

On the analysis of English exhaustive conditionals

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Abstract

So-called ‘Exhaustive Conditionals’ (ECs, also known as ‘Unconditionals’) have been an important focus of recent research. We develop an HPSG analysis of governed ECs (e.g. ‘no matter how intelligent the students are...’), sketch an approach to ungoverned ECs (e.g. ‘however intelligent the students are...’), and evaluate three possible analyses of reduced ECs (e.g. ‘no matter how intelligent the students...’, ‘however intelligent the students...’).

1 Introduction

Free relatives such as the emphasised part of (1) have had considerable attention within syntactic theory, including HPSG (e.g. Müller, 1999; Kubota, 2003). The superficially similar construction in (2) has had rather less.

- (1) They will do *whatever you do*.
- (2) They will do that *whatever you do*.

The free relative in (1) is an argument whereas the construction in (2) is an adjunct. Some have supposed that this is the only difference – that the construction in (2) is just an adjunct free relative (e.g. Abeillé and Borsley, 2008). But it is clear that we have a rather different construction in (2). The free relative in (1) can be paraphrased with *any* but not with *no matter*:

- (3) They will do *anything you do*.
- (4) *They will do *no matter what you do*.

The opposite is true with the construction in (2):

- (5) *They will do that *anything you do*.
- (6) They will do that *no matter what you do*.

Following Huddleston and Pullum (2002: 761-5, 985-91) (henceforth H&P), we refer to the construction in (2) and its paraphrase with *no matter* in (6) as *exhaustive conditionals* (henceforth ECs). They have also been called ‘unconditionals’ (Zaeferrer, 1990; Rawlins, 2013, 2008).¹

A further type of EC is exemplified by (7) and (8) – we will call these ‘*or* ECs’:

- (7) They will do that (*no matter*) *whether it’s essential or not*.

[†]We are grateful to many colleagues for helpful discussion, notably several anonymous referees for, and participants at, HPSG21 in Buffalo. Remaining flaws are purely our fault.

¹As noted, ECs are always adjuncts. Free relatives are often arguments, but they can also be adjuncts. This can lead to ambiguity; e.g. *They will be there whenever you are there*. can be understood as either a free relative (‘They will be there all the time you are’) or an EC (‘They will be there no matter when you are there’).

(8) Kim will have fun (*no matter*) *whether he goes to Wales or to Scotland*.

H&P call ECs involving '*wh-ever*' words, as in (2), 'ungoverned ECs', in contrast to 'governed ECs', like (6) and similar examples with *irrespective* and *regardless*, as in (9) and (10). As well as this terminology, we will sometimes talk about *no matter* ECs and *wh-ever* ECs.

(9) They will do that *regardless of what you do*.

(10) They will do that *irrespective of what you do*.

Both *no matter* and *or* ECs look like interrogatives, and despite the superficial resemblance to free relatives, H&P and Rawlins (2008, 2013) argue that *wh-ever* ECs are also interrogatives. H&P (p.989) note that *wh-ever* ECs are like interrogatives in allowing the *wh*-element to be modified by *the hell*:

(11) We must be attractive, { *whatever the hell*
no matter what the hell } that means.

Free relatives do not allow this:

(12) *Whoever the hell said that was wrong.

They also note that ECs, like interrogatives, allow multiple *wh*-elements:

(13) { *Whoever*
No matter who } said what to whom we must move on.

This is not possible with free relatives:

(14) *Whoever said what to whom is going to be severely dealt with.

Similarly, Rawlins (2013, 148-9) notes that the *What was X doing Y* idiom (with the interpretation of 'why') appears in interrogatives and ECs but not free relatives:

(15) *Whatever they were doing reading her mail, it didn't lead to any legal problems.*

(16) **She didn't worry about whatever they were doing reading her mail.*

So, in (15) the idiomatic interpretation of 'regardless of the reason why they were reading her mail' is available. In contrast, (16) cannot be interpreted as 'she did not worry about why they were reading her mail'.²

Thus, there seems to be quite strong evidence that ECs are interrogatives, *wh*-interrogatives in the case of *wh-ever* ECs, disjunctive interrogatives in the case of *or* ECs, and most kinds of interrogatives in the case of *no matter* and other governed ECs.

As regards polar interrogatives, governed ECs are possible without obvious restrictions, e.g. (17) is a simple polar interrogative, (18) and (19) are

²Though of course (16) has a perfectly good non-idiomatic interpretation involving a free relative, where *whatever they were doing reading her mail* is interpreted as meaning 'the thing (whatever it was) they were doing'.

alternative polar interrogatives:

- (17) We will do it, no matter whether the staff complain.
- (18) I'll manage, (no matter) whether you help or you do nothing.
- (19) I'll manage, (no matter) whether you help or not.

