Internal DP heads in restrictive relative clauses

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In this paper, I show that restrictive relative clauses can be internally headed by a DP, not, as is standardly assumed, an NP. Syntactically, the internal copy of a relative clause head licenses constructions that I show can only be licensed by a full DP: movement out of weak islands and parasitic gapping. Semantically, relative clause heads hosting ACD sites show scopal sensitivity to elements inside the relative clause, which requires an analysis with a full copy of the DP head originating inside the relative clause. Based on both theoretical considerations of licensing ellipsis and empirical diagnostics, I argue that relative clauses require a modified matching analysis, such that a full copy of the DP hosting the relative clause originates inside the relative clause itself, with second copy of the DP in the matrix clause.

1. Overview

It is widely assumed that restrictive relative clauses can have two potential structures: a raising structure, where the NP of the DP hosting the relative clause originates inside the relative clause and a matching structure, where the NP is generated outside of the relative clause, which in turn contains an identical (matched) but elided version of the same NP (Vergnaud 1974, Carlson 1977, Bhatt 2002, Sauerland 1998, Sauerland & Hulsey 2006).

Though a third option is available, in which the internal component of a matching relative clause is a null operator, rather than a copy of the external NP, I follow among others, Safir (1999) and Sauerland (2002), in assuming that both forms of relative clause have a complex internal-head, rather than a phonetically null operator which binds the trace position. Many arguments have been laid out to support this analysis, including reconstruction effects, Double Headed ACD, pronoun and variable binding, and weak-crossover violations (Sauerland 2002).

The standard assumption that this complex internal-head takes the form of a NP (Kayne 1994, Sauerland 2002) gives rise to the raising structure, (1), and the matching structure, (2).

(1) Raising: … [DP every [CP book, that Mary read t]]

(2) Matching: … [DP every [NP book [CP book, that Mary read t]]]
In this paper I will argue that, at least for some relative clauses, these complex internal-heads are not correctly characterized as NPs, but behave syntactically and semantically like full DPs.

In Section 2, I argue that syntactically, relative clause heads license constructions (movement out of weak islands and parasitic gaps) that I show only DPs can license. This argues for an analysis of relative clause heads not as NPs, but as full DPs. In Section 3, I argue that these DPs must be full copies of the external DP (rather than a DP-like operator or indefinite) in order to account for scope interactions in relative clauses hosting ACD sites. In Section 4, I present an ellipsis licensing algorithm that accounts for the data in Section 3, and consider the possible structures for these three constructions. I argue that only a modified matching analysis of relative clauses is theoretically sufficient to account for the data. Finally, in Section 5, I test the empirical predictions of this conclusion, showing that relative clauses with weak islands, parasitic gap sites, and ACD sites are necessarily matching. I draw two conclusions: first some relative clauses must have an internal copy of the DP head, and second that these relative clauses must have a matching structure, (3).

(3) Modified Matching \[ \ldots \text{[DP every [NP book [CP every book, that Mary read \(t_1\)]]]} \].

\footnote{Note that I will use \textit{every book} to indicate phonetically unpronounced material, and either \(t_1\) or \textless every book\textgreater ; to indicate the bottom of a movement chain.}
2. Relative clauses and DP movement

It has been previous argued that relative clause heads can behave like DPs (De Vries, 2002, Borsley, 1997). However, these arguments fail to show that minimally different NPs cannot share this behavior. In this section, I show that there are specific types of constructions that DPs, but not NPs, license, specifically extraction out of weak islands and parasitic gapping. NPs are non-referring predicates and pattern with adjunct extraction in that they are sensitive to weak islands, and cannot license parasitic gaps. DPs, on the other hand, carry a “referential” index (Cinque 1990, Rizzi 1991) which allows them to escape weak islands and license parasitic gaps. When tested in English and German, I show that the internal copy of the relative clause head licenses both these constructions, which, if analyzed as a bare NP, should not be possible. This is a strong argument in favor of treating relative clause internal heads as DPs, not NPs.

2.1. Weak island effects

Weak islands, such as those created by embedded wh-words, show sensitivity to A’ movement: Specifically, A’ movement out of a wh-island is easiest for argument DPs, (4(4)a), and hardest for temporal/manner adjuncts, (4(4)b). Following Rizzi (1991, 2001), I assume that only A’ chains involving DPs can cross weak island boundaries (marked by [ ]).

(4) a. Which problem1 do you wonder [how to solve <which problem>1]?
    b. *How1 do you wonder [which problem to solve <how>1]?

This generalization extends to include a constraint on the extraction of predicates. Baltin (1992) observed that predicates do not readily extract from wh-islands, in contrast with full DP extraction. Though both the subject and predicate of a small clause can undergo wh-movement, (5)(5), asymmetry arises when the movement is out of a wh-island, (6)(6).
(5) a. How many people do you consider t intelligent?
   (Baltin 1992)
   b. How intelligent do you consider John t?

(6) a. How many people do you wonder [whether I consider t intelligent]?
   b. *How intelligent do you wonder [whether I consider John t]?

