Wh-Interrogatives
The OCP Cycle

Louis-H. Desouvrey

lhd33 at yahoo dot com

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This article shows that *do*-support is due to the interaction of a few constraints, including the Obligatory Contour Principle (OCP), the Superiority Condition. In English interrogatives, OCP triggers movement of the object operator to the front of the clause, yielding a superiority effect. In French, movement under OCP yields a violation of OCP', and the resolution of the latter by movement of the subject violates the constraint against ambiguity. Although the interacting constraints are somewhat different, both languages use an analogous strategy to settle constraint conflicting requirements. English inserts a dummy auxiliary, *do*, while (formal) French uses a clitic-doubled construction. This analysis sheds a new light on a closed paradigm like *wh*-elements and the harmonic effect that affects their syntax.

Keywords: *do*-support, clitic doubling, *wh*-movement, superiority effect, Case, OCP.

1. Introduction

In this article I shall examine certain types of interrogative constructions involving *do* in English and relate them to similar phenomena in French. Limiting the discussion to root clauses, I will show that *do*-support and clitic doubling in (standard) French interrogatives are intended to avoid the violation of the Obligatory Contour Principle (OCP), the Superiority Condition, and a constraint against structural ambiguity that would arise if subject inversion, concomitant to *wh*-movement under OCP, as I will show, were allowed to freely occur in these languages.

The theory I shall build on mostly emerges from previous work (e.g. Desouvrey 2000) and is an attempt to simplify syntactic representations while allowing a greater accuracy and explanatory power. Such a theory is much based on nonlinear representations, as in phonology, and incorporates insights from Optimality Theory (Prince and Smolensky 1993). However, unlike OT, constraints try to find the best configuration in order to be satisfied, which gives rise to a few derivational steps in a grammatical model that includes

separate components such as syntax, phonology, lexicon, etc. (see also Rubach, 2000).[1]

It is not my objective in this article to tackle the properties of each level. For my present purpose, it is sufficient to assume that a computational component, much like in Chomsky (1995), generates a syntactic structure, which can make it directly to the output, or serves as an input to be modified by a series of structural changes destined to settle constraint violations. The making of the initial syntactic structure obeys certain combinatoric principles which require that the elements being merged have compatible features (see Desouvrey 2000).

The theory proposed in Desouvrey (2000) draws heavily from nonlinear phonology from which the representations and OCPs are adapted. These constraints have a considerable syntactic interest. With *wh*-operators, they make up a cycle of repulsion and attraction. One instance of OCP forces movement of the operator outside the minimal projection of the verb it is the complement of, while a second instance requires that the operator be adjacent with the verb, which gives rise to fronting and then subject inversion.

The representations are constrained, as in phonology, by the ban on line crossing (No Crossing Lines, or NCL) and further by the ban on string-vacuous operations (No String Vacuous, NSV). NCL, and NSV are taken to be structure-building constraints, i.e. they are immutable well-formedness conditions on syntactic representations, and therefore are not expected to be violated in a derivation (see Desouvrey 2000, and references therein). NSV has no analog in non-linear phonology, where phonological segments are not subject to movement during a derivation. Simply put, NSV requires that movement give rise to a modification of the word string and bans circularity in a derivation.

The constraints (excluding well-formedness conditions on the representations) that

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[1] In syntax, where some elements may obviously be interpreted at two different positions, it is necessary to explain why movement of a given element takes place and whether or not it is obligatory. To achieve this we must somewhat know the history of the element, namely the sequence of events that occurs or fails to occur in the way to a well-formed sentence.

are relevant for this article are given in (1)-(4).

(1) Obligatory Contour Principle (OCP)
Two elements with identical Case features are forbidden in the same domain.

(2) Obligatory Contour Principle (prime) (OCP')[2]
Identical feature-bearing elements must be string-adjacent.

(3) Superiority Condition (SUPC)[3]
The relative positions of [σ]-specified elements in the clause must be preserved throughout the derivation.

(4) Avoid Ambiguity Constraint (AAC)[4]
Each argument in a structure must be unambiguously related to a unique grammatical relation.

All those constraints will be motivated when they become relevant. For the time being, one may note that constraints need not be ranked. In fact, it seems that no constraints can be violated in a derivation, except the OCPs, which interest physical aspects of grammatical objects (see Desouvrey 2000 for a discussion). Thus, a constraint applies whenever possible, i.e., without inducing the violation of another constraint. That is, no constraint can be violated for the satisfaction of another one. A constraint violation triggers movement operations on the input, and even alternative inputs, as I

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[2] This constraint is referred to as gemination effect, which it is in fact, in Desouvrey (2000).

[3] It turns out that this constraint is a subpart of a set of phenomena that I refer to as vector effects (see Desouvrey in progress and below). Since other vector effects are not relevant in this paper, I use this formulation for simplicity.

[4] This is a family of constraints, and other specific formulations are possible (cf. Desouvrey 2002). It may at first glance appear strange, for it is a truism that linguistic expressions are often ambiguous. The type of ambiguity I refer to here is restrained to morphological ambiguities, where, in some structure, a morpheme may be related to any grammatical functions, for instance *what* in English and *qui* 'who' in French. In the same vein, the use of a pronoun is ruled out when an anaphor is available.

will show in this article.

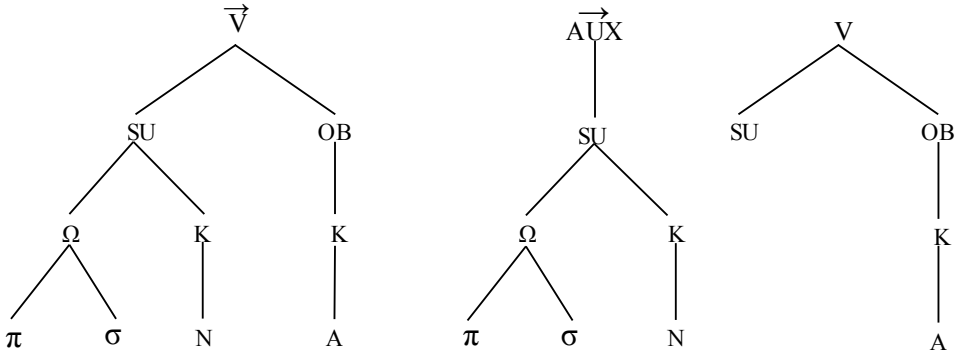
In the next section, the theoretical backgrounds which underlies the analysis to be presented are unfolded. Section 3 deals with the interaction of the constraints in tensed clauses, in both French and English. It is shown that *wh*-movement and subsequent subject inversion are triggered by OCP and that *do*-support and clitic doubling in French interrogatives are strategies to settle further constraint violation concomitant with subject inversion. Finally in section 4, I examine the ways languages vary under the proposed system, and in section 5 I briefly conclude the article.