Alternative polar interrogatives can be governed or ungoverned ECs, but there is a restriction that bare polar interrogatives cannot function as ECs, so *no matter* is obligatory in (17).

Similarly, as regards constituent questions, governed ECs seem to exhibit the full range of possibilities:

- (20) no matter *who/what/which problems/whose ideas* you talk about
- (21) no matter *when/where/why/how cheaply* they do it.

There are no obvious restrictions on the *wh*-phrase, except that pied-piping is restricted, as it is in normal questions – the contrast between the ECs in (22) parallels that with the normal interrogatives in (23):

- (22) a. no matter *what* the students are worried about
- b. ?no matter *about what* the students are worried
- (23) a. *What* are the students worried about?
- b. ?*About what* are the students worried?

Ungoverned ECs are similar, and examples corresponding to (20) and (21) without the *no matter* and with the appropriate *wh-ever* expression are possible.³

However, ECs have a number of special properties compared to normal interrogatives. Most obviously, on the semantic side, they are interpreted not as questions but as a kind of conditional. This is clearest with *or* ECs, e.g. (7) is interpreted roughly as:

- (24) They will do that *if it's essential and if it is not essential*.

And unlike questions, whose typical discourse function is to raise issues, the point of an EC is to explicitly *remove* an issue from discussion, to 'take it off the table'. So, for example, *They will do that no matter what you do* conveys that your potential actions are irrelevant to the issue at hand (hence the name 'unconditionals'). Unsurprisingly, they carry a presupposition that the issue to be removed would otherwise be somehow 'live', hence the bizarreness of (25a), compared to (25b):

- (25) a. #This restaurant will succeed, no matter who the goalkeeper is.
- b. This team will succeed, no matter who the goalkeeper is.

³The only exception is that there is a lexical gap with *why*: the expression *why ever* is not a normal *wh-ever* expression – it is only used as an emphatic form of *why*, expressing surprise. *Why ever did she go?* means something like *Why on earth did she go?*, and cannot be used as an EC.

The name ‘exhaustive conditional’ arises from the fact that they seem to be acceptable only if *all* ‘live’ possibilities are covered. For example (8) is only felicitous if Wales and Scotland are the only potential destinations, and the following is only acceptable on the presupposition that all outcomes involve Granny getting drunk to some degree:

(26) It’ll be okay, no matter how drunk Granny gets.

Syntactically, ECs differ from other embedded interrogatives in two respects. First, ECs are required to be finite. Compare the EC in (27) with the normal embedded interrogative in (28):

(27) *They will leave, no matter what to do.

(28) I wonder what to do.

Second, they display more freedom, in allowing what H&P call ‘reduction’, that is, what might be interpreted as omission of the copula:

(29) a. It’s hard to explain this, however good the students (are).

b. It’s hard to explain this, no matter how good the students (are).

This reduction is not possible in ordinary *wh*-interrogatives, either root or embedded:⁴

(30) a. How good *(are) the students?

b. I wonder how good the students *(are).

There are a number of descriptive and theoretical challenges here, which are addressed in the remainder of the paper. Section 2 develops a basic HPSG analysis for unreduced ECs, focussing on governed cases involving *no matter*. Section 3 considers the description of reduced ECs, and considers a number of possible HPSG approaches. Our starting point is the framework of Ginzburg and Sag (2001) (G&S), in particular, the analysis of interrogatives.

2 An Analysis of Un-reduced ECs

In discussing un-reduced ECs, governed cases seem to pose fewer challenges, with ECs governed by *no matter* being the most straightforward.

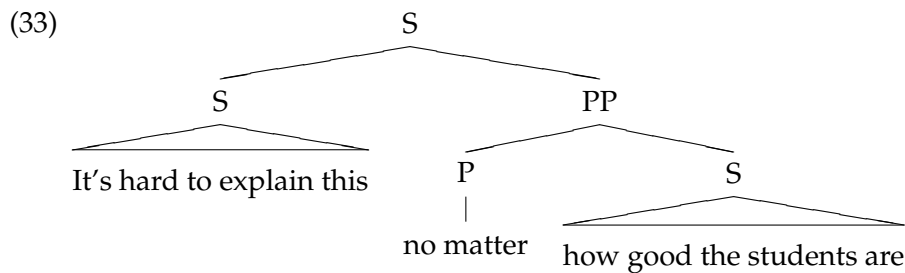
The following suggests that nothing can intervene between *no* and *matter* in *no matter*:

(31) *They will do that, no $\left\{ \begin{array}{l} \text{real} \\ \text{serious} \\ \text{earthly} \end{array} \right\}$ matter what you do.

