur an additional LA violation, and even if one assumes that X-bar projections do not count as interveners between probe and goal for LA, movement to an outer specifier is still ruled out because it would imply extracting a *wh*-element out of SpecC. This violates the Condition on Extraction Domains (CED, represented in (10)). As has been discussed earlier in this section, in Heck's (2009) analysis, pied-piping follows from CED (and Left Branch Condition) outranking LA, and the observation made by Coon (2007) that Chol does not permit extraction from subjects nor adjuncts independently suggests that CED is ranked higher than LA in Mayan. Lastly, ranking LA higher than the CED would not even solve the problem, as the order of minimal *wh*-fronting and pied-piping in Heck's (2009) approach follows, independently from all the considerations listed above, from the crucial assumption that both operations are driven by the need to check one and the same [wh] feature on one and the same probe. Given this assumption, if pied-piping applied first, it would already check the [wh] feature, thus bleeding further LA-driven movement of the minimal *wh*-phrase. However, as has been argued above, the fact that minimal *wh*-fronting in English is restricted to sluicing contexts suggests that, unless one assumes lookahead, it must take place *after* pied-piping.

3 Possible analyses of swiping

As neither of the analyses for pied-piping in Mayan discussed above are applicable to swiping in English, the question arises what an analysis for swiping should look like. Given the assumption that sluicing implies pied-piping to SpecC and subsequent deletion of TP by an E-feature on C (following Merchant 2001), the fact that swiping is restricted to sluicing contexts suggests that it takes place after sluicing and involves either movement within the pied-piped XP, in violation SCC, or movement out of the pied-piped XP in SpecC to an outer specifier of C, in violation of the CED. In either case, swiping violates a constraint on movement independently argued for. This suggests that an optimality-theoretic approach to swiping is most suitable. Following Müller (e.g. 2020 for morphology) in assuming that the SCC is inviolable, I will here disregard the first option involving XP-internal movement, and focus on the second option involving extraction out of SpecC, which can be implemented in an optimality-theoretic account via a low-ranked CED. The question that remains to be answered is which constraint outranks the CED and thus triggers swiping, since, as I have shown above, LA-driven swiping is counterfed by previous checking of the [wh] feature relevant for LA by

pied-piping, and postulating an additional feature responsible for swiping, for example by enrichment, would give rise to a lookahead problem. This, alongside the restricted distribution of swiping, suggests that it is repair-driven rather than feature-driven. So what could repair-driven movement arise from? One possibility[1], which I will consider here, is that there is a constraint on the *alignment* of a minimal *wh*-element that, if ranked sufficiently high, leads to fronting of that *wh*-element, in analogy to alignment-driven morphological movement as proposed in Müller (2020).

(14) Possible alignment constraints
   a. L ⇦ *wh*-min: Assign 1 violation for every element that intervenes between the left edge of a CP and a minimal *wh*-element.
   b. **wh*-min ⇨ R: Assign violation for a minimal wh-element that is aligned with the right edge of a CP.
   c. **wh*-min ⇨ $C_{[E]}$: Assign violation for a minimal wh-element that is aligned with a head bearing an E feature.

The most straightforward way to implement alignment-driven leftward movement is via a constraint requiring a minimal wh-element to be aligned with the left edge of a CP, as in (13a) (I adopt Trommer's (2001) and Müller's (2020) notation of ⇦ for left-alignment and ⇨ for right-alignment). As swiping is optional, two rankings of L ⇦ *wh*-min and the CED must be simultaneously available to English speakers such that (6a) and (7a) emerge from the same candidate set, each under one ranking. To derive swiping, L ⇦ *wh*-min must be ranked higher than the CED. As (14a-b) show, this ranking makes correct predictions for swiping: it yields fronting of the minimal *wh*-element *who* but rules out fronting of the non-minimal wh-element *which one*. The reverse ranking, where the CED outranks L ⇦ *wh*-min, correctly rules out