2. Features and morphemes

2.1 Verb features

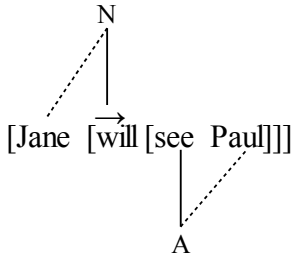
As suggested in Desouvrey (2002), English verbs belong to two major categories according to features: tensed verbs, including auxiliaries and modals, and non-tensed verbs, whether accompanied with *to* or not. Tensed verbs are specified for feature [σ], which provides the element bearing it scope properties, just like *wh*-words. Besides, these verbs are specified for Case. Modal and auxiliaries only bear nominative Case (N), while all other tensed verbs are specified for both nominative (N) and accusative (A). Non-tensed verbs, however, are specified only for A-Case. Both tensed verbs and auxiliaries are specified for omega-features, which include π (related to timing tier) and σ (scope). The features of the three types of verbs are represented in (5), where V stands for lexical verbs and AUX for modals and auxiliaries. Both lexical verbs and auxiliaries are arrowed to indicate that they are vectors, or scope-bearing elements. Also, the tree reflects the argument structure of the verb; so a simple transitive verb has a subject node and an object node, each of which dominates a class node, K. A ditransitive verb has a further object node, which does not expand to a k-node under the assumption that English has no oblique Case (see below).

(5)



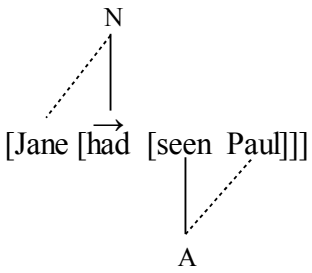
AUX must only have the subject branch, since they cannot have NP complements, while a lexical infinitive has a bare subject node. Assuming that syntactic structures are binary, a modal can be merged as a sister to a VP, as seen in (6), where the lexical verb and the modal respectively assign A-Case and N-Case to their argument. Notice that in (6), and in subsequent examples, nonterminal features (or class nodes), which are in the same plane, will be conveniently omitted.

(6)



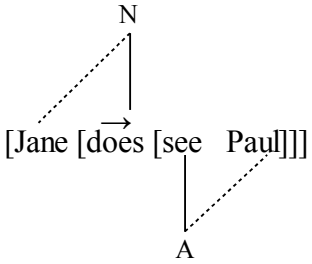
The same type of structure can be assumed for auxiliaries *have* and *be,* which require that the complement verb take a special form, namely participle morphology. The tree structure of participles is similar to that of non-tensed verbs, except they lack the subject node. So the structure of a sentence with a participle verb is similar to a structure with a modal, as seen in (7).

(7)



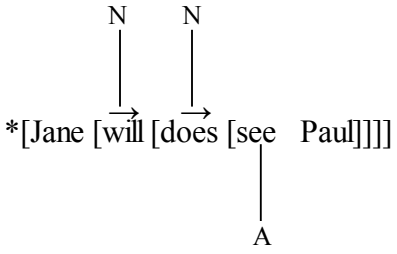
It should be noted that in those structures there are no constraint violations. The lexical structure of each verb is satisfied and each Case is saturated by spreading. Just as in (6) and (7), one can have a *do* construction as seen in (8), which is perfectly grammatical. I take *do* to be an emphatic modal, since it is not completely meaningless. As we will see below, it becomes so in contexts where it can't have an emphatic nuance.

(8)



From the present perspective, it is obvious that *do* cannot be used if the structure already contains an AUX, (9). In effect, since those elements have the same feature structure, they are not complementary elements; either can't supply feature to the other.

(9)



The proposed structures for auxiliaries are consistent with observable facts and it

makes it possible to predict which elements can be merged together. It is suggested that tensed lexical verbs and auxiliaries are vectors, or scope-bearing elements. Their scope property can be seen in interaction with other scope elements, like *wh*-interrogatives, whose feature structure is discussed next.

2.2 *Wh*-elements and their features

Let us turn now to the distribution of features in English *wh*-paradigm. There are two argument operators that refer to humans, *who* and *whom*, the latter being mainly used in formal English. As illustrated in (10), operator *whom* appears as object of a verb or a preposition, while *who* can be either subject, direct object or indirect object with a stranded preposition. In my view, different morphological shapes, semantically unnecessary, reflect different Case specifications. In a paradigm, a Case-specified element has a much more restricted distribution than an underspecified one (see Desouvrey 2000). Therefore I am led to take *whom* to be specified for accusative Case. As for *who*, it appears in formal speeches as subject of a verb (10c), while in colloquial speeches it can be subject or object, (10c,d,g). So it must be the case that it is underspecified for Case in formal speeches. Now since in non-formal English, object *who* patterns mostly like *whom*, it must be the case that it is different from subject *who*. So let's posit that in non-formal English one instance of *who* is specified for accusative Case, while the other is underspecified for Case, a decision that will become obvious in due course. On this view a clearer picture of English *wh*-paradigm emerges. In non-formal contexts (or perhaps modern English), *whom* is eroded into *who*, although it keeps its accusative Case. There are still a few differences between *who* [A] and *whom*, as seen in (10b,f, g), which I turn to later on.

(10) a. Whom did you see? (Formal)
b. To whom did you talk? (Formal)
c. Who saw Mary?

d. *Whom saw Mary?
e. Who did you see?
f. *To who did you talk?
g. Who did you talk to?
h. *Whom did you talk to?

Case feature in this paradigm can be summarized as shown in (11). Generally all rows in a given paradigm are harmonized with the one that presents more complexities, such as the first row in (11). Therefore I assume that all other *wh*-operators show a duplicated morpheme whose Case specification parallels that of the human operators just discussed. This view will be shown to be correct to the extent it makes it possible to account for the syntax of these elements in a highly principled way.

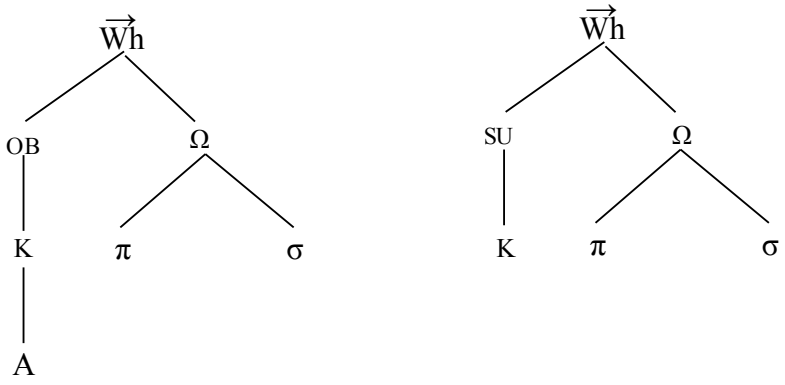
(11) Case Specification in English *wh*-paradigm

who: [ ]	whom: [A];	(Formal English)
who: [ ]	who: [A];	
what: [ ]	what: [A];	
which: [ ]	which: [A]; etc.	

In addition, two features play a crucial role in this paradigm. Besides feature [σ], which explains why operators are vectors, feature [π], which has no equivalent in other theories, makes the element bearing it incompatible with tier shifting, or adjunction to a morpheme, as discussed in Desouvrey (2000, 2005). I refer to those features as omega, from the name of their class node, as shown below.[5]

[5] The omega-node also holds the R-node of the morpheme, in the same way that the R-node of a scalar is hold by its phi-node. R-nodes are omitted in this representation because referential properties of these elements are not considered here (see Desouvrey 2003, in progress).

