

# Adjoined XPs and Relativized Minimality: Binominal *chacun*

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## 0. Introduction

In this paper we argue that, given a certain set of assumptions, we can account for the contrasts in the distribution of the quantifier *chacun* 'each' with respect to extraction of the quantifier *combien* (illustrated in (1)-(2)).

- (1) a. Les professeurs ont lu deux livres *chacun* hier  
'the professors read two books each yesterday'  
b. [Combien de livres]<sub>i</sub> les professeurs ont-ils lus *t<sub>i</sub> chacun* hier?  
'how many books have the professors read each yesterday?'  
c. Combien<sub>i</sub> les professeurs ont-ils lu *t<sub>i</sub> de livres chacun* hier?  
'how many have the professors read books each yesterday?'
- (2) a. Les professeurs ont lu *chacun* trois livres hier  
'the professors read each three books yesterday'  
b. [Combien de livres]<sub>i</sub> les professeurs ont-ils lus *chacun t<sub>i</sub>* hier?  
'how many books have the professors read each yesterday?'  
c. \*Combien<sub>i</sub> les professeurs ont-ils lu *chacun t<sub>i</sub>* de livres hier?  
'how many have the professors read each books yesterday?'

Our analysis will lead us to refine the notion of "potential binder" in Rizzi's (1990) Relativized Minimality. We will propose that non-specifiers act as potential binders with respect to the trace of a given XP just in case they too bind a trace. We will also account for the fact neither "adverbial" *chacun* (3b) nor sentence-final *chacun* (4b) blocks extraction of *combien*:

- (3) a. Combien de livres ont-ils *chacun* lus?  
'how many books have they each read?'  
b. Combien ont-ils *chacun* lu de livres?

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- (4) a. Combien de livres ont-ils donné aux étudiants hier *chacun*?  
 'how many books have they given to the students yesterday each?'  
 b. Combien ont-ils donné de livres aux étudiants hier *chacun*?

Finally, the following contrasts will also be explained:

- (5) a. Les professeurs ont lu beaucoup de livres *chacun*  
 'the professors have read many books each'  
 b. Les professeurs ont lu *chacun* beaucoup de livres  
 'the professors have read each many books'  
 c. Les professeurs ont beaucoup lu de livres *chacun*  
 'the professors have many read books each'  
 d. \*Les professeurs ont beaucoup lu *chacun* de livres  
 'the professors have many read each books'

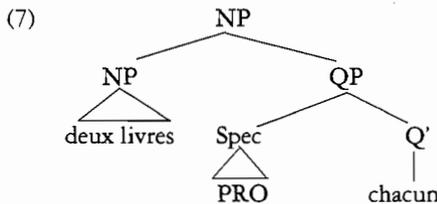
We will show that the ill-formedness of (2c) and (5d) is akin to the contrasts first discussed by Obenauer (1984) concerning the blocking effect of the quantifier *beaucoup* on *combien*-extraction:

- (6) a. [Combien de livres]<sub>i</sub> as-tu beaucoup consultés  $t_i$ ?  
 'how many books have you much consulted'  
 b. \*Combien<sub>i</sub> as-tu beaucoup consulté  $t_i$  de livres?

Before discussing these data, however, we must establish what the internal structure of the XP containing *chacun* is.

### 1. The structure of non-adverbial *chacun*

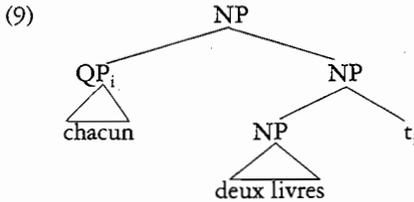
As first discussed by Safir & Stowell (1989) for English *each*, *chacun* is a two-place predicate which selects both a definite R(ange)-NP (here *les professeurs*) and an indefinite or cardinal D(istributive)-NP (here *deux livres*). The structure we argue for is somewhat similar to that proposed by Safir & Stowell, where the QP headed by *chacun* is adjoined to the right of the D-NP, and the other argument is a QP-internal PRO controlled by the R-NP. This is shown in (7):



In French, the QP headed by *chacun* can also appear in pre-nominal position, as in (8b):