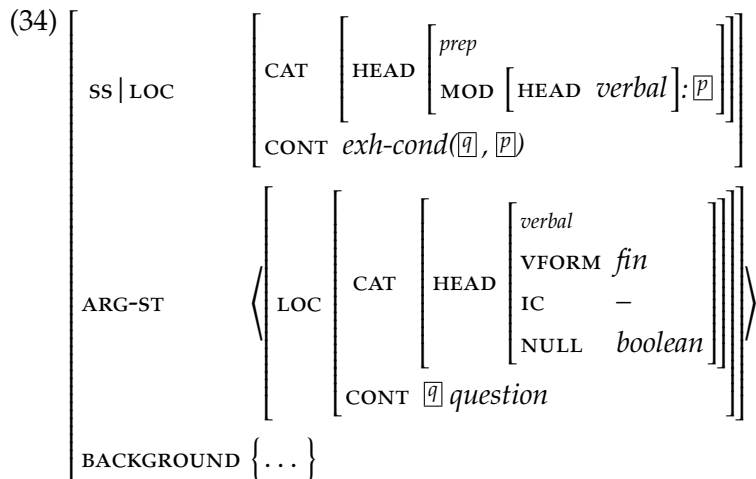
⁴Interestingly, it is also possible in comparative correlatives, a point we shall return to: *The better the students (are), the more fun the classes (are)*.

We conclude that *no matter* is a single lexical item, and given the preceding discussion, we assume it takes an interrogative complement and heads a conditional adjunct. Following H&P (p.761), we assume that it is a preposition. So example (32) will have a structure like (33).

(32) It's hard to explain this, no matter how good the students are.



We suggest the following lexical description for *no matter*.



The value of ARG-ST here allows *no matter* to take as its complement any finite (VFORM *fin*) clause (HEAD *verbal*) which is interrogative (cf. the CONT value of *question*), and which is not a main clause (cf. the minus value for the independent clause (IC) feature). We will return to the NULL *boolean* feature in the discussion of reduced ECs.

This will license all the examples of governed ECs discussed above. For example, since HEAD *verbal* subsumes both verbs and complementisers, it is compatible with all forms of embedded polar questions (headed by a complementiser like *whether* or *if*), and constituent questions (which, following G&S, we assume are headed by verbs):

- (35) no matter whether you go
- (36) no matter whether you go or not
- (37) no matter how clever the students appear to be

The minus value for IC (independent clause) not only excludes inverted

examples like (38), reprises like (39), and ‘quiz show’ questions like (40):

(38) *no matter how good are the students

(39) *no matter the students are how good

(40) *no matter the 1912 Olympics were held in which Scandinavian city

Reprise questions are excluded because while *The students are HOW good?* can be analysed as a question, it can only be a root question, hence [IC +].⁵ Similarly, though ‘quiz show’ questions and similar *in situ* interrogatives can denote questions, they only do this as root clauses – on G&S’s analysis an example like *And you propose that we should pay for it HOW, exactly?* only becomes a question because of a non-branching production which produces a root clause (IC+), and while it contains a non-root clause, this clause is declarative, and denotes a proposition, not a question (see G&S,p280ff). Either way it is excluded as a complement of *no matter*.

The [vFORM *fin*] restriction ensures that the complement must be finite, correctly excluding (27), repeated here:

(41) *They will leave, no matter what to do. [= (27)]

Given the value of HEAD|MOD in (34), *no matter* can modify any *verbal* expression, including Ss, CPs, and VPs. Examples of S modification can be seen above. The following show that ECs can modify VPs and CPs:⁶

(42) He will go *tomorrow* no matter what you say, and *stay away* no matter what you think.

(43) It is important *that we are early and that everyone else is on time*, no matter what happens.

The semantics of the modified expression is given as \overline{p} and the semantics of the complement of *no matter* is \overline{q} . The overall semantics is given as *exh-cond*($\overline{q}, \overline{p}$), where we take *exh-cond*(Q, P) to be a condition that holds just in case freely choosing answers that resolve the question Q leave P holding, that is, just in case P holds for every resolution of Q .

Consider for example (44), whose semantics is given in (45c). The semantics of the antecedent is something like (45a), and the semantics of *who Cameron offends*, following G&S, is as in (45b) (this is the same as the semantics of *Who does Cameron offend?*).