Assuming a standard analysis of NPs as predicates (Heim & Kratzer, 1998), these island effects predict that bare NPs cannot extract out of weak islands. I look to German to examine cases of bare NP, rather than full DP, movement. In German, both DPs and NPs can be topicalized to the front of the root (SpecCP), as in (7)(7).

(7) a. (Nur) ein Haus hat er t verkauft.
   (only) one house has he sold.
   ‘He sold (only) one house.’

b. Haus hat er eines t verkauft.
   house has he one sold.
   ‘He sold one house.’

However, this topicalization is asymmetrically subject to island constraints – while wh-phrases, (8)(8), and DPs, (9)(9), can undergo topicalization out of a (negated) factive infinitival complement clause (a weak island), NPs cannot, (10)(10). Moreover, the data in (11)(11) shows that Split-NP topicalization is grammatical if the splitting occurs after the full DP is extracted out of the island, indicating that it is specifically the NP-movement out of the island that causes the ungrammaticality of (10)(10).

(8) Wast hat er (nicht) bedauert [t zu verkaufen zu muss]?
   What has he (not) regretted to sell to must?
   ‘What did he (not) regret having to sell?’

(9) (Nur) ein Haus hat er (nicht) bedauert [t verkaufen zu muessen]
   (only) one house has he (not) regretted to sell to must
   ‘Only one house is such that he has (not) regretted having to sell it.’

(10) *Haus hat er (nicht) bedauert eines [t zu verkaufen zu muessen]
    house has he (not) regretted one to sell to must
    ‘house is such that he has (not) regretted having to sell one’

(11) Haus2 hat er [(k)eines t2] bedauert [dass er t verkaufen muss]
    house2 has he [(n)one t2] regretted [that he sell must
    ‘No house is such that he has regretted having to sell it.’

The sensitivity of Split-NP topicalization extends to (weak) wh-islands, as well factive clauses, as shown by the contrast between (12)(12) and (13)(13).
(12) (Nur) ein Haus_1 hat er sich gefragt [ob er t₁ kaufen soll]  \textit{DP Movement}  
(only) a house\textsubscript{1} has he self asked [if he t₁ buy should]  
‘Only a house is such that he wondered whether he should buy it.’

(13) *Haus\textsubscript{1} hat er sich gefragt [ob eines t₁ kaufen soll]  \textit{*NP Movement}  
house\textsubscript{1} has he self asked [if a t₁ buy should]  
‘house is such that he has wondered whether to buy it’

Together, these data strongly support the prediction that DPs, but not NPs, can undergo extraction out of weak islands.

This makes a fairly strong prediction for relative clauses: if relative clause heads are NPs, they should not be able to extract out of weak islands. However, relative clause heads can extract out of infinitival \textit{wh}-complements and factive complements, in both English, (14)(14), and German, (15)b. This is quite unexpected under a standard analysis - these islands are inside of the relative clause, and the internal RC head (which must move to the top of the relative clause) must extract out of these islands before being combined with the external determiner. Treating these heads as NPs predicts that the internal head should never be able to escape the weak island, and so the derivation should crash. The fact that relative clauses hosting weak islands are grammatical, combined with the previous extraction data, seems to require an analysis of relative clause heads not as NPs, but as DPs.

(14) a. The book\textsubscript{1} that we regretted [that John read t₁]  
b. The book\textsubscript{1} that we wondered [how to read t₁]

(15) a. Das Haus\textsubscript{1} dass er (nicht) bedauert hat [t₁ verkaufen zu muessen]…  
the house that he (not) regretted has [t₁ sell to must]…  
‘The house that he didn’t regret having to sell.’

b. Das Haus\textsubscript{1} dass er sich gefragt hat [ob er t₁ kaufen soll]…  
the house that he self asked has [if he t₁ buy should]…  
‘the house that he wondered whether to buy’

2.2. Parasitic gaps

Borsley (1997) argues that, like \textit{wh}-DP traces, relative clause heads can license parasitic gaps, as in (16)(16). However, he provides no evidence that NP-traces cannot also license parasitic gaps.

(16) a. Which form\textsubscript{1} did Bill fill out t₁ without reading __?  
b. The form\textsubscript{1} that Bill filled out t₁ without reading __ was…

Again, data from German can be used to shed light on the behavior of bare NPs. We see that that, unlike DPs, NPs cannot license parasitic gaps. In topicalized DP constructions, the DP-trace can license a parasitic gap, (17)(17); however, a topicalized NP-trace cannot, (18)(18).
Relative clauses in German, like English, do license parasitic gaps, strongly suggesting that the head must have the properties of a DP, not an NP, (19). This data shows that relative clause heads do license parasitic gaps, which is again unexpected under an analysis of relative clauses that treats the internal head as a bare NP. Together with the data in the previous section, it seems that relative clause heads are syntactically DPs and not NPs.