(12)



The proposed Case features for *wh*-operators are consistent with facts of the language and are descriptively necessary. For instance, if one claims that Case is not a relevant feature, one could not account for the fact that *whom* can never bear the grammatical function of subject. Conversely under the claim that all arguments uniformly enter the syntax with Case (and other relevant features), there is no way to syntactically account for the different distributional properties of an NP from an operator like *whom*, for instance.

3. Constraint interaction

I turn now to the interaction of the elements discussed above. It will be shown that three constraints account for the syntax of *wh*-operators in English: SUPC and OCPs. The impossibility to satisfy OCP and SUPC at the same time forces the grammar to generate an alternative input with *do*. From the substitution input, the OCP cycle takes place, fronting the operator which in turn attracts the dummy verb. A similar phenomenon arises in French where OCP interacts with the constraint against ambiguity. Both languages are discussed in turn.

As mentioned above, SUPC refers to a set of defining properties of σ-specified elements, referred to as vectors, as opposed to scalars, which are not σ-specified. The vector effects include: scope and spreading orientation. Scope is a familiar notion,

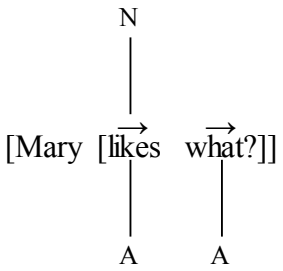
which is used in current generative theory. In my view, the scope of a *wh*-vector is independent of its position in the structure. The notion of scope counts only when there are more than one vector, in which case the leftmost one takes scope over the next, and so on. The relative scope depends on the position of the vectors in the input, and is permanent, that is, it cannot be modified by movement. W*h*-vectors are referring element, hence they can serve as antecedents to other elements by spreading either an R-node or an R-feature; this occurs mostly in complex sentences, as discussed in Desouvrey (in progress).

3.1 OCP vs. SUPC

Consider the contrast in (13). Three facts must be accounted for: (a) why *do* is mandatory to obtain a well-formed sentence, (b) why the *wh*-operator has to be in clause initial position, and (c) why subject inversion is mandatory. Since the *wh*-element replaces an NP, which would appear after the verb, the natural input for (13) would be the structure shown in (14). There are two A-bearing elements in the inner domain of this structure, the verb and the operator, and therefore this structure violates OCP, as defined in (1) (see also Desouvrey 2000, 2002, 2003, 2005, 2006). With nominals such a problem does not arise, since in the present system they are not Case-bearing elements. Normally OCP is avoided by moving the object outside its domain. However, since both elements in this domain are vectors, movement of the operator past the verb would violate SUPC, as defined above. Since constraints are not ranked, OCP can't be satisfied at the expense of SUPC, and therefore there is no way out for this structure.

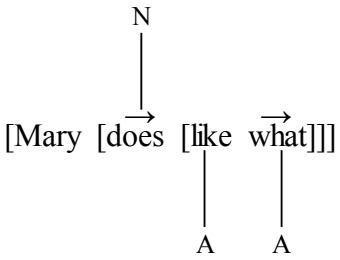
(13) a. What does Mary like?
b. *What Mary likes?
c. *Mary likes what?
d. *What Mary does like?

(14)

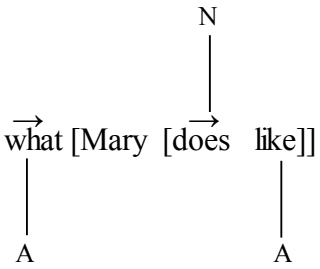


In fact, a structure like (14) may be acceptable in languages, depending on the possibilities offered by their lexical inventory. Fortunately, the lexical inventory of English makes it possible to circumvent the problems in (14). I suggest that an alternative input with *do*, as shown in (15a). The lexical verb is now tenseless and is no longer a vector. The *wh*-vector moves to the front of the clause by crossing over the modal, yielding a SUPC violation, (15b). The latter is satisfied by attraction of the vector modal to the *wh*-vector, as seen in (15c), which is the desired result.[6]

(15) a.

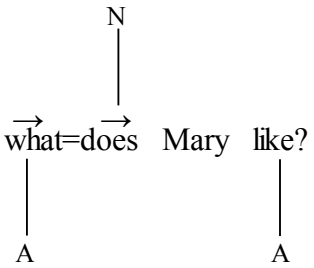


b.



[6] Other strategies seem to be used to settle this constraint conflict across languages. In Malay, lexical verbs may host an affix, *meN*, as discussed in Cole and Hermon (2000). When the affix is present on the verb, *wh*-movement cannot take place. However, if the affix is omitted on the verb, *wh*-movement occurs. Translated in terms of the present analysis, *meN* bears the feature sigma of the verb and therefore the latter enters in a scope relation with its *wh*-complement, just as in English. In both languages, an identical feature-driven phenomenon is dealt with differently, due to different verb morphology and morpheme inventory.

c.



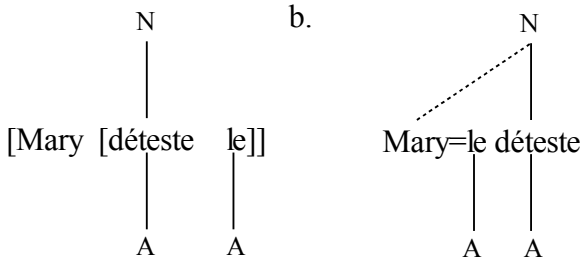
It should be emphasized that in (15c), the operator and the modal come to make up a single bimorphemic element, though they are on different timing tiers. Therefore there is just one vector in the structure. However, OCP' is still violated, since the verb and the *wh*-element is not adjacent. Suppose that a derivation is constrained by a maximal number of configurations it can give rise to. Let's call this number *ε*. It turns out that this number is 3, including the input.[7] Thus, in any derivation, when ε is at most 3 the structure is spelled out, to use a familiar parlance. What does this mean? Earlier constraint violations are likely to be repaired, while a late constraint violation resulting from satisfaction of earlier constraint violation can be repaired as long as it remains within the range of *ε*. This raises the question as to how many constraints can be violated in a well-formed sentence. In the present theory, where the number of constraints are very limited, it seems that only one constraint can be violated in a derivation of a well-formed sentence. On this view, (15c) comes out as the output because the derivation runs out of time.

Before moving on, we may note that movement of the operator to the clause initial position is not related to the nature of *wh*-operator, as assumed in current generative theory. To avoid OCP an A-specified argument has to move out the domain it makes up with the verb. The actual landing site depends on whether it is specified for feature [π]. As mentioned above, a π-specified element must stay in its original timing tier. Since adjunction of an element A to another element B puts the adjunct (A) on a new timing

[7] Obviously one would like to know why the value must not be greater than 3. I have to concede that it is difficult to find out at this time.

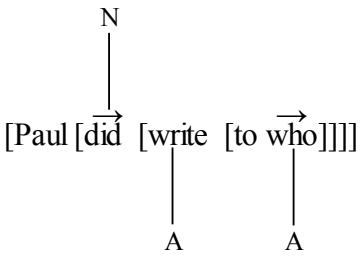
tier, π-specified elements like *wh*-operators in English and similar languages have to be juxtaposed to an edge of the structure, normally the opposite one in order to avoid a string-vacuous operation. For instance a French sentence with an object clitic displays an OCP' violation at the input, as seen in (16) (*'Mary hates him'*), which is parallel to (15a). Since clitic *le* is neither π-specified nor σ-specified, just like the verb, it need not move to the clause initial position, and indeed ends up to the first element outside the forbidden domain, which can be any element that can legitimately appear in such a position.