(44) The Conservatives will win, no matter who Cameron offends.

⁵More generally, the combination of question semantics and the minus value for IC in (34) has the desirable effect of excluding all complements that do not contain an initial *wh*-expression – see G&S,p270ff.

⁶We are grateful to an anonymous referee for suggesting examples like (42). ECs can also attach to other kinds of phrase, as in e.g. *No true Scotsman, no matter where he lives, would tolerate this*, which are thus *prima facie* counter-examples to (34). We ignore this because ECs are just like other conditionals in this respect, e.g. *No true Scotsman, if he is honest, would tolerate this*. We assume a proper treatment of parentheticals would carry over to ECs.

- (45) a. $\text{win}(\text{TheConservatives})$
 b. $\lambda\{x_{\text{person}(x)}\}\text{offended}(\text{Cameron}, x)$
 c. $\text{exh-cond}(\lambda\{x_{\text{person}(x)}\}\text{offended}(\text{Cameron}, x), \text{win}(\text{TheConservatives}))$

Thus (44) will be true if we can freely choose among answers that resolve the question *Who does Cameron offend?* (e.g. *Abe, Bev, . . . , Zack, . . . Everyone*), with *The Conservatives will win* remaining true. It will be false in a situation where there is some answer (say, the answer corresponding to *Cameron offends the Queen*) whose truth is inconsistent with the Conservatives winning:

- (46) a. Will the Conservatives win, no matter who Cameron offends?
 b. No, if Cameron offends the Queen, the Conservatives won't win.

We have left the BACKGROUND value unspecified in (34). It should specify presuppositions to the effect that, first, \bar{Q} (e.g. *Who does Cameron offend*) is a 'live' question, and second, that the possible answers to \bar{Q} cover all and only the relevant possibilities (i.e. it should be exhaustive). It should also specify the intended discourse effect that \bar{Q} is taken 'off the table' (e.g. does not enter, or is removed from, the set of questions under discussion).

Appropriate lexical entries for *regardless (of)* and *irrespective (of)* would be similar to (34), but raise some problems as regards the specification of the complement. In particular, coordination facts make an analysis of these items as single lexemes implausible (cf. examples like *regardless of whether you stay or of whether you go*), and notice that the syntactic and semantic requirements stated in the ARG-ST of *no matter* must be imposed on what one might plausibly take to be the complement of *of*, rather than the complement of *regardless* or *irrespective*.⁷

The obvious way to extend this approach to ungoverned ECs would be to introduce a special construction (a sub-type of *non-headed-phrase*) whose mother has the semantics of *no matter*, and a single daughter corresponding to the complement of *no matter*, along the lines of (47).

This is not satisfactory as it stands. First, and less important, it is unclear what category we should assign to the mother here – the analogy of governed ECs would suggest either preposition (like *no matter*) or adjective (like *regardless* and *irrespective*). Neither has much intuitive appeal, but nor is there a clearly motivated alternative. More important, this account will overgenerate, since it will allow ungoverned polar interrogatives like (48), and ungoverned *wh*-questions which do not contain a '*wh-ever*' form like (49), both of which are possible in governed ECs:

- (48) They will win the election *(no matter) whether Cameron is replaced.

⁷One possibility here would be to treat *of* as a 'weak head' in the sense of Tseng (2002): *regardless* and *irrespective* would be like *no matter* except for being adjectives and taking a complement which is specified as [MARKING *of*].

First, only a copula that is the highest verb in the ECQ can be omitted, as the following illustrate:

- (51) This is hard to teach, no matter how good the students may *(be).
- (52) This is hard to teach, no matter how good it seems the students *(are).

Second, as a number of authors have noted, there are restrictions on the subjects of reduced ECQs (e.g. Culicover, 2013). In particular, pronominal subjects are not possible:

- (53) a. This is hard to teach, however good they *(are).
- b. This is hard to teach, no matter how good they *(are).

Demonstratives, proper nouns, quantificational NPs, and indefinite NPs are also excluded:

- (54) no matter how good that person over there *(is)
- (55) no matter how good John *(is)
- (56) no matter how clever everyone *(is)
- (57) no matter what time a class *(is), . . .

Moreover, *only* NPs are allowed, e.g. clauses and PPs are not possible:

- (58) no matter how interesting *whether he left or not* *(might be), . . .
- (59) no matter how good a place *under the bed* *(might be), . . .

In fact, it seems that only definite NPs with *the* or a possessive are possible:

- (60) They are always cheerful, no matter what time $\left\{ \begin{array}{l} \text{the} \\ \text{their} \end{array} \right\}$ class.