- (8) a. Les professeurs ont lu deux livres *chacun*  
 'the professors read two books each'  
 b. Les professeurs ont lu *chacun* deux livres  
 'the professors read each two books'

In this case, we propose that the QP is adjoined to the left of the NP, as in (9); see below for discussion:



That the QP headed by *chacun* in (8a) and (8b) forms a constituent with the NP containing the head noun *livres* is supported by the fact that they can be clefted together (see Safir & Stowell 1989):

- (10) a. C'est [un livre *chacun*] que les professeurs ont lu  
'it is a book each that the professors read'  
b. C'est [*chacun* un livre] que les professeurs ont lu  
'it is each a book that the professors read'

Support for the PRO argument comes from two sources which suggest a control relation (between the R-NP and PRO). First, *chacun* always agrees in gender with the R-NP:

- (11) a. Les professeurs (masc.) ont lu deux lettres (fem.) *chacun* (masc.) /  
\**chacune* (fem.)  
'the professors read two letters each'  
b. Les filles (fem.) ont lu deux livres (masc.) \**chacun* (masc.) /  
*chacune* (fem.)  
'the girls read two letters each'

We assume the R-NP transmits its gender feature to PRO via control, and that *chacun* receives this feature from PRO through specifier-head agreement.<sup>1</sup> Secondly, in the presence of two c-commanding definite NPs, either one may be construed as an R-NP (Burzio 1986):

- (12) Les professeurs ont acheté deux livres *chacun* aux étudiants  
'the professors bought two books each to the students'

In (12), either the NP subject *les professeurs* or the dative NP *aux étudiants* can be interpreted as the R-NP, as can be seen by the fact that *chacun* may agree in gender with either NP:

- (13) Les professeurs (masc.) ont acheté deux livres *chacun* (masc.) / *chacune*  
(fem.) aux étudiantes (fem.).

(1) As an alternative to the structure in (7), Safir & Stowell suggest that the [Spec,QP] position could be occupied at S-Structure by a null operator originating in the complement position of *chacun*. This hypothesis is compatible with the agreement facts in (11), on the assumption that the null operator must be licensed through feature identification by an antecedent (the R-NP) at S-Structure; the gender features then transfer onto *chacun* via Spec-Head agreement. On the view that licensing requirements must be met at every level of representation, see Tellier (1991).



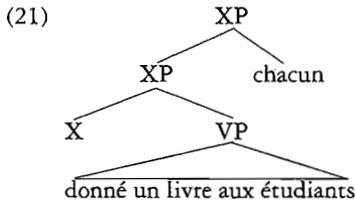
which *chacun* is inside a "true" PP (14). Additional evidence for this claim can be drawn from what we label 'sentence-final' *chacun*:

- (19) Les professeurs ont donné un livre aux étudiants *chacun*  
 (R-NP) (≠ R-NP)  
 'the professors have given a book to the students each'

By contrast with (12), (19) is not ambiguous: only the subject NP can act as R-NP. This can be seen by the fact that sentence-final *chacun* can agree with the subject but not with the dative object:

- (20) a. Les filles (fem.) ont donné un livre aux étudiants (masc.) *chacune* (fem.)  
 'the girls have given a book to the students each'  
 b. \*Les filles (fem.) ont donné un livre aux étudiants (masc.) *chacun* (masc.)

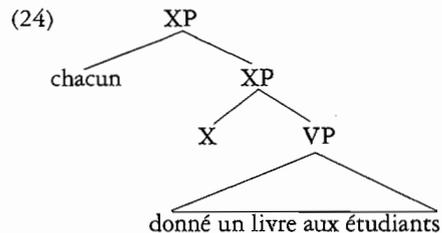
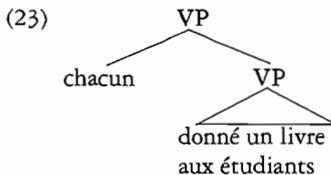
For these facts to follow, it cannot be the case that sentence-final *chacun* originates from inside a VP-internal NP. But the account is straightforward if sentence-final *chacun* is adjoined to a position higher than VP (or to VP with a strict c-command restriction; see (23)-(24) below). The contrast between (13) and (20) then reduces to the lack of c-command between the R-NP *aux étudiants* and *chacun* in (20):