(16) a. b.

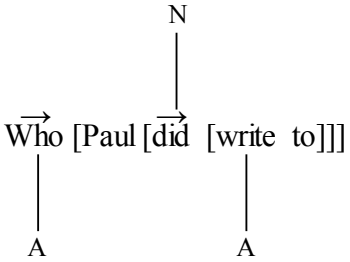


The same set of phenomena induced by OCP and SUPC can be seen with verbs whose objects are introduced by a preposition. Suppose that the preposition is an agreement marker that supplies the argument with some thematic feature of the verb, just as in Romance (cf. Desouvrey 2000). Unlike Romance, suppose that the preposition is not specified for Case, an hypothesis to be motivated below. With this in mind consider input (17a), which displays an indirect object. (I disregard the *do*-less natural input.) Under OCP (and OCP', due to the intervening preposition) the operator moves to the left edge of the structure, as seen in (17b). As in the previous derivation, the dummy modal moves to the operator, yielding (17c). As it happens, this analysis straightforwardly accounts for the preposition stranding phenomenon in English.

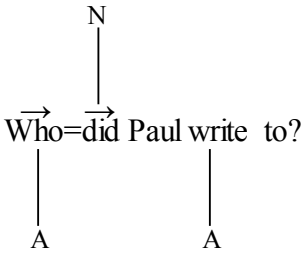
(17) a.



b.



c.



Consider the assumption that the preposition is not an oblique Case assigner in English. As a piece of evidence, one can show that English differs in many respects from French, which has an oblique Case. A third Case is obvious in the paradigm of personal pronouns in French. In this language, third person pronouns exist in four forms, each of which corresponds to a Case/grammatical role, except one which is underspecified, as shown in (18). The unspecified form can appear by default in any position with or without a verb. French verbs are equipped to host any of these arguments by being specified for nominative, accusative and oblique Case. If there were not a third Case in French, one would have to assume that *leur* is either specified for accusative Case or underspecified for Case. In any event, one would face tremendous descriptive problems, since one would have either two A-specified

pronouns or two underspecified pronouns in complementary distribution. In contrast, for the same row English has two pronouns, *they* and *them*. It turns out that the former is specified for nominative Case, while the latter is Caseless, as discussed in Desouvrey (2000).

(18) Case specification of third person plural pronouns in French

ils, [N]	'they'	les, [A]	'them'
leur, [O]	'to them'	eux, [ ]	'they/them'

Moreover, English differs further from French in verbs taking two objects. While certain ditransitive verbs in English can be used in two constructions, illustrated in (19a) and (19b), French only has the equivalent of (19a), as shown in (20). Under the present set of assumptions, one can say that in (19) the verb spreads one A-Case to both arguments. The fact is, an argument can't be assigned two different Cases by spreading (cf. Desouvrey 2000), which would be just that if English verbs were specified for an oblique Case as well. In French, where such verbs bears both accusative and oblique Case, the preposition cannot be omitted, as it is used as a thematic marker (as in English) and a Case relay for the argument, and therefore, a construction like (19b) is not possible.[8]

(19) a. Mary gave a book to Paul.
b. Mary gave Paul a book.

(20) a. Marie a donné un livre à Paul.
b. *Marie a donné Paul un livre.

In fact, it is more appropriate to admit that oblique Case has been lost in the history of English. This is supported by a well-known difference between formal and

[8] In constructions like (25a) it is plausible to assume that English relies to some argument hierarchy, perhaps the Animacy Hierarchy (Desouvrey 2000), to discriminate grammatical functions.

colloquial English. The preposition can move with *whom*, but not with *who*, as illustrated in (21). One can tentatively assume that (21a) is a reminiscence of a former state of English grammar, at a time where the language had a distinct oblique Case for preposition, just like French (preposition stranding is never acceptable in French, see (22)). Possibly the loss of oblique Case in English and the erosion of *whom* into *who* were not accepted by all speakers at the same time; one group of speakers, presumably the most conservative ones, keeps a French-like structure, while the second group lost it altogether. Thus, in (21a) *to* survives as an oblique Case marker, while in (21c) it is a Caseless thematic marker, and therefore may not move with its argument.

(21) a. To whom did you write? (formal)
b. *To who did you write.
c. Who did you write to?

(22) a. A qui écrivais-tu? (French)
b. *Qui écrivais-tu à?

In this section I have shown that *do* is inserted in *wh*-questions in order to avoid a constraint conflict. SUPC conflicts with OCP, and therefore, in order to resolve the issue a *do*-support input is generated. Similar phenomena will be shown to occur in French grammar as well, and to the extent that the analysis succeeds, it will serve as a piece of evidence for the account of *do* in English.

3.2 OCPs vs. AAC in French

French interrogatives are at the same time more transparent and more complex than their English counterparts. For non-animate arguments, French possesses two overt object operators, *que* and *quoi*, which are in complementary distribution. As seen in (23a,b), operators *que* and *quoi* are object of the verb, while in (23b,c,d) only *quoi* can be an indirect object. In addition, *que*, unlike *quoi*, can't stay in situ.

(23) a. Que/*quoi fais-tu?
what do you
b. Tu fais quoi/*que?
you do what
'What do you do?' (a and b)
c. Tu penses à quoi/*que?
d. A quoi/*que penses-tu?
'What do you think to?' (c and d)

To refer to humans, operator *qui* is used as subject and object. In (24), *qui* is the direct object, while in (25) it is the subject (a), and indirect object (b,c). Thus, as object of the verb, *qui* can be either fronted or in situ.

(24) a. Qui vois-tu?
who see you
b. Tu vois qui?
'Who did you see?'

(25) a. Qui est venu?
who is came
'Who came?'
b. Tu penses à qui?
you think to whom
c. A qui penses-tu?
To whom do you think?

Finally, although *quoi* is Caseless, it can never be the subject of the verb. This gap in the paradigm is filled by a complex operator *qu'est-ce qui*, as seen in (26).

(26) a. *Quoi/*que se passe?

what SE happens
What happens?

b. Qu'est-ce qui se passe?
What SE happens?

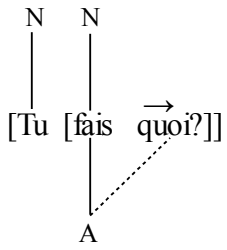
Despite their initial complexity, these operators are relatively transparent to the extent that their features are easy to track down. In order to do so, it is convenient to consider the paradigm with respect to things (non-animate) and humans (animate). In the non-animate paradigm, *quoi* can be either a direct object or an indirect object, cf. (23). Therefore, it must be the case that it is underspecified for Case. In contrast *que* can only be a direct object, and therefore it must be specified for accusative Case. This is summarized in (27). The fact that *quoi*, though underspecified for Case, may not be used as subject, can be dealt with by assuming that it is specified for the grammatical relation of object, which does not extend to a Case node.