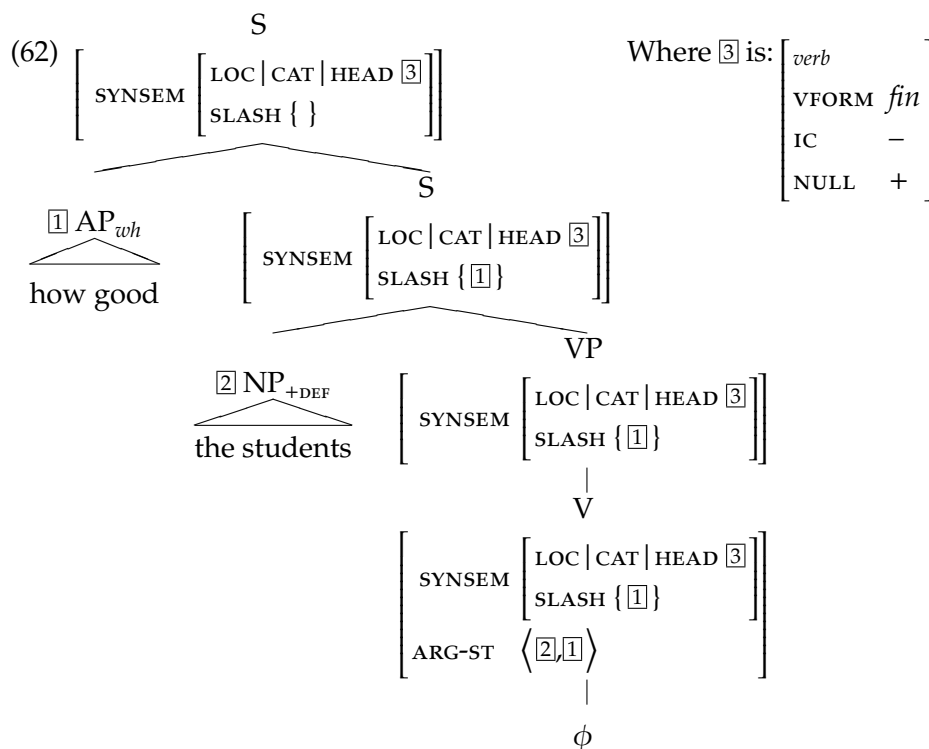
As regards the *wh*-phrase, the most obvious constraint is that it must be initial in the clause (as it must in unreduced ECQs of course):

- (61) a. no matter how clever the students
- b. *no matter the students how clever

We will consider three different analyses. The first involves a null-copula. The second two are constructional. According to the first and second, the *wh*-phrase is a filler. According to the third, the relation of the subject and *wh*-phrase is just that of a subject and predicate.

3.1 A Non-Constructional Filler Analysis (Empty Copula)

In unreduced ECQs the initial *wh*-phrase is plausibly analysed as a filler, as in a normal question, so it is natural to assume that it is also a filler in reduced ECQs. As noted in Borsley (2004, 2011) in relation to comparative correlatives, one way to provide an analysis of reduced phrases is to postulate a phonologically empty form of the copula which takes a gap as its complement, giving structures like (62). On this account, a reduced ECQ consists of a *wh*-filler, and a slashed S, which in turn contains a subject and



a slashed VP, containing an empty copula verb (which we write as ' ϕ ', and which we assume is lexically specified as [NULL +]).

We can rule out some examples of omission of embedded copulas, like (51) (repeated here), if we assume that ϕ has no non-finite form (ϕ is here the complement of *may*, which is required to be non-finite):

(63) *... no matter how good the students may ϕ . [= (51)]

To exclude other examples we would have to assume that verbs generally select [NULL -] complements, excluding complements headed by ϕ :

(64) *... no matter how good it seems the students ϕ . [= (52)]

We can capture the restrictions on the subject of reduced ECQs straightforwardly, as restrictions on the subject of ϕ , and restrictions on the *wh*-phrase as restrictions on its complement.

It would increase the plausibility of this analysis if it could be shown that ϕ has some similarity with other null copulas that have been independently proposed for English in the HPSG literature.⁹ However, this is not possible.

Apart from the idiosyncratic restriction on the subject (only definite NPs), its complementation behaviour is quite restricted when compared to other

⁹Examples include Sag et al. (2003), Bender (2001), and Avgustinova (2006).

null copulas. For example, because the *wh*-expression in an ECQ is always fronted, the complement of ϕ is always a gap. By contrast according to Bender the complement of the AAVE null copula is never a gap – it is always *in situ*.