3. Scope restrictions in relative clauses with ACD

In this section, I argue, following Koster-Moeller & Hackl (2008) that the syntactic data pointing to an analysis of a relative clause head as a DP is strongly supported by the observation that the host-DP of the relative clause seems to be semantically (scopally) active inside the relative clause itself. Moreover, this evidence argues that the DP inside the relative clause cannot be any item that has the semantic status of a DP (e.g. that (De Vries, 2002), a null operator with DP-like semantics, an indefinite), but that the external determiner is present inside of the relative clause.

3.1. Antecedent contained deletion (ACD)

ACD occurs when elided material, [ ], is properly contained within the expression that serves as its antecedent, (20) (cf. Sag 1976 etc.).

(20) [ ]

This seeming paradox can be resolved by raising the object DP hosting the relative clause and ellipsis site outside of the antecedent VP.
3.2. Quantifier scope restrictions in ACD structures

In standard relative clauses (RCs), both surface and inverse scope seem to be available between the matrix subject (a professor) and the host object-DP (every book...), not unexpectedly regardless of the semantic properties of the RC internal subject (Mary/a student).

(22) a. A professor read every book that Mary wrote.
   Surface: A single professor read every book that Mary wrote.
   Inverse: Every book that Mary wrote is such that some (different) professor read it.

   b. A professor read every book that a student wrote.
   Surface: A single professor read every book that a student wrote
   Inverse: Every book that a student wrote is such that some professor read it

However, in relative clauses that contain an ACD site, there seems to be additional restrictions on scope of the host DP. Specifically, in (23(23)a), we observe that inverse scope of the DP every book that Mary did over the matrix subject a professor is difficult compared to (22(22)a). In (23(23)b), however, which differs only in that the relative clause subject is the indefinite a student, inverse scope seems to be as easy as in the relative clause without ACD, (22(22)a,b).²

² This contrast is rather reminiscent of Fox’s (1995) Scope Economy generalization exemplified below.

(i) a. A boy read every book and Mary did too. *Inverse Scope
(23) a. A professor read every book that Mary did.  
   *Inverse Scope (∀>∃)
 b. A professor read every book that a student did.  
   Inverse Scope (∀>∃)

Following Koster-Moeller & Hackl (2008), the contrast in (23)(23) is an instantiation of a  
larger generalization, (24)(24):

(24)  *ACD-Scope Generalization* (Koster-Moeller & Hackl 2008):
In a sentence of the form [… Op₁ ….][DP … Op₂ …<VP> ], where Op₁ is a matrix  
operator, the DP is the host DP containing a relative clause with an ACD site, and Op₂  
an operator inside the relative clause, the DP can have inverse scope over Op₁ only if  
the DP and Op₂ are scopally non-commutative.

When considering the standard RC analysis in which the relative clause determiner merges  
outside of the relative clause, the generalization that the scopal relationship between the  
determiner and an operator inside the relative clause determines properties of the larger  
sentence is very surprising – the internal operator and the external determiner should not be  
able to interact dynamically.

The data in (25)(25) confirms that scopal non-commutativity between the host DP and the  
relative clause subject is the driving force behind the inverse scope restriction observed in  
(23)(23), as every book and every boy are scopally commutative, predicting correctly that  
inverse scope should not be available.

(25) a. A girl read every book that every boy did.  *Inverse Scope (∀>∃)
 b. A girl read every book that a boy did. Inverse Scope (∀>∃)

The data below show that the generalization extends to scope-taking operators besides DPs. In  
(26)(26), the inverse scope reading of the host DP over the matrix negation is only available  
when the RC also contains a scope taking element, in this case another negative operator. In  
fact, as (26(26)b) shows, when the RC does contain negation, surface scope is not allowed.  
Similarly, in (27)(27), inverse scope of the host DP over the modal operator *can* is only  
possible when RC also contains a modal operator.

(26) a. Mary didn’t read every book that John did.  *
 b. Mary didn’t read every book that John didn’t.  *

(27) Sue kissed two boys at the party last night. Mary can kiss at most one boy, but …  
a. … she is allowed to kiss every boy that Sue kissed/#did.  *
b. … she is allowed to kiss every boy that Sue was allowed to.  *

The data in (22)(22)-(27)(27) shows that the relative clause determiner interacts scopally with  
relative clause-internal operators. Due to standard movement constrains regarding movement  
in and out of relative clauses, it is very difficult to treat this interaction as a genuine semantic  
interaction between the internal operator and the external determiner. Rather, it seems that
the internal relative clause head itself has systematic scopal force, a semantic property of quantificational DPs, not NPs. These data support the conclusion drawn from the previous section – we need an analysis of RC heads as an object with DP-like syntax and semantics. Moreover, this data suggests how that analysis should be implemented: the internal head seems to be identical to the external DP head of the relative clause.

4. A focus semantic account

4.1. Licensing ellipsis

Following Heim (1997), Merchant (2001), and specifically Rooth (2006), I assume that ellipsis licensing relies on a focus semantic notion of contrast rather than simple identity between ellipsis and antecedent constituent, as follows:

Ellipsis of a VP$_2$ is possible only if there is an antecedent VP$_1$, such that there is a constituent (EC) that contains VP$_2$ and that appropriately contrasts with an antecedent constituent (AC) containing VP$_1$,

where $\alpha$ contrasts appropriately with $\beta$ iff the ordinary semantic value of $\Box$ entails the grand union of the focus semantic value of $\alpha$: $[[\beta]]^o \supset \cup ([[\alpha]]^f)$.