(27) Nonhuman object operators

que: [A] quoi: [ ] 'what'

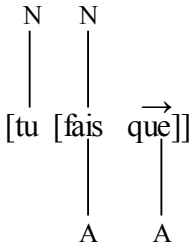
Consider the derivation of (23b). The input is identical to the output, since none of the constraints posited above are violated. Specifically, operator *quoi* is not Case-specified, and therefore there is no A-OCP effect with the verb. The subject pronoun is specified for nominative, just like the verb, and one can say that OCP is violated in the larger constituent. However, there is no further domain where the subject can escape to in order to avoid OCP, and therefore I shall ignore this throughout (see Desouvrey 2000 for a discussion).

(28)



If instead, *que* is selected, cf. (23a), the input contains an OCP violation in the inner domain, as shown in (29a). Since the *wh*-operator is π-specified, it normally moves to the left edge of the structure, yielding (29b). In the latter, the subject *tu* is in between two identical features, [A], violating OCP'. To resolve this issue, the subject just moves to the right edge of the structure, actually adjoining (hence incorporating) to the verb, as seen in (29c), which is the desired result. In French, only the *wh*-operator is a vector, and therefore SUPC is irrelevant.

(29) a.



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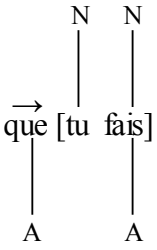

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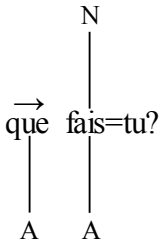


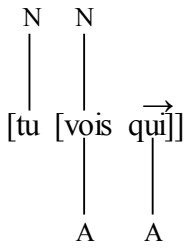
Let's turn now to human operators. There is only one morpheme, *qui*, which can be used either as subject, direct object, or indirect object, cf. (24) and (25). One could say that *qui* is unspecified for Case and grammatical functions. However, this view would be incorrect, since *qui* patterns mostly like *que*, as I will show. Indeed, since *que* is the only operator that has an allomorph (parallel to English *who*/*whom*), I take it to be the master key in the paradigm, that is, all other *wh*-elements are specified according to its model. On this view *qui* must represent two distinct operators, one of which is specified as accusative (equivalent to *que*) and the other is underspecified for Case (equivalent to *quoi*), as shown below.

(30) Human operators

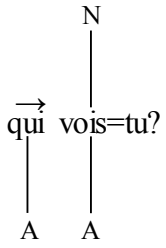
qui: [A] qui: [..] 'whom / who'

Thus, the derivation of sentence (24a) is similar to (29). It proceeds from input (31a), in which OCP moves the operator to the left edge of the structure, which in turn triggers movement of the subject to the verb, as seen in (31b). If the Caseless allomorph were used in the input, no movement would take place, just as in the case of (28) above.

(31) a.

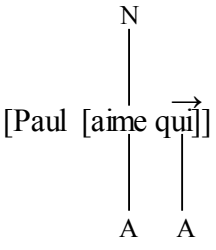


b.



Consider now an input in which the subject is a Caseless NP, while the direct object is the accusative operator *qui*, as seen in (32a). Since OCP is violated in the complement domain of the verb, the operator must move to the left edge of the clause. This yields (32b), where OCP' is now violated, since the A-specified elements are no longer string-adjacent. To overcome this problem, the subject would normally move to the right edge of the clause, as seen in (32c). (Case-unspecified arguments cannot be incorporated to the verb by adjunction, see below.) However, (32c) may not be acceptable, since it sounds exactly as if *qui* were the subject and *Paul* the direct object, that is, instead of the intended meaning *who does Paul like?,* one obtains *who likes Paul?*, whose structure is shown in (33). This ambiguity is obviously due to the fact that the specified and the underspecified form of the operator have the same morphological shape. Therefore the structure is ruled out by AAC, as formulated in (4).

(32) a.



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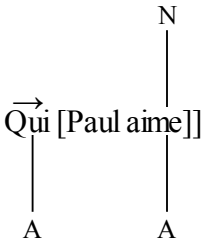

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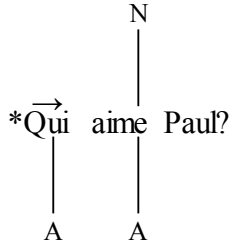
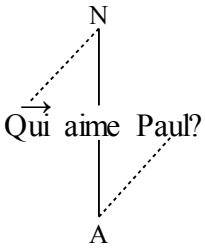
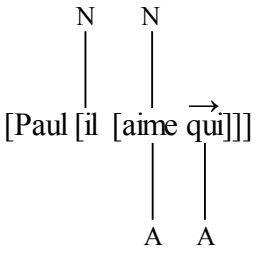


(33)

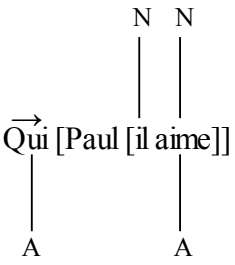


I suggest that French grammar avoids the unwanted derivation in (32) by generating an alternative structure where the subject is doubled by a clitic (i.e., a Case-specified pronoun) with which it agrees in person, number and gender, much like a topicalization structure, as seen in (34a). Under OCP the operator moves to the left edge of the structure, triggering an OCP' effect, as seen in (34b). Finally, the clitic incorporates to the operator, as seen in (34c), which is the correct output, though with a persistent OCP' effect, since ε reaches its maximal value.[9]

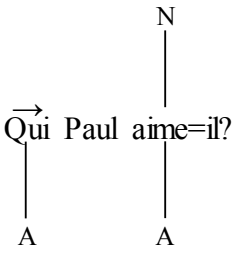
(34) a.



b.



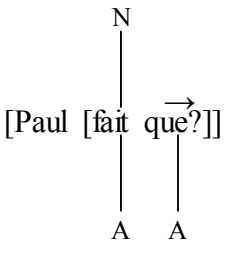
c.

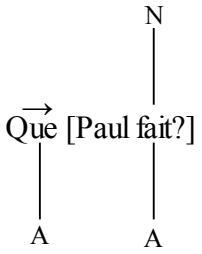


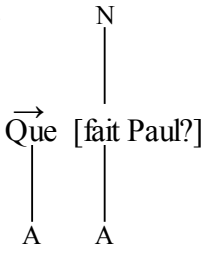
It appears that in standard French, a clitic-doubled construction is used as input in order to avoid the ambiguity resulting from rightward movement of the subject under OCP'. As a piece of evidence for this analysis, one can show that the alternative input is

[9] The output of (34) is actually *Qui Paul aime-t-il?* ('who does Paul like?) Particle *t* is a purely phonological material.

not necessary if the operator is not ambiguous. As seen above, nonhuman object operator *que* is morphologically different from any other operator. Thus in derivation (35), the familiar sequence of events takes place, namely operator movement under OCP, then subject movement under OCP', yielding a well-formed sentence, unlike derivation (32). Since *que* is morphologically different from its allomorph *quoi,* there is no ambiguity with respect to its grammatical relation, and therefore there is no reason to use a clitic-doubled input.[10]

(35) a. 

b. 

c. 