This account extends to adverbial *chacun*. As was shown in (18), if two internal arguments are projected, only the subject NP can serve as R-NP. In fact, a sentence with adverbial *chacun* is ruled out if the subject is not a possible R-NP, i.e. if it is not a definite NP:

- (22) \*J'ai *chacun* distribué un livre aux étudiants.  
 'I have each distributed a book to the students'

The dative NP will be prevented from being an R-NP if it does not c-command *chacun*. This will be the case if *chacun* is adjoined to VP (cf. (23)) and the c-command relation is one of *strict* c-command, or if *chacun* is adjoined to a higher projection (TP or AgrP (cf. (24)); see Pollock 1989):



#### 4. Adjoined XPs and Relativized Minimality

We are now in a position to discuss the extraction data given in (1)-(4), repeated below:

- (1) a. Les professeurs ont lu deux livres *chacun* hier  
'the professors read two books each yesterday'  
b. [Combien de livres]<sub>i</sub> les professeurs ont-ils lus t<sub>i</sub> *chacun* hier?  
'how many books have the professors read each yesterday'  
c. Combien<sub>i</sub> les professeurs ont-ils lu t<sub>i</sub> de livres *chacun* hier?  
'how many have the professors read books each yesterday'
- (2) a. Les professeurs ont lu *chacun* trois livres hier  
'the professors read each three books yesterday'  
b. [Combien de livres]<sub>i</sub> les professeurs ont-ils lus *chacun* t<sub>i</sub> hier?  
'how many books have the professors read each yesterday'  
c. \*Combien<sub>i</sub> les professeurs ont-ils lu *chacun* t<sub>i</sub> de livres hier?  
'how many have the professors read each books yesterday'
- (3) a. Combien de livres ont-ils *chacun* lus?  
'how many books have they each read'  
b. Combien ont-ils *chacun* lu de livres?
- (4) a. Combien de livres ont-ils donné aux étudiants hier *chacun*?  
'how many books have they given to the students yesterday each'  
b. Combien ont-ils donné de livres aux étudiants hier *chacun*?

These sentences show that only pre-nominal *chacun* blocks extraction of *combien*. There are then three (interrelated) problems to be accounted for:

- (i) what blocks extraction of *combien* in (2c)?  
(ii) why is *combien* extraction allowed in (1c), (3b) and (4b)?  
(iii) why is extraction of the entire QP *combien de livres* not blocked in (2b)?

As we mentioned, the fact that the entire NP but not *combien* alone is extractable over pre-nominal *chacun* is reminiscent of Obenauer's observation concerning the adverbial quantifier *beaucoup* illustrated in (6), and repeated below:

- (6) a. Combien de livres as-tu beaucoup consultés?  
'how many books have you much consulted'  
b. \*Combien as-tu beaucoup consulté de livres?

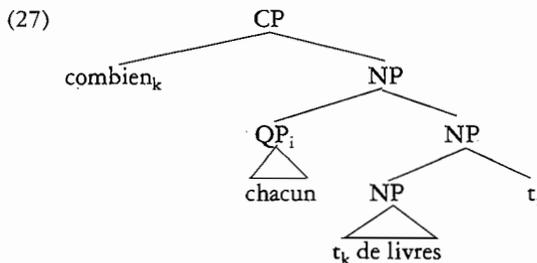
Obenauer's account of this contrast relies on the idea that *beaucoup* is a potential binder for the trace of *combien* in (6b), but not for the trace of *combien de livres* in (6a). This is so since *beaucoup* is a quantificational adverb, and as such binds the (quantificational) trace of *combien*. Assuming that *beaucoup* is generated in an A'-specifier of VP, Rizzi (1990) reinterprets this as a violation of Relativized Minimality (RM). Rizzi's definition of RM is given in (25); "typical potential antecedent governor" is defined in (26):

- (25) Relativized Minimality:  
X  $\alpha$ -governs Y only if there is no Z such that:

- (i) Z is a typical potential a-governor for Y,  
(ii) Z c-commands Y and does not c-command X.
- (26) a. Z is a typical potential antecedent governor for Y,  
Y in an A-chain = Z is an A specifier c-commanding Y.  
b. Z is a typical potential antecedent governor for Y,  
Y in an A'-chain = Z is an A' specifier c-commanding Y.  
c. Z is a typical potential antecedent governor for Y,  
Y in an X<sup>0</sup>-chain = Z is a head c-commanding Y.