Thus to satisfy ellipsis of VP$_2$, we need a structure as in (28), which gives rise to the entailment relationship in (29).

(28) $[\text{AC} \ldots \text{VP}_1 \ldots] [\text{EC} \ldots <\text{VP}_2> \ldots]$ 

(29) $[[\text{AC}]^o \supset \cup ([\text{EC}]^f)]$.

Following this algorithm, I give a calculation in (30), where (a) represents the sentence (capital letters indicate F-marking), (b) the focus semantic value of EC (the constituent containing the ellipsis), (c) the grand union of the focus semantic value of EC, and (d) the relationship between the ordinary semantic value of AC and the grand union of the focus semantic value of EC, where entailment licenses ellipsis.

(30) a. Mary likes John and SUE does, too.
   b. $[[\text{SUE does }<\text{like John}>]]^f = 
      \{\text{that Sue likes John, that Mary like John, that Bill likes John}\ldots\}$
   c. $\cup[[\text{SUE does }<\text{like John}>]]^f = \exists x [x \in \text{Alt(Sue)} \& x \text{ likes John}]$
   d. Mary likes John $\Rightarrow \exists x [x \in \text{Alt(Sue)} \& x \text{ likes John}]$

4.2. Licensing ACD

Following Koster-Moeller & Hackl (2008), this theory of focus-based ellipsis licensing can be extended to ACD structures, with AC as the matrix clause and EC as the relative clause. Crucially, however, such an extension requires that there is a point in the derivation where there are two constituents that can strand in the required entailment relationship, both with access to the DP hosting the ACD site. Without the host DP as part of the semantic calculation of both $[[\text{EC}]]^f$ and $[[\text{AC}]]^f$, the basic entailment relationships found in ACD cannot be calculated.
Treating the AC is the matrix clause with the host DP (without the RC) and the EC as the full relative clause, again with a copy of the host DP, achieves this configuration. The host DP is part of the semantic calculation of both \([[[EC]]_\theta^0]\) and \([[[AC]]_\theta^1]\). (31) illustrates how the system works for basic ACD sentences, where (a) represents the sentence, (b) a sketch of the assumed LF, (c) the grand union of the focus semantic value of EC, and (d) the relation between \([[[AC]]_\theta^0]\) and \(\cup([[[EC]]_\theta^1])\). If the entailment relationship in (d) holds, ellipsis is licensed.

\[
\begin{align*}
(a) & \text{ Mary read every book that John did.} \\
(b) & \text{ [Every [book}_x [John}_y <y \text{ read } x>] [Mary}_z z \text{ read } x]] \\
(c) & \text{ ([every book}_x [John}_y y \text{ read } x])]^f = (\{\text{that every book}_x [y \text{ read } x]: y \in D_x\}) \\
& = \exists y[y \in \text{Alt(John)} \& [\text{every book}_x [y \text{ read } x]]] \\
(d) & \text{ [every book}_x [Mary}_z z \text{ read } x]] \Rightarrow \exists y[y \in \text{Alt(John)} \& [\text{every book}_x [y \text{ read } x]]]
\end{align*}
\]

From this system, the ACD-Scope generalization, (24), follows. When the operator embedded in the relative clause is non-scopal, the entailment relationships required to license ellipsis for the inverse scope reading do not hold. Calculations are given in (32) - (34).

\[
\begin{align*}
(32) (a) & \text{ A girl read every book that a BOY did.} \\
& \text{ [Every [book}_x [a \text{ BOY}_y y \text{ read } x>] [a \text{ girl}_z z \text{ read } x]] \\
& \cup([\text{every book}_x [a \text{ BOY}_y y \text{ read } x]])^f = \exists P[P \in \text{Alt(boy)} \& [\text{every book}_x [a P}_z z \text{ read } x]]] \\
& \text{ [every book}_x [a \text{ girl}_y y \text{ read } x]] \Rightarrow \exists P[P \in \text{Alt(boy)} \& [\text{every book}_x [a P}_z z \text{ read } x]]]
\end{align*}
\]

\[
\begin{align*}
(33) (a) & \text{ A girl read every book that JOHN did.} \\
& \text{ [Every [book}_x [John}_y y \text{ read } x>] [a \text{ girl}_z z \text{ read } x]] \\
& \cup([\text{every book}_x [John}_y y \text{ read } x]])^f = \exists y[y \in \text{Alt(John)} \& [\text{every book}_x [y \text{ read } x]]] \\
& \text{ [every book}_x [a \text{ girl}_y y \text{ read } x]] \Rightarrow \exists y[y \in \text{Alt(John)} \& [\text{every book}_x [y \text{ read } x]]]
\end{align*}
\]

\[
\begin{align*}
(34) (a) & \text{ A girl read every book that every BOY did.} \\
& \text{ [Every [book}_x [\text{every BOY}_y y \text{ read } x>] [a \text{ girl}_z z \text{ read } x]] \\
& \cup([\text{every book}_x [\text{every BOY}_y y \text{ read } x]])^f = \exists P[P \in \text{Alt(boy)} \& [\text{every book}_x [\text{every P}_y y \text{ read } x]]] \\
& \text{ [every book}_x [a \text{ girl}_y y \text{ read } x]] \Rightarrow \exists P[P \in \text{Alt(boy)} \& [\text{every book}_x [\text{every P}_y y \text{ read } x]]]
\end{align*}
\]