Notice also that ϕ must be compatible with both present and past tenses, since it is compatible both with environments which require present and environments which require past forms of the overt copula:

- (65) a. They were brave, no matter how dangerous the situation was/*is.
- b. They are brave, no matter how dangerous the situation *was/is.
- c. They were brave, no matter how dangerous the situation ϕ .
- d. They are brave, no matter how dangerous the situation ϕ .

This is also unlike the situation with AAVE null copula, which is generally assumed to have no past form (e.g. Bender (2001, p87)).

Interaction with negation is also problematic. Consider the examples in (66). In a situation in which various people have made statements about what the answer is not, a participant who feels the discussion has been excessively negative might try to move it onwards and away from these negative views by saying something like (66a) with an overt copula. Notice that the corresponding reduced example, (66b), is ungrammatical:

- (66) a. No matter what the answer is not, we need to move on.
- b. *No matter what the answer ϕ not, we need to move on.

This should be surprising. For example, on the widely accepted analysis of Kim and Sag (2002), negation involves the addition of an optional complement to auxiliary verbs (including so-called ‘main verb’ *be*). One would expect ϕ to be able to undergo the same process, licensing *not* just like an overt copula. Notice that according to Bender (2001), some speakers of AAVE specifically allow a null copula in main clauses with negation (e.g. *They say they’re best friends and shit, but they not.* (Bender, 2001, 115)), suggesting that it undergoes this process.

More generally, ϕ seems to resist adverbial modification:¹⁰

- (67) no matter how difficult the problem actually *(is)

Notice this is not because of a general constraint on adverbials appearing next to phonologically empty structure – for example it is quite possible to have an adverbial in a clause that has undergone gapping:

- (68) Sam is allegedly in London, and Kim actually Δ in Rome.

Of course, these objections are not fatal. But there are more serious em-

¹⁰This point is different from the point about negation: while it is widely accepted that negation involves addition of an optional complement, the consensus is that preverbal adverbs like *actually* in (67) are *not* complements – see, e.g. Bouma et al. (2001).

pirical objections. In particular, on this analysis missing copula clauses consist of a slashed S, and contain a slashed VP, and one would expect it to be possible to conjoin them with similarly slashed constituents. However, this is clearly impossible with slashed VPs:¹¹

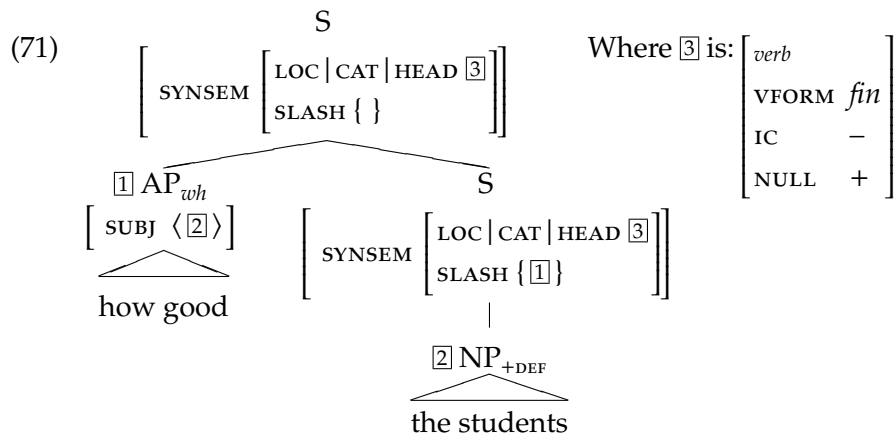
(69) *... no matter how good the students [ϕ] or [seem to be]

Examples involving a slashed S are equally bad: (70) cannot be interpreted as a conjunction of ECQs (the string represented in (70) can be interpreted, but not as a conjunction of ECQs – the interpretation involves a single ECQ with *the students* or *the lecturers* as the subject of *seem*).¹²

(70) *no matter how good [the students ϕ] or [the lecturers seem to be]

3.2 A Constructional Filler Analysis

However, it is also possible to provide a filler analysis without assuming a null form of the copula if one takes a constructional view. The non-*wh* sister can be treated as an S with a predicative expression in its SLASH value, and a single definite NP daughter which satisfies the subject requirements of the predicative expression.