Since *beaucoup* is in an A'-specifier in (6b), it counts as a potential binder for the trace of the adjunct *combien*. By contrast, the entire NP may be moved over *beaucoup* in (6a): the NP, being an argument, is not subject to antecedent government (see also Cinque 1990).

We propose to account for the data in (1)-(4) by expanding the notion of potential antecedent governor so as to include those adjoined XPs which bind a trace. This, we claim, is what accounts for the contrast between (1c) and (2c). As proposed earlier, *chacun* in (2c) has been moved to the left of the NP containing it. It then binds a trace within this NP. Now it is clear how the extension of potential governors to adjoined XP accounts for the ungrammaticality of (2c): here, but not in (1c), the QP headed by *chacun* "minimally" binds the trace of *combien*.<sup>3</sup> This is shown in (27):



By contrast, the entire NP *combien de livres* may be moved over *chacun*. Consider (28), where *à couverture rouge* 'with a red cover' is an adjunct modifying the head noun *livres*:

- (28) a. Ils ont acheté deux livres à couverture rouge chacun  
'they bought two books with a red cover each'  
b. Ils ont acheté chacun deux livres à couverture rouge  
'they bought each two books with a red cover'

Here, the entire NP containing *combien* can be extracted whether *chacun* precedes or follows the NP, while, predictably, *combien* cannot move over pre-nominal *chacun* ((29c)):

- (29) a. [Combien de livres]<sub>i</sub> ont-ils acheté [<sub>NP</sub> t<sub>i</sub> à couverture rouge *chacun*]?  
'how many books did they buy with a red cover each'

(3) Pre-nominal *chacun* does not block adjunct movement, cf. *Quand ont-ils acheté chacun trois livres?*, 'When did they buy each three books?'. This is expected since pre-nominal *chacun* does not c-command the adjunct trace, hence cannot be a potential binder for it.

- b. [Combien de livres]<sub>i</sub> ont-ils acheté [<sub>NP</sub> *chacun* t<sub>i</sub> à couverture rouge]?  
 'how many books did they buy each with a red cover'  
 c. \*Combien<sub>i</sub> ont-ils acheté [<sub>NP</sub> *chacun* t<sub>i</sub> de livres à couverture rouge]?

The data in (3) and (4) confirm that it is crucial that an XP bind a trace in order to serve as potential binder. As we have argued, in both cases *chacun* is base-generated in its surface position. As a result, it does not bind a trace, and extraction over it is possible.<sup>4</sup>

A note of caution is in order here. It should be pointed out that the sentence in (29c) is possible under one interpretation. Here, the sentence is fine if there is a pause right after *chacun*. This suggests that the direct object [*t de livres à couverture rouge*] has been Heavy-NP Shifted over a sentence-final *chacun*. That this is what happens can clearly be seen by the fact that, when two c-commanding R-NPs occur, *chacun* here can only agree in gender with the subject NP, which is typical of sentence-final *chacun*.<sup>5</sup>

- (30) a. Combien<sub>k</sub> ont-ils (masc.) donné chacun (masc.) [t<sub>k</sub> de livres aux étudiantes (fem.)]?  
 'how many have they given each book to the students'  
 b. \*Combien<sub>k</sub> ont-ils (masc.) donné chacune (fem.) [t<sub>k</sub> de livres aux étudiantes (fem.)]?

Finally, let us look at (5), repeated below:

- (5) a. Les professeurs ont lu beaucoup de livres *chacun*  
 'the professors have read many books each'  
 b. Les professeurs ont lu *chacun* beaucoup de livres  
 'the professors have read each many books'  
 c. Les professeurs ont beaucoup lu de livres *chacun*  
 'the professors have many read books each'  
 d. \*Les professeurs ont beaucoup lu *chacun* de livres  
 'the professors have many read each books'