A critical aspect of this analysis is that to license ACD, the determiner of the host DP needs to be active in both AC and EC. Derivationally, there needs to be separate domains, each with access to the DP, that are able to properly contrast. (35) shows the two cyclic domains (phases) that need enter into the ellipsis licensing algorithm.

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\(^{3}\) Following Heim (1997), the quantified object is always above the matrix subject in AC, because quantified objects must QR to at least VP, and AC cannot contain any unbound variables.
However, it is also clear that there are not two active copies of the DP at the final point in the derivation.
Therefore, we are faced with a theoretical puzzle. We need to reconcile the demands of the ellipsis licensing algorithm, which requires access to two full DPs, (36)(35), with the final relative clause structure, which has only one, (36).

4.3. Implications for the structure of relative clauses

From the previous sections, there seem to be two types of constrains on the possible analyses of relatives clauses. Syntactically, we see that relative clause heads license constructions that seem to be licensed only by DPs. Semantically, we see that relative clause heads have robust scopal force, which DPs, but not NPs, have, and that these heads are semantically active both inside and outside the relative clause.

Thus, any successful analysis of these relative clauses needs to provide:

a) an internal relative clause head that has the syntactic and semantic status of the external DP
b) two properly contrasting constituents (AC and EC), each with access to this host DP
c) a way to merge these constituents into a single tree, with correct meaning and spell out

No currently endorsed analysis of relative clauses can accommodate the first of these requirements, which would include the determiner of the host DP inside the relative clause. However, there are two candidate analyses of RCs, raising and matching, that might be modified to accommodate what is needed, (37)(37), (38)(38).

(37) … [DP every [CP every book that Mary read t]].

(38) … [DP every [NP book [CP every book that Mary read t]]].

Amended Raising: “D-Raising”
An amended version of the raising analysis assumes that the entire host DP raises from the RC internal trace position to SpecCP, which is then followed by the determiner alone raising and projecting (e.g. Donati 2006)

(37(37)’)

However, in D-Raising structures, all copies of the host DP are part of a single chain (moved from inside the RC object position to SpecCP). This creates a fundamental problem for the ellipsis licensing, as there is no point in the derivational history when both AC and EC can
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contain the DP simultaneously, and so ellipsis would never be licensed. This suggest that a D-Raising analysis of relative clauses with ACD sites is not viable.

*Amended Matching*

An amended version of the matching analysis assumes that there is a full copy of the host DP inside the relative clause. It raises to SpecCP and undergoes deletion under identity as the relative clause is merged with the external copy of the host DP.

\[(38(38)')\]

In amending-matching structures, there are two separate copies of the host DP – one in the matrix clause, and one in the relative clause (cf. Chomsky 1965). This provides the conditions needed to satisfy the ellipsis licensing algorithm, as both the AC and the EC will have access to identical copies of the host DP. The RC can then be late (counter-cyclically) merged into host DP (Fox & Nissenbaum 1999, Hulsey & Sauerland 2006), giving rise to a single tree with one spelled-out copy of DP. A sketch of a solution is to assume that (Partee 1975), late merge needs to trigger type-shifting of the RC-internal DP, in addition to deletion of RC internal copy, (39)(39). The specifics of this implementation are beyond the scope of the paper. Rather, the conclusion most relevant to the goal of the paper is that, in order to accommodate the internal copy of the DP head in a way that allows it to affect ellipsis licensing requires a modified matching analysis, with two (fully separate) copies of the relative clause head DP.
Late Merge of Relative Clause, given Amended Matching

(39)  

\[
\text{Host DP} \quad \text{RC}
\]

\[
\begin{array}{c}
\text{DP} \\
\downarrow \\
\text{D} \\
\text{NP} \\
\text{every} \\
\text{book}
\end{array}
\quad
\begin{array}{c}
\text{CP} \\
\downarrow \\
\text{D} \\
\text{NP} \\
\text{every} \\
\text{book}
\end{array}
\]

\[
\begin{array}{c}
\text{DP}_7 \\
\downarrow \\
\text{D} \\
\text{NP} \\
\text{book}
\end{array}
\quad
\begin{array}{c}
\text{C'} \\
\downarrow \\
\text{IP} \\
\text{John read t}_7
\end{array}
\]

- Deletion under identity
- Trace conversion
- Type-shifting
5. Empirical support: tests for modified matching and modified raising

I have so far argued that, for theoretical reasons, the most feasible structure for a relative clause with an internal DP head is an amended version of the matching analysis of relative clauses, in which there are two full copies of the DP. In this section, I consider the empirical implications of this analysis.