Let's turn now to indirect object verbs, which take a complement introduced by a preposition. As mentioned above, French prepositions are specified for an oblique Case, unlike their English counterparts (cf. Desouvrey 2000, 2005). The preposition is an agreement marker, and is required in order for the argument to agree with the verb. Therefore, if the argument is already specified for all relevant features of the verb, it may not be introduced by a preposition. Indeed, oblique-specified pronouns cannot be introduced by an oblique preposition (cf. *Jean leur parle* vs.**Jean parle à leur*, 'Jean speaks to them.'), and non-oblique pronouns may not be introduced by an oblique verb without creating a fatal Case mismatch. Under this view, the *wh*-word complement of a preposition has to be Caseless, as shown in (36) and (37).

(36) a. Tu parlais à qui [ ] / *qui [A]?
You spoke to whom?
b. Tu pensais à quoi/*que?

[10] In fact, a clitic doubled interrogative with *que* is rather marginal: *?Que Paul fait-il?*

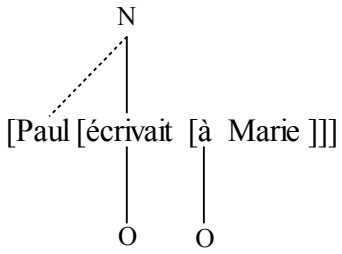
You thought to what?

c. Paul écrivait *(à) Marie.
'Paul wrote to Mary.'

(37) a. À qui parlais-tu?
b. À quoi pensais-tu?
c. *À Marie Paul écrivait.

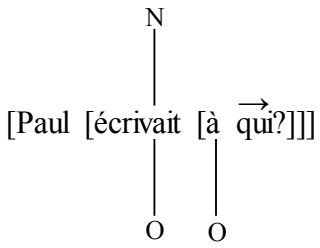
As can be seen in the above structures, movement of the *à*-wh phrase appears to be optional, unlike the *à*-NP phrase which must stay in situ. In order to understand these facts, consider the representation of (36c), as seen in (38a). The verb is specified for oblique Case, so is the *à*-NP. However, since both O-Cases are not in the same minimal domain, OCP effect is weak, allowing the phrasal complement to stay in situ.

(38)



However, if the complement is an *à*-wh phrase, further considerations allow movement to take place. In a closed paradigm with a limited number of elements, a constraint or a property that involves one element may apply to the rest of the elements for harmonic reasons. As discussed above in English every *wh*-element is harmonized with the pattern of *who*/*whom*. Thus, in (39a) no constraint forces the operator to move. However, since other *wh*-elements may or may not move, by harmony the operator may move to the right edge of the structure (39b), and then it forces the subject to move to the opposite edge, as seen in (39c).

(39) a.



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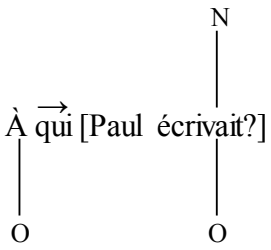

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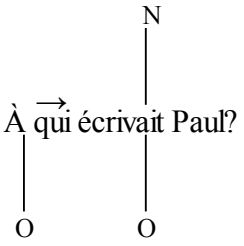


With respect to (35c) and (39c), the question arises as to what is the evidence for juxtaposing the NP to the right edge of the clause, and why it can't be adjoined to the verb, like a clitic. The evidence is quite simple and direct. In compound tenses, a subject NP and a subject clitic are in complementary distribution, as can be seen in (40) and (41) (*qu'* is a phonological variation of *que*). The short movement of the clitic is to be expected, since a longer movement would cause a violation of OCP'. Consider now the second part of the question, namely, why the NP must not adjoin to the verb. In the present theory, an argument must be licensed either by Case or the lexical structure of a verb (cf. Desouvrey 2000). If the NP is adjoined, it is no longer in the same tier as the verb it is an argument of, and therefore plausibly is outside its lexical structure.

(40) a. Qu'avait fait Paul?
what had done Paul

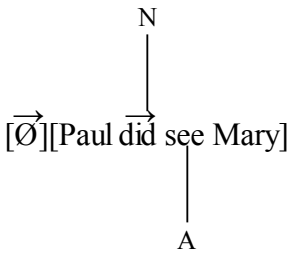
b. *Qu'avait Paul fait?
'What did Paul do?'

(41) a. Qu'avait-il fait?
What had he done
b. *Qu'avait fait-il?
'What did he do?'

3.3 Yes-no questions

This analysis straightforwardly carries over to yes-no questions once one assumes, alongside Grimshaw (1997) and others, that English and French possess an abstract operator. The existence of such an operator is forced by the harmonic process referred to above. Consider the derivation of *Did Paul see Mary?* In the input the operator being not an argument of the verb is juxtaposed to the left edge of the structure, as seen in (42a). *Do* must be inserted in order to avoid putting the subject between two vectors (OCP'), the lexical verb and the abstract operator. The dummy verb moves to the operator, which eliminates OCP', as seen in (42c), which is the desired result.

(42) a.



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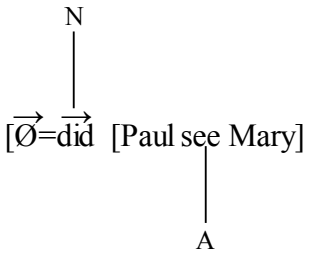

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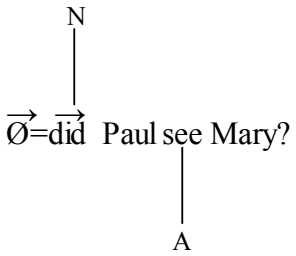
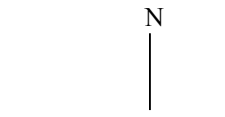


Notice that the same process takes place, even in absence of a lexical verb. The fact is, auxiliaries in English are vector and π-less, which allow them to undergo tier translation by adjunction. Thus from input (43a) the auxiliary is attracted by the null operator, yielding a well-formed sentence, (43b).

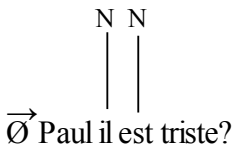
(43) a.



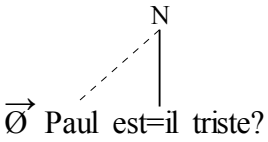
b.

In French, however, there is no distinction between auxiliaries and lexical verbs. Since lexical verbs cannot strand their argument by moving, auxiliaries just behaves the same way. Thus the French equivalent of (43) is ill-formed: **Est Paul triste?* To derive a well-formed sentence, a clitic-doubled input must be used, as seen in derivation (44). Notice that the clitic prevents the verb from assigning nominative Case to the NP in the input. This is corrected by the incorporation of the clitic to the verb, as seen in (44b).

(44) a.



c.



By way of conclusion, consider the question why *do* is used in English in order to resolve the conflict between OCP and SUPC. At this point we may take a look at Grimshaw (1997). Although she uses a completely different set of constraints, which includes neither OCP nor SUPC, she proposes that there is just one *do* in English and its use instead of another verb is due to the interaction of constraints. The key constraint in her proposal is FULL-INT, which requires the LCS to be parsed. Parsing the LCS always yields a lexical verb. When the LCS is unparsed, a light verb obtains instead. Why this happens to *do* and not to another verb, e.g. *shout* or *obfuscate*, as she points out (p.386), may be due to *do'*s having the simplest LCS in the language.