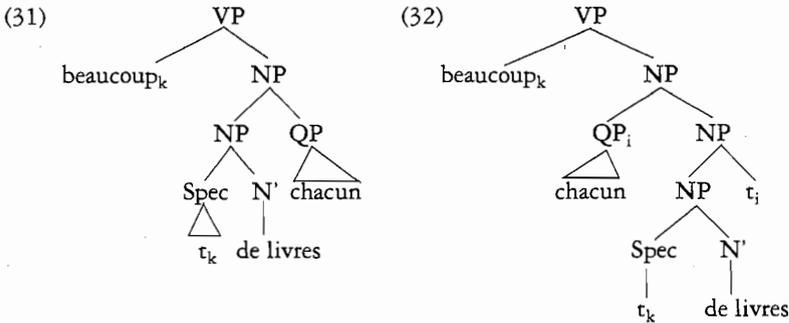
(5a) and (5b) show that the presence of the quantifier *beaucoup* inside the D-NP does not affect the possible positions of *chacun*. But interestingly, the contrast between (5c) and (5d) shows that *beaucoup* can appear in pre-verbal position only when *chacun* is post-nominal. Under our proposal, the difference between these two sentences is attributed to the fact that the QP headed by *chacun* in (5d) binds a trace within the D-NP, while it does not in (5c). Since only those adjoined XPs which

(4) Heles Contreas (p.c.) suggests that the contrast between (3b)/(4b) and (2c) might be accounted for independently of our proposal, by invoking for RM the notion of government directionality. Indeed in the former cases, *chacun* appears to the left of the trace of *combien*, while in the latter case it appears to the right of it. Note however that directionality in itself is insufficient, as it cannot capture the difference between pre-nominal *chacun* (2c) and adverbial *chacun* (3b): while both occur to the left of the trace of *combien*, only the latter counts as an intervening governor for the purposes of RM.

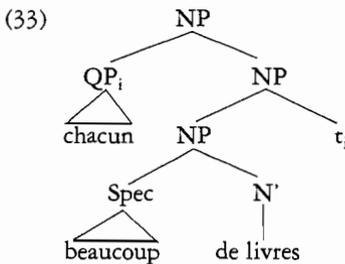
(5) In (30a), it seems that the entire string *de livres aux étudiantes* has been moved in one fell swoop as an instance of Heavy-XP Shift, as can be seen by the ungrammaticality of (i), where the direct object has been scrambled over the indirect object (see Valois 1991), which should be possible if two scrambling operations had taken place:

(i) \*Combien<sub>k</sub> ont-ils donné chacun t<sub>k</sub> aux étudiantes de livres?

bind a trace are potential binders, the empty category bound by *beaucoup* is minimally bound by the QP in (5d) (= (32)), but not in (5c) (= (31)):



Note that, even though it is an A-specifier, *beaucoup* in (5b) is not a potential binder for the leftward-moved *chacun*, since it does not c-command the trace bound by *chacun*:



Of course, neither adverbial nor sentence-final *chacun* is incompatible with preverbal *beaucoup*, since neither binds a trace:

- (34) a. Les professeurs ont chacun beaucoup lu de livres  
'the professors have each many read books'  
b. Les professeurs ont beaucoup lu de livres chacun  
'the professors have many read books each'

There are other cases which support the view that only those XPs which bind a trace are potential binders. Obenauer (1984) notes that adverbs which have meanings similar to *beaucoup* do not create blocking effects with respect to extraction of *beaucoup*:

- (35) a. \*Combien a-t-il beaucoup aimé de femmes?  
'how many has he a lot loved women'  
b. Combien a-t-il passionnément aimé de femmes?  
'how many has he passionately loved women'

Although both *beaucoup* and *passionnément* are adverbs, Obenauer attributes the above contrast to the different categorial status of each adverb. We reinterpret this as follows: assuming that *passionnément* is adjoined to VP, the grammaticality of (35b) is attributable the fact that *passionnément* does not bind a trace.