Using a series of diagnostics following Hulsey and Sauerland (2006), I argue the relative clauses with movement of weak islands, relative clauses with parasitic gap sites, and relative clauses hosting ACD sites all have an underlying matching structure. I will observe that minimally different relative clauses without constructions requiring a full copy of the DP are not necessarily matching, indicating that it is the presence of these constructions is the driving force behind the structural restriction. I apply the same tests to basic wh-questions to provide a baseline. These tests, in line with the theoretical arguments, point conclusively towards the fact relative clauses that have DP internal heads have a matching, not raising, structure.

5.1. Variable Binding

We can use variable binding has a diagnostic for a raising structure – if a pronoun in the host DP can be bound by an operator inside the relative clause, the relative clause must have a raising analysis, as operators can only bind pronouns whose chains they c-command. In a matching structure, the higher copy of the pronoun will never be within in the domain of the embedded operator, (40)(40). Thus if a pronoun in the host DP is bound by an element inside the relative clause, a raising structure must be assumed.

(40) The picture of his father that every boy saw…
   a. Raising
      [DP the [CP the picture of his father [that every boy saw < the picture of his father >]]]
   b. *Matching
      [DP the [NP picture of his father [CP the picture of his father [that every boy saw <the picture of his father >]]]]

Parasitic Gaps:
In (41)(41), wh-extraction over a binding variable licenses parasitic gaps while retaining the bound reading. In (42(42)a), when a basic relative clause head moves over its binder, him remains bound by every boy. However, when a parasitic gap is introduced, (42(42)b), binding of him by every boy is no longer available. (43)(43) shows that parasitic gaps are generally acceptable in relative clauses. This suggests an incompatibility between raising structures (required to get variable binding) and internal DP headedness (required to license parasitic gaps).

(41) a. Which picture of his father did every boy purchase?
   b. Which picture of his father did every boy purchase without seeing?

(42) a. The picture of his father that every boy purchased was flattering.
   b. ??The picture of his father that every boy purchased without seeing was flattering.
(43) a. The picture of Joe’s father that every boy purchased was flattering.
    b. The picture of Joe’s father that every boy purchased without seeing was flattering.

**Extraction out of Weak Islands:**
Similarly, (44) shows that wh-phrases that contain a bound pronoun can extract out of weak wh-islands and retain the bound reading. However, the contrast between (45) and (45)b), such that binding is noticeably harder for (45)b), where the head is extracted out of a weak island, indicates that the extraction is not compatible with raising structure required for a bound-variable reading. The lack of contrast in (46) shows that relative clause heads can, in general, extract out of weak islands. This suggests that relative clause heads that undergo movement out of weak islands are necessarily matching, and so cannot support variable binding from inside the relative clause.

(44) a. Which picture of his father did every boy purchase?
    b. Which picture of his father did every boy wonder if Sue purchased?

(45) a. The picture of his father that every boy purchased was flattering.
    b. ??The picture of his father that every boy wondered if Sue purchased was flattering.

(46) a. The picture of Joe’s father that every boy purchased was flattering.
    b. The picture of Joe’s father that every boy wondered if Sue purchased was flattering.

**ACD-Scope:**
For relative clauses that contain an ACD site, we see that an inverse scope reading is incompatible with a bound variable reading. In (47), the lack of inverse scope of a boy over every picture of his father (forcing us to consider at most one boy) indicates that every picture of his father is not bound by a boy, but rather receives co-reference through standard co-indexation (Heim & Kratzer 1998). (48) shows inverse scope is again available when variable binding is not required. This indicates that ACD scope constructions, which require an internal DP head, are not compatible with a raising analysis, which license variable binding.

(47) a. A girl saw every picture of his father that John did *Inverse
    b. A girl saw every picture of his father that a boy did Inverse

(48) a. A girl saw every picture of Bill’s father that John did *Inverse
    b. A girl saw every picture of Bill’s father that a boy did Inverse

The variable binding test indicates that structures requiring internal DP heads are not compatible with structures that also require a raising analysis, suggesting that constructions with internal DP heads must have a matching structure.
5.2. Idioms

Hulsey and Sauerland (2006) argue (following Brame 1968, Schachter 1973, Marantz 1984, and Chomsky 1993) that if an idiomatic interpretation of the host DP is available, the relative clause must have a raising structure, as the entire head needs to be reconstructable into the idiom constituent, (49). Thus the availability of idiomatic readings can be used to test for a raising structure in various relative clause constructions: if an idiomatic reading of the host DP is not available, it is evidence that the relative clause does not have a raising structure.