Such a claim is not incompatible with the present proposal. It seems quite correct to say that light *do* arises from failure of lexical *do'*s LCS to be parsed. More generally, I may take the possibility of unparsing the LCS of a lexical verb to be a kind of word formation rule universally available in the lexicon. Natural languages may use such a rule for creating modals, auxiliaries and other functional elements to the extent it limits the size of the lexicon as to the number of functional elements.[11] However, under the present set of assumptions, it is unlikely that such a lexical rule can interact with syntactic constraints, since the lexicon and the morphology make up distinct components, opaque to syntactic constraints.

A more relevant question is the following. Could another strategy be available to settle the conflict between OCP and SUPC? In Desouvrey (in progress), it is shown that, due to the vector effects, *do* is useless in complement clauses. So the conflict is resolved by relativization of the complement clause to the operator. Such a strategy is ruled out in root clauses by the ban of string vacuous operations because the relative pronoun must be non-overt (Ø). For instance, an input with a relative clause like (45a) would yield output (45b), which would not allow any speaker to entertain that the conflict is ever

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[11] Auxiliaries do not usually have a shape on their own. They share their morpheme with a lexical equivalent, from which they are presumably derived. Thus French auxiliaries *avoir* 'to have' has a lexical equivalent, just like English. It is the same for Spanish *tener* 'to have'.

resolved. Rather, it would be interpreted as either SUPC is violated or English verbs are not sensitive to that constraint. To put it another way, (45b) sounds just as if the derivation proceeds from the natural input. If the overt relative were possible in this context, English would be just like certain languages with doubly-filled complementizer, a well-known and misunderstood phenomenon in the literature.

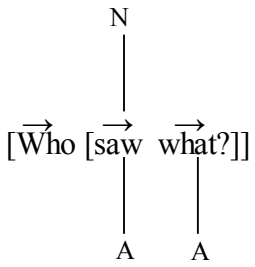
(45) a. What$_i$ [you like Ø$_i$]

b. *What=Ø$_i$ you like?

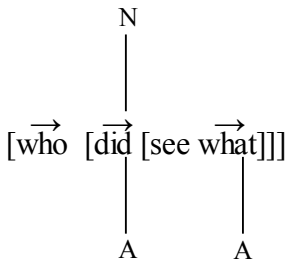
3.4 *Wh* in situ

English object *wh*-operators stay in situ when the subject is a *wh*-operator as well, see (46). It is easy to see that any reordering consecutive to movement of the object operator would violate SUPC, since incorporation (or adjunction) is never possible with *wh*-operators and lexical verbs. In fact, what is of interest here is that *do* cannot save the structure. Consider an alternative input to (46), as seen in (47a). In this three-vector structure, the usual set of operations takes place, yielding (47c), which is not acceptable since the lower vectors come to take scope over the *wh*-subject. In order word, (47c) do not resolve the constraint violation in (46), and therefore there is no reason to use it. We may note that if the number of derivational steps were not limited to 3, the structure could have been rescued by a further step, as seen in (48), in which the subject operator regains wide-scope by moving past the complex operators.

(46)



(47) a.



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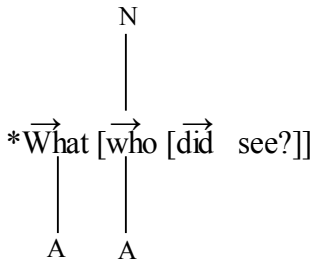

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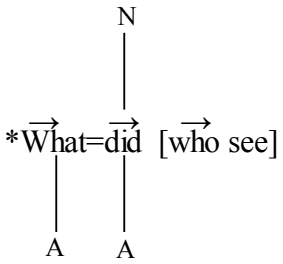
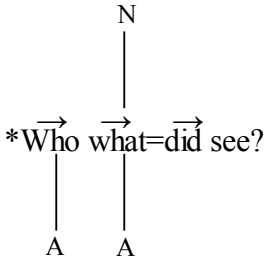


(48)



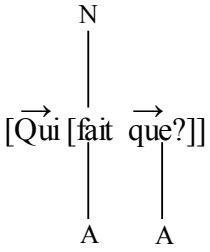
It turns out that both inputs fail when an operator is in the subject position as well. In such a case, since the alternative input is more costly than the natural input, which needs no further vain derivational steps, the grammar sends the latter as the output.[12]

Similar phenomena in French strongly support this analysis. Since in French one

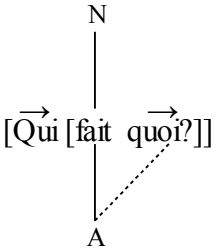
[12] In this context, the output is usually spelled out with a pitch movement on the object operator, presumably to indicate that a constraint is violated, as observed in Desouvrey (2000).

of the pairs of operators displays different morphological shapes for the Case and the Caseless allomorph, a clearer picture emerges. Normally, the input is built with the best element, the one that bears the same feature as the verb, as in (49a) (cf. Desouvrey 2000). Since OCP is violated in this input, the object operator would have to move to the left edge of the structure, and SUPC would be in turn violated. To avoid this unrepairable violation of SUPC, the grammar uses an alternative input with the Caseless allomorph, as shown in (49b).

(49) a.

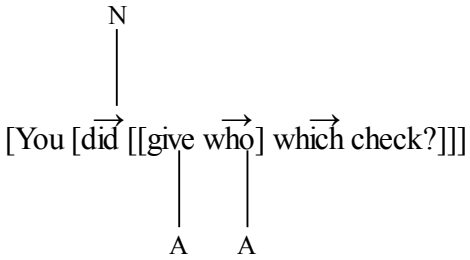


b.

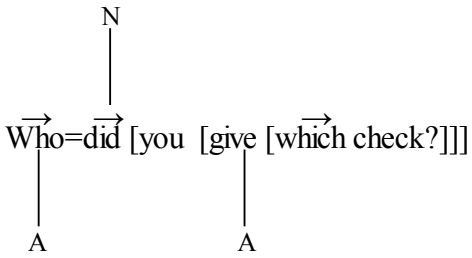


To further illustrate the explanatory power of this analysis, consider another instance of *wh* in situ. (50a) is an input structure with a ditransitive verb whose both object arguments are operators. The verb has only one accusative Case, and therefore it can license only one Case-specified operator, *who*. The second operator appears in its unspecified form, which yields no OCP violation after movement of the first operator. Movement of the Case-specified operator triggers incorporation of the auxiliary, just as in the structures discussed above, yielding a well-formed sentence, (50b).

(50) a.



b.



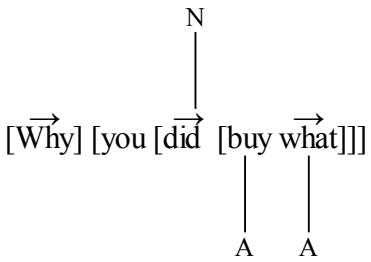
Consider now the contrast in (51), which is heavily discussed in the literature. The adjunct *wh*-operator must be fronted, while the argument *wh*-operator must not be.

(51) a. Why did you buy what?

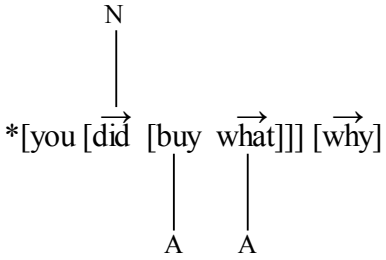
b. *What did you buy why?