¹¹An anonymous referee points out that there is a general constraint that conjuncts cannot be gaps (cf. the Element Constraint, e.g. Sag et al. (2003, Ch14)), and it is conceivable that some such constraint might apply to all empty elements, including a null copula. However, it is not straightforward to invoke such a principle here – in general what excludes gaps as conjuncts in cases like **Who did you see Δ and Kim?* is the lack of a head to license them (gaps are licensed as an effect of argument realisation). But this constraint is not applicable here where there would be a phonologically null head, not a missing argument.

¹²Of course, a reduced clause or VP and a non-reduced clause or VP will differ in the value of HEAD | NULL, but there is in general no requirement that conjuncts agree in their *head* values. The only requirement is that all conjuncts be compatible with the environment of the coordinate structure. So for example since *know* allows interrogative complements whose HEAD values are specified as either finite or non-finite, it allows coordinations of such complements: *I don't know what to drink or whether I'm allowed to eat anything.*

Here the higher S is a normal *head-filler-phrase*, and (apart from being [NULL +]) a normal *wh-interrogative-clause*, hence, for example, the *wh*-marking on the AP. The lower S involves a new phrase type, what we might call a *missing-copula-clause*, a subtype of *non-headed-phrase*. It involves a slashed S mother with an unslashed NP daughter (since the daughter is not a head this is consistent with the head-driven view of SLASH assumed in G&S). The type *missing-copula-clause* could be constrained as follows.

$$(72) \quad \text{missing-copula-clause} \rightarrow \left[\begin{array}{l} \text{SS | LOC | CAT} \\ \text{DTRS} \end{array} \left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \textit{verb} \\ \text{NULL +} \\ \text{IC -} \end{array} \right] \\ \text{SUBJ} \langle \rangle \\ \text{SLASH} \left\{ \text{AP} \left[\text{CAT | SUBJ} \langle \boxed{1} \rangle \right] \right\} \\ \left\langle \left[\text{SYNSEM} \boxed{1} \text{NP}_{+\text{DEF}} \right] \right\rangle \end{array} \right] \right]$$

This requires a *missing-copula-clause* to be an embedded clause (*verbal*, and SUBJ $\langle \rangle$), with a single definite NP daughter. The clause has as its SLASH value an AP whose SUBJ value is identified with the SYNSEM value of that single NP daughter.

Empirically, this approach can account for all the data that the null-copula analysis deals with. For example, there is no possibility of examples like (51) and (52), because on this analysis the second daughter of a reduced ECQ is an S containing just a definite NP, but the relevant parts of (51) and (52) cannot be analysed in this way.

(73) *... no matter how good *the students may*. [= (51)]

(74) *... no matter how good *it seems the students*. [= (52)]

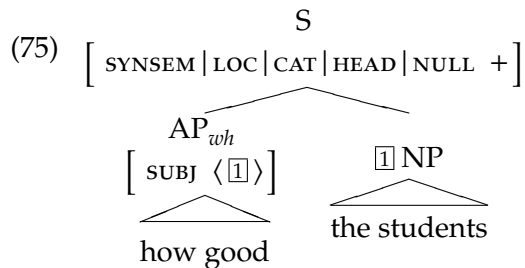
This account improves on the null-copula account in several ways (e.g. since there is no verb, there is no possibility of negation, or adverbial modification, so examples like (66b) and (67) are excluded straightforwardly), and there is no problem with examples like (69) involving conjunction of slashed VPs – there is no VP here to be conjoined.

Unfortunately, however, one of the major empirical objections remains: we still have a slashed S, and so we still wrongly predict that it should be possible to conjoin the subject of the reduced clause with a slashed S, as in (70).

This suggest that we should abandon the idea that the second daughter of a reduced clause is a slashed S, and look for an alternative analysis.

3.3 A Constructional Non-Filler Analysis

One possible alternative, suggested by Culicover (2013, 121-126), is that reduced ECQs involve a predicative expression preceding its subject, as in (75). We will extend and formalise this idea.



Let us call this construction a *reduced-wh-interrogative-clause*. It will be a sub-type of *non-headed-phrase* and *wh-interrog-clause*. It consists of an S, marked NULL+, dominating a *wh*-phrase, followed by the subject of the *wh*-phrase.