(49) The cat that John let out of the bag
   a. Raising: \[
      \begin{array}{c}
      \text{DP} \\
      \text{the [CP the cat} \[
      \text{1 [that John let out of the bag <the cat}_{1} >]}
      \end{array}
   \]
   b. *Matching: \[
      \begin{array}{c}
      \text{DP} \\
      \text{the [NP cat [CP the cat} \[
      \text{1 [that John let out of the bag <the cat}_{1} >]}
      \end{array}
   \]

Parasitic Gaps:
The relative lack of contrast between (50a) and (50b) shows that, though a bit odd, \textit{wh}-extraction out of an idiomatic expression can license a parasitic gap. However, while the head of a non-idiomatic relative clause can license a parasitic gap, (51a), the host DP of the relative clause cannot both license a parasitic gap and retain an idiomatic reading, (51b). This suggests that a relative clause cannot have an internal DP head and a raising structure.

(50) a. Which secret did John reveal without meaning to?
   b. *Which cat did John let out of the bag without meaning to?

(51) a. The secret that John revealed without meaning to …
   b. *The cat that John let out of the bag without meaning to …

Extraction out of Weak Islands:
The data in (52)(52) suggests that \textit{wh}-phrases (DPs) with idiomatic readings are not sensitive to weak islands. However, the contrast between (53(53)a) and (53(53)b) indicates that relative clause heads with idiomatic readings cannot extract out of weak \textit{wh}-islands, while (54)(54) shows that non-idiomatic relative clause heads can. This data also suggests that relative clauses that require DP-internal heads cannot have a covert raising structure.

(52) a. How much headway did John make last year?
   b. How much headway did Sue wonder whether John made last year?

(53) a. I was impressed by the headway that John made last year.
   b. *I was impressed by the headway that Sue wondered if John made last year.

(54) a. I was impressed by the soufflé that John made last year.
   b. I was impressed by the soufflé that Sue wondered if John made last year.

\[\textsuperscript{4}\text{Note that I do not test the ACD-scope data for idioms, as I could not find any idioms that allow for a quantificational determiner (}\textit{*every cat that John let out of the bag}\text{).}\]
These data together indicate that a raising structure (which is required to retain an idiomatic reading) does not allow an internal DP head, and strongly suggest that both parasitic gap constructions and weak island relative clauses must have a matching structure.

5.3. **Condition A**

To avoid a condition A violation, an anaphor must be bound at some point in its derivational history. In a raising structure, the anaphor chain can be bound by an element inside of the relative clause. However, in a matching structure, the high copy of the anaphor will never be in the c-command domain of a binder inside the relative clause, (55)(55). Thus condition-A violations in relative clauses suggest a matching structure.

(55) The pictures of each other, that John and Mary, saw

a. Raising:
   \[[\text{DP the } [\text{CP the pictures of each other}_1 [\text{that John and Mary}_1 \text{ saw} <\text{the pictures of each other}_1>]]]\

b. *Matching:
   *[\text{DP the } [\text{NP pictures of each other}_1 [\text{CP the pictures of each other}_1 [\text{that J&M}_1 \text{ saw} <\text{the pictures of each other}_1>]]]]

**Parasitic Gaps:**

In (56)(56), movement of a wh-phrase containing an anaphor over its binder licenses parasitic gaps while without incurring a condition-A violation. The same is true in (57)(57), in which a relative clause head containing an anaphor moves over its binder, suggesting that parasitic gap constructions are consistent with a raising analysis. This could indicate that a raising analysis is possible for internal DP heads, that parasitic gap licensors are not always DPs, or that the condition A test is not fully straightforward. (58)(58) shows that, generally, condition A violations are not incurred in relative clauses with parasitic gaps.

(56) a. Which pictures of each other\(_1\) did John and Mary\(_1\) purchase?
   b. Which pictures of each other\(_1\) did John and Mary\(_1\) purchase without seeing?

(57) a. The pictures of each other\(_1\) that John and Mary\(_1\) purchased were flattering
   b. The pictures of each other\(_1\) that J and M\(_1\) purchased without seeing were flattering

(58) a. The pictures of Bill that John and Mary purchased were flattering
   b. The pictures of Bill that John and Mary purchased without seeing were flattering

**Extraction out of Weak Islands:**

(59) shows that wh-phrases that contain an anaphor can extract out of weak wh-islands, both when the anaphor binder is outside of the island, (59)(59)b) and inside the island, (59)(59)c). However, the contrast between (60)(60)a), without a weak island and (60)(60)b,c), with weak
island extraction, indicates that relative clauses with DP internal heads incur condition-A violations. This strongly suggests that relative clauses with DP internal heads cannot have a raising structure, but instead must be analyzed as matching.

(59)  
a. Which pictures of each other did John and Mary see?
b. Which pictures of each other did John and Mary wondered if Sue saw?
c. Which pictures of each other did Sue wonder if John and Mary saw?

(60)  
a. The pictures of each other that John and Mary saw were flattering.
b. The pictures of each other that John and Mary wondered if Sue saw were flattering.
c. *The pictures of each other that Sue wondered if John and Mary saw were flattering.

(61)  
a. The pictures of Bill that John and Mary saw were flattering.
b. The pictures of Bill that John and Mary wondered if Sue saw were flattering.
c. The pictures of Bill that Sue wondered if John and Mary saw were flattering.