[1] As an anonymous reviewer points out, Heck & Müller (2000, 2007) derive repair-driven *wh*-fronting via a constraint WH-RECOVERABILITY which requires any *wh*-phrase to be at the edge of a phase marked by an E-feature. In the original version in Heck & Müller (2000, 2007), this constraint is satisfied if the *wh*-phrase is *in the edge domain* of an *[E]*-marked phase, i.e. *not dominated by an [E]-marked category*, which is the case if the *wh*-element is inside an XP that is in SpecC. This version does not derive swiping. A modified version of the constraint requiring (minimal) *wh*-elements to be immediately at the left edge of an *[E]*-marked phase would predict swiping correctly if ranked variably wrt the CED but would not derive *wh*-fronting in Chol which takes place in contexts that do not involve sluicing. For the cases at hand, this modified version of WH-RECOVERABILITY thus makes the same prediction as the constraint in (13c). While this latter constraint can be parametrised wrt the properties of the C head in order to extend the analysis to Chol, it is unclear how the relevance of recoverability could be motivated in the absence of deletion in order to extend an analysis in terms of WH-RECOVERABILITY to the Chol data.
On a side note, in German, swiping constructions as in (8a) are ungrammatical. This means that the modified version of WH-RECOVERABILITY requiring a minimal *wh*-element to be immediately at the edge of an [E]-marked phase would have to be ranked higher than the CED in German but lower than the CED in English, which would be a very neat instance of variation in OT rankings explaining grammatical variation.

fronting of both *who* (as shown in (14c)) and *which one*, yielding the sentences in (6a-b). However, the analysis overgenerates, as high-ranked L ⇦ *wh*-min also predicts swiping to occur in standard *wh*-clauses, which, as shown in (8), is ungrammatical.

(15) Derivation of swiping

a. L ⇦ *wh*-min >> CED: Swiping of minimal *wh*-elements

	$[_{CP}\ [_{PP}\ [_{P}$ for $]\ [_{wh}$ whom $]\ ]\ ]$	L ⇦ *wh*-min	CED
a.	$[_{CP}\ [_{PP}\ [_{P}$ for $]\ [_{wh}$ whom $]\ ]\ ]$	*!	
☞ b.	$[_{CP}\ [_{wh}$ whom $]_1\ [_{CP}\ [_{PP}\ [_{P}$ for $]\ t_1\ ]\ ]\ ]$		*

b. L ⇦ *wh*-min >> CED: No swiping of non-minimal *wh*-elements

	$[_{CP}\ [_{PP}\ [_{P}$ for $]\ [_{wh}$ which one $]\ ]\ ]$	L ⇦ *wh*-min	CED
☞ a.	$[_{CP}\ [_{PP}\ [_{P}$ for $]\ [_{wh}$ which one $]\ ]\ ]$		
b.	$[_{CP}\ [_{wh}$ which one $]_1\ [_{CP}\ [_{PP}\ [_{P}$ for $]\ t_1\ ]\ ]\ ]$		*!

c. CED >> L ⇦ *wh*-min: No swiping of minimal *wh*-elements

	$[_{CP}\ [_{PP}\ [_{P}$ for $]\ [_{wh}$ whom $]\ ]\ ]$	CED	L ⇦ *wh*-min
☞ a.	$[_{CP}\ [_{PP}\ [_{P}$ for $]\ [_{wh}$ whom $]\ ]\ ]$	*!	
b.	$[_{CP}\ [_{wh}$ whom $]_1\ [_{CP}\ [_{PP}\ [_{P}$ for $]\ t_1\ ]\ ]\ ]$		*

A constraint that would predict swiping in sluicing contexts but not in standard *wh*-clauses would be that in in (13b) penalising minimal *wh*-elements at the right edge. Again, two rankings of **wh*-min ⇨ R and the CED must be simultaneously available, where **wh*-min ⇨ R is ranked higher than the CED to derive (7) and lower than the CED to account for (6). This constraint makes the same predictions for sluicing and swiping as (13a), but in addition exclude minimal wh-fronting in standard wh-clauses, where the minimal wh-element is not at the right edge of the CP and **wh*-min ⇨ R is not relevant. However, high-ranked **wh*-min ⇨ R would rule out *wh*-in-situ clauses (*You saw whom?*), where the minimal wh-element is at the right edge of the CP, and therefore undergenerate. One might argue that in *wh*-in-situ constructions the *wh*-element is in a more deeply embedded phrase, at the edge of *v*P, and therefore not exactly at the edge of CP. On the other hand, in sluicing constructions, only the TP has been deleted so there is an empty C' node with an empty C head intervening between the *wh*-element and the right edge of CP. So while **wh*-min ⇨ R both triggers swiping and

rules out *wh*-in-situ if it refers to the phonological left edge, it does neither if the left edge is defined in syntactic terms.