It is my contention that no movement ever takes place in the well-formed sentence (51a). Since *why* is not an obligatory argument, it must be external to any projection of the verb, standing alone as a clause, and therefore it would appear at either edge of the structure if no other condition were involved. On the other hand, the argument operator is strictly ordered inside the VP. When there are two operators in a structure, their respective scope corresponds to their relative positions, such that the left-hand operator takes scope over the right-hand one. Thus, if the adjunct is at the left edge of the structure, as in (52a), it has scope over the argument operator, otherwise the latter has wide scope, (52b). Now suppose that if a vector can be generated in two different positions sensitive to scope, it must choose to have wide scope. Therefore, the correct input must be (52a), where the adjunct has the widest scope in the structure. Notice that *do* appears in the input and is intended to facilitate the movement of the argument operator, but since the adjunct already takes wide scope, *do* incorporates to the latter, which prevents the argument from fronting, as seen in (52c).

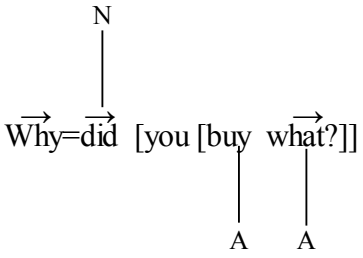
(52) a.



b.

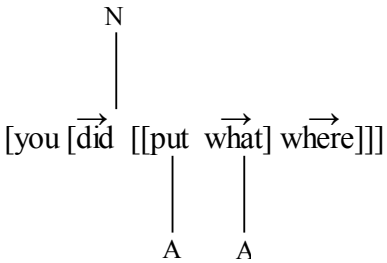


c.

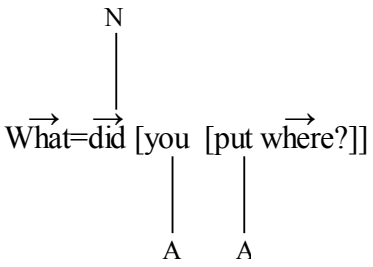


Of course if both operators are argument of the verbs, only the first one is expected to move. This is exactly what happens with a verb like *to put* that takes two arguments.

(53) a.



b.



4. Feature variation in *wh*-operators

In the present theory constraints being not ranked, cross-linguistic variations are reduced to feature specifications and morpheme inventory among languages. This is radically different from parameters that are usually invoked to account for syntactic variations of *wh*-operators. The present approach allows a fine-grained analysis, and makes it possible to accurately predict the existence of different *wh*-systems.

As evidenced with French and English, movement of object operators results from a violation of OCP in the accusative feature tier. The landing site of *wh*-elements in these languages is always the front of the clause, since a special feature, [π], prevents them from changing tier by adjunction to another element. A third feature, [σ], defines operators by giving them scope properties, but are not specific to them. Indeed, we have seen that tensed verbs in English are specified for this feature as well, which make them interact with operators in the sense of SUPC.[13]

Given these three features, one can tentatively propose a typology of *wh*-constructions in SVO or SOV languages, as shown in Table 1 below. The first row includes features that are crucial for the behavior of these elements, namely A, π, and σ. The symbol '+' in a cell indicates that the *wh*-operator is specified for the feature of the column. The first column contains known and unknown language types, L3, L4, and L5,

[13] In Spanish, as in many Romance languages, clitic pronouns must move past inflected verbs under OCP. However, both infinitive verbs and clitic pronouns are vector, and therefore clitics must stay in situ after infinitive verbs, unless they can move to a higher clause. Clitics in Romance are thoroughly discussed in Desouvrey (2000).

and the last column indicates known and likely effects of a particular inventory of features. This Table does not provide any clue as to the appearance of *do*-support and the like. The fact is, as discussed above, such structures belong to a set of strategies to settle constraint conflicts.

Table 1. Tentative typology of *wh*-operators

Languages	**A**	**π**	**σ**	**Main effects**
English	+	+	+	Fronting, SUPC
French	(+)	+	+	Fronting and/or in-situ
L3	+		+	Adjunction, *wh*-cluster, SUPC
L4	+	+		Fronting, *wh*-cluster, no SUPC
L5		(+)	+	*Wh* in situ

In languages of type L3, which lacks feature π, object *wh*-operators need not move to the clause initial position (fronting); rather they have to move to the first element outside the OCP domain, just like Romance object clitics (Desouvrey 2005), and VP adverbs in English (Desouvrey 2002). Moreover, if there are more than one object operators, all of them must normally move, one adjoining to the other, forming a *wh*-cluster within the clause, like a clitic cluster in Romance. Feature sigma would give a movement priority to each operator so that the initial ordering of the operators is not altered after the movement. Furthermore, if the subject itself is a *wh*-operator, the object operators must adjoin to it, attracted by the feature σ, like *do* in English. Certain Slavic languages, discussed in Rudin (1988), are surely of this type. Notice that if an intervening element is specified for σ, the object operator need not move to the subject operator, rather it will adjoin to that element, because of SUPC. However, if the verb is a σ-operator as well, such a short movement will not be possible, since the σ-feature of the verb would induce a superiority effect. Therefore, a *do*-like structure must be used or possibly the operator has to stay in situ.

In L4 languages, which lack sigma, each object operator would have to undergo a movement to the front of their clause, which may yield a different ordering from the input. Finally, in L5 languages no *wh*-interrogative is expected to move at all, since there is no OCP effect in the complement domain of the verb.

In SOV languages, an operator in object position may not adjoin to the subject, even if it is not π-specified, given the ban of string-vacuous movement. It has to move to the front of the sentence or perhaps stay in situ.

We may emphasize that, in any event, *wh*-elements in subject position do not have to move, unless an OCP' effect is triggered by movement of object operators (L4 type). In such a case, if the subject operator is not syncretic with the object operator, it will move rightward to avoid OCP', either to the right edge of the clause if it is π-specified or to the next element to its right if it is not π-specified.

5. Conclusion

It is shown that *wh*-movement in root clauses and subsequent subject inversion are due to the OCPs. Use of *do* is a strategy to settle a conflict between OCP, that requires movement of the operator to the front of the structure, and SUPC, which opposes such a movement. The insertion of *do* in an alternative input allows a provisional violation of SUPC, which is resolved by the incorporation of the dummy verb to the operator. In formal French, A-specified operators move to the front of the structure, where they trigger a violation of OCP'. As a result, the subject quits the OCP' position by moving rightward. However, if the subject is an NP, as opposed to a clitic, a fatal ambiguity arises as to which argument bears which grammatical function. To resolve this issue, a clitic doubled-structure is used.

This analysis clearly shows that by shifting the focus from phrase structure geometry and category labels to features and their interaction in a nonlinear fashion a fine-grained explanation is possible. Phenomena traditionally attributed to parametric

variations (which explain nothing) and apparently unrelated are accounted for in principled ways. For instance, clitic movement (Desouvrey 2000, 2005), adverb placement (Desouvrey 2002), coreference (Desouvrey 2003), relative clause and long *wh*-extraction (Desouvrey, in progress) are all OCP effects.

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