*ACD-Scope*  
In (62), ACD constructions show condition-A violations, suggesting that these constructions must be given a matching, not raising, analysis. This contrasts strongly with (63), in which there is no ACD, (and thus an internal DP head is not necessitated) and no condition-A violation. This suggests that relative clauses with internal DP heads must have a matching structure.

(62)  
a. A girl saw every picture that John did
b. *A girl saw every picture of himself that John did

(63)  
a. A girl saw every picture that John sent
b. A girl saw every picture of himself that John sent

Though the condition-A violation test was not entirely conclusive, for two of the three relevant structures, it, like the other tests, suggests that those structures requiring internal DP heads are not compatible with structures that also require a raising analysis. This furthers the argument that constructions with internal DP heads must have a matching structure.

5.4. *Extraposition*  
Temporal adjuncts (marking edge of VP) split RC and host DP, indicating late merge of the RC. Late merge requires two self-contained components, the host head and the complete relative clause, which is only available in a matching structure (cf. Hulsey & Sauerland

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5 There is an additional contrast between (60)b and (60)c, when the binder is inside the island, a contrast which deserves further consideration. It is possible that in (60)b, the DP can first extract out of the *wh*-island without incurring any sort of violation (not needing to pass over the binder). However, in (60)c, the DP cannot even move out of *wh*-island, causing the sentences to be more seriously unacceptable.
If extraposition is allowed in a relative clause, the RC therefore has a matching structure.

(64) Mary read the book yesterday that John read
   a. *Raising:
      \[ \text{DP} \, \text{every CP} \, \text{every book}_{1} \, \text{yesterday that John read }<\text{every book}>_{1}. \]
   b. Matching
      \[ \text{DP} \, \text{every NP book} \, \text{yesterday CP every book}_{1} \, \text{that John read }<\text{every book}>_{1}. \]

Parasitic Gaps:
Like the base-line *-questions, (65)(65), relative clauses with parasitic gaps can undergo extraposition, (66)(66), as can standard relative clauses, (67)(67), indicating that they have a matching, not raising, structure.

(65) a. Which form did Mary find that Bill filled out without reading?
    b. Which form did Mary find yesterday that Bill filled out without reading?

(66) a. Mary found the form that Bill filled out without reading
    b. Mary found the form yesterday that Bill filled out without reading

(67) a. Mary found the form that Bill filled out.
    b. Mary found the form yesterday that Bill filled out.

Extraction out of Weak Islands:
Similarly, extraposition is consistent with relative clauses with factive islands, (68),(68) and *-islands, (69)(69), indicating that they have a matching, and not raising, structure.

(68) a. Mary purchased a book that Sue regretted that John read
    b. Mary purchased a book last year that Sue regretted that John read

(69) a. Sue purchased the book that John wondered how to read
    b. Sue purchased the book yesterday that John wondered how to read

ACD-Scope
Finally, extraposition does not change the grammaticality or scope judgments of relative clauses with ACD, indicating they too have a matching, not raising structure.

(70) a. A girl read every book that John did
    b. A girl read every book yesterday that John did

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6 Idiomatic interpretations give rise to a raising structure (all copies of idiomatic NP need to be part of the idiom constituent), and RC idioms do not allow extraposition over temporal adjuncts:
(i) a. Mary praised the headway that John made  \text{(Hulsey & Sauerland 2006)}
    b. *Mary praised the headway last year that John made
(71) a. A girl read every book that a boy did  
   b. A girl read every book yesterday that a boy did

The extraposition test conclusively points to an analysis of internally DP headed relative clauses as matching, and not raising.

These tests together support the theoretical argument that a relative clause with a full copy of the DP in the head requires a matching, not a raising analysis.

6. Conclusion

In this paper, I present two arguments that relative clauses must have internal heads that are full DPs, not, as is standardly assumed, NPs.

One, based on Borsley (1997), argues that DPs, and not NPs, can undergo extraction out of weak islands and license parasitic gaps. The fact that, cross-linguistically, relative clause heads can both arise from DP and relative clause heads must be DPs, not NPs.

The other, based on Koster-Moeller&Hackl (2008), argues that a full copy host DP of a relative clause is semantically active in ACD constructions, and thus must be part of the relative clause’s internal derivation. Specifically, the account requires that the host DP is accessible to both the matrix clause and the relative clause for the purpose of ellipsis licensing.

Two possible relative clause structures, both of which are argued to exist in English, could be modified to include a full DP as the internal relative clause head. However, both theoretical considerations and empirical evidence (based on tests presented by Hulsey and Sauerland (2006)), argue that only the modified matching analysis is adequate. To accommodate this requirement, I proposed an amendment to relative clause syntax, putting forth a modified matching structure with a full copy of the host DP inside the relative clause.

Acknowledgements

Many thanks to the audience at ConSOLE XVII for helpful comments and questions, as well as Martin Hackl, Stephanie Harves, and an anonymous reviewer from ConSOLE.

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