Once again, the presence of an intervening adjoined XP blocks extraction of *combien*. Note that sentence (38b) cannot possibly be the result of rightward movement of *tous les livres*. In order to see this, consider the data in (41):

- (41) a. On a lu plusieurs livres de Zola avant de partir  
'we read many books by Zola before leaving'  
b. On a lu avant de partir plusieurs livres de Zola  
'we read before leaving many books by Zola'  
c. On a lu de Zola plusieurs livres  
'we read by Zola many books'  
d. \*On a lu de Zola avant de partir plusieurs livres  
'we read by Zola before leaving many books'

In (41b), the entire direct object can be Heavy-NP Shifted. The ungrammaticality of (41d) shows that *plusieurs livres* cannot be extraposed out of the complement NP. Consequently, (41c) cannot be the result of rightward movement of *plusieurs livres*, barring this derivation for (38b) as well. Secondly, movement out of the shifted position is possible in French, possibly due to the fact that the shifted position is not an A'-position in the "usual" sense (Valois 1991):

- (42) a. J'ai vu le portrait de cette personne cette semaine  
'I saw the picture of this person this week'  
b. J'ai vu cette semaine le portrait de cette personne  
'I saw this week the picture of this person'  
c. La personne dont<sub>i</sub> j'ai vu cette semaine le portrait t<sub>i</sub>  
'the personne of-whom I saw this week the picture'

Crucially, extraction of *combien* out of a shifted NP is also possible:

- (43) Combien<sub>i</sub> as-tu donné t<sub>k</sub> à Julie cette semaine [t<sub>i</sub> de livres qui traitaient de Kafka]<sub>k</sub>?  
'how many did you give to Julie this week books that dealt with Kafka'

The ungrammaticality of (40) could not be accounted for if movement of *combien* proceeded out of a shifted XP of the form *combien de livres*. However, (40) follows straightforwardly if *de Zola* is moved to the left of VP: the leftward-moved NP minimally binds the trace of *combien*.

One last point must be made. Note that (40) improves if the direct object is heavy, as in (44):

- (44) Combien as-tu lu, de Zola, de livres qui parlaient des conditions de vie à Paris?  
'How many did you read, by Zola, books that dealt with living conditions in Paris?'

This is unproblematic, however, since in (44), the entire object has undergone Heavy NP-Shift. As shown in (43), *combien* extraction is possible in this configuration.

## 6.2. L-tous

As is well known, the quantifier *tous* 'all' can be floated either to the right of the subject (Right-Tous) or in some cases to the left of it (L-Tous) (see Kayne 1975):

- (45) a. Ils ont tous acheté un vélo (R-tous)  
'They have all bought a bicycle'

- b. Tu as tous voulu qu'ils viennent (L-tous)  
'You have all wanted them to come'

Of particular relevance is the fact that *combien* extraction is blocked with L-Tous (46b), but not with R-Tous (46a):<sup>6</sup>

- (46) a. Combien ont-ils tous acheté de vélos?  
'How many did they all buy bicycles?'  
b. \*Combien as-tu tous voulu qu'ils achètent de vélos?  
'How many did you all want them to buy bicycles?'

Sentence (46a) is unproblematic for our analysis on the assumption that R-Tous does not involve rightward movement of the quantifier, but rather leftward A-movement of the subject NP (Sportiche 1988). Consequently, the quantifier *tous* neither binds a trace nor *c*-commands the trace of *combien*. As for (46b), the quantifier *tous* is clearly not left behind by leftward A-movement of the subject *ils*. We must then assume that *tous* has moved and adjoined to the matrix VP (before it cliticizes onto the verb)<sup>7</sup>. Therefore, it qualifies as a potential A'-binder for the trace of *combien*.

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(6) Although (46b) might not be completely ungrammatical for some speakers, the important point is that these speakers still find a clear contrast between (46a) and (46b).

(7) There are cases for which L-Tous does not seem to block movement of *combien*:

(i) Combien leur as-tu tous donné de livres?  
How many to-them did you all give books

One possible solution is that in (i), *tous* has simply undergone cliticization onto the past participle. Since this is an instance of head-movement, *tous* does not qualify as a potential binder for the XP-trace of *combien*. The derivation of (i) is shown below:

(ii) Combien leur<sub>i</sub> as-tu tous<sub>k</sub> donné de livres [t<sub>i</sub> t<sub>k</sub> ]?

On the other hand, (46b) cannot be the result of direct cliticization of *tous* since French does not allow clitics to move beyond clausal boundaries. It must be the case then that movement of *tous* out of the embedded clause at least involves an instance of XP-movement.