What predicts swiping in sluicing contexts but not in standard wh-clauses, and does not rule out wh-in-situ clauses, is a ban on adjacency of a minimal wh-element and a C head with an E-feature, as in (13c). Again, outranking the CED correctly predicts swiping of minimal *wh*-elements and derives (7), whereas the CED outranking **wh*-min ⇨ $C_{[E]}$ predicts no swiping in either case, yielding the structure in (6). The assumption that both rankings are simultaneously available to speakers accounts for the optionality of swiping.

Finally, the question arises whether these analyses are extendable to the Chol data if one assumes that, like swiping in English, minimal *wh*-fronting in Chol takes place *after* pied-piping and is alignment-driven. The analysis based on the constraint in (13b) banning alignment of a minimal *wh*-element with the right edge of a CP rules out minimal *wh*-fronting in Chol pied-piping contexts for the same reason as it rules out minimal *wh*-fronting in English standard *wh*-clauses: In both contexts, the minimal *wh*-element, even if it is at the right edge of the pied-piped XP, is not at the right edge of the CP, therefore it does not need to be fronted. A high-ranked constraint requiring a minimal wh-element to be aligned with the left edge of the CP correctly predicts minimal *wh*-fronting in Chol standard *wh*-clauses, but, as discussed above, incorrectly predicts the same in English standard *wh*-clauses. The constraint in (13c), which penalises adjacency of a minimal wh-element to a C head containing an E feature, does not derive minimal *wh*-fronting in Chol, which also takes place in the absence of an E-feature on the C head. One could, however, modify the analysis by assuming a constraint banning adjacency of minimal wh-elements to any C head which is ranked higher than the CED but lower than LA in Chol, as in (15a), (and possibly lower than LA in *wh*-in-situ languages) and lower than the CED in English, while a version of this constraint additionally specified for C heads bearing an E feature is ranked higher than the CED, as in (15b)[2]. This "parametrised" version of the analysis based on (15) derives both the Chol pattern and the English pattern.

(16) Rankings

a. LA >> **wh*-min ⇨ C >> CED

b. LA >> **wh*-min ⇨ $C_{[E]}$ >> CED >> **wh*-min ⇨ C

[2] This could also be implemented by assuming a hierarchy of markedness constraints for C heads and conjoining an alignment constraint with this hierarchy, in analogy to conjunction of a constraint penalising the absence of a value for case with a hierarchy of markedness constraints in Aissen's (2003) analysis of differential object marking in El Cid Spanish.

4 Conclusion

Although there are instances of fronting of a minimal *wh*-element in *wh*-phrases pied-piped to SpecC in both Chol and English, the distribution of this phenomenon in both languages differs: While minimal *wh*-inversion obligatorily takes place in all pied-piping contexts in Chol, its occurrence is restricted to sluicing contexts and optional in English. This renders a unified analysis of both patterns problematic. In fact, existing analyses of the Mayan data are incompatible with the English data, as they rely on minimal *wh*-fronting taking place before pied-piping, while the restriction of its distribution to sluicing contexts suggests that it must take place after pied-piping to SpecC. This involves extraction of the minimal *wh*-element out of SpecC in violation of the CED, which can be taken as an argument for optimality-theoretic approaches to syntax. I have therefore sketched three optimality-theoretic approaches to swiping in English. While two of these approaches make false predictions either for English or for both Chol and English, the third one, which involves a ban on adjacency of a minimal *wh*-element to a C head bearing an E feature, correctly predicts the occurrence of minimal *wh*-fronting in English and can technically be extended to the Chol data by making the additional assumption that adjacency of minimal *wh*-elements to C heads is generally marked, but to a different extent in different languages depending not only on the ranking of the respective markedness constraints but also on the quality of the C head. This assumption, however, has yet to be independently motivated.

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