This avoids the coordination problems noted above: since on this analysis *the students* is an (un-slashed) NP, we would expect conjunction with a slashed clause, or a slashed VP to be impossible, as in (69) and (70), repeated here:¹³

(76) *no matter how good [the students] or [seem to be]

(77) *no matter how good [the students] or [the lecturers seem to be]

Likewise, there is no problem with negation – since there is no auxiliary verb, there is no argument structure to which *not* can be added, hence we account for the ungrammaticality of (78), and there is nothing for *actually* to modify, accounting for the impossibility of (67):¹⁴

(78) *No matter what the answer not, we need to move on. [cf. (66b)]

(79) *no matter how difficult the problem actually [cf. (67)]

We can rule out examples like (51) and (52), where the ‘missing copula’ is not the highest verb in the ECQ, straightforwardly: on this analysis the second daughter of a reduced ECQ is just an NP, but the relevant parts of (51) and (52) cannot be analysed in this way:

(80) *no matter how good *the students may*. [= (51)]

(81) *no matter how good *it seems that the students*. [= (52)]

¹³Recall that there is nothing wrong with the *string* in (77), just it cannot be understood as the coordination of two ECQs.

¹⁴Reduced versions of examples with post-verbal adverbs, like *in former times* in *no matter how good the students (were) in former times*, can be analysed as having the adverbial adjoined to S in (75).

As with the other analyses restrictions on the *wh*-expression and the subject in reduced ECQs can be dealt with straightforwardly, as constructional effects. We thus have an empirically satisfactory account.

Moreover, the account is not as stipulative as one might fear, based on (75), because the structure in (75) is not as idiosyncratic as might first appear. It is, in particular, very similar to a plausible analysis of reduced comparative correlatives (e.g. Borsley, 2004, 2011; Culicover, 2013):

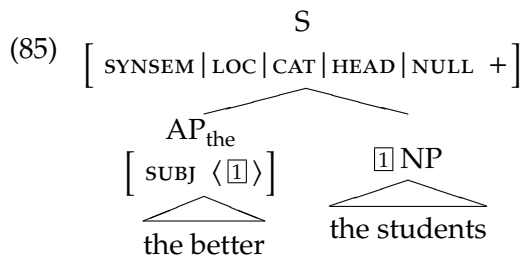
(82) The better the students (are), the more fun the class (is).

Notice there are similar restrictions on the subject NP, e.g. no pronouns or proper names:

(83) The better they *(are), the more fun the class is.

(84) The more interesting Kim *(is), the less interesting Pat *(is)

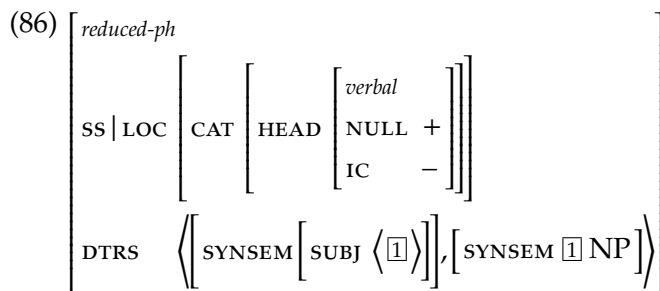
A plausible analysis for the initial part of (82) is provided in (85):



Compared to (75), the main syntactic difference is that the AP in a comparative correlative is marked with a feature that guarantees the presence of *the* (e.g. [CORREL *the*]), whereas the AP in (86) is marked +*WH* (more precisely, it has a *WH* feature whose value is a non-empty set of *parameters*).

These commonalities can be factored out, and assigned to a new construction type which we will call *reduced-phrase*, a sub-type of *non-headed-phrase*, which has sub-types *reduced-wh-interrogative-clause* and *reduced-comparative-correlative-clause*. We thus amend the *HEADEDNESS* dimension of the type system in G&S as in Figure 1, where our addition is highlighted.

Reduced-phrases are constrained as in (86), equivalent to (87). That is, a *reduced-phrase* is a non-root *verbal* expression (e.g. S) marked [NULL +], containing a predicate and its subject NP.



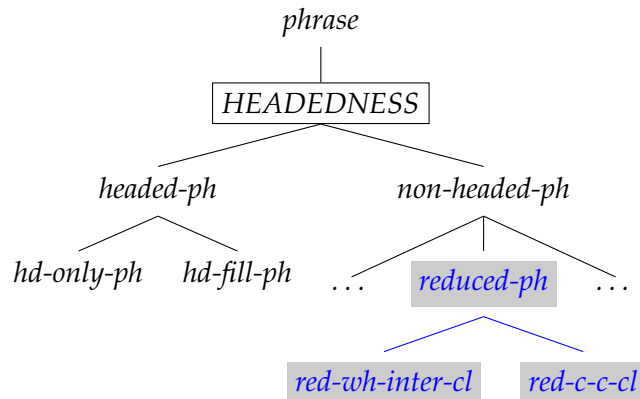


Figure 1: The HEADEDNESS dimension

$$(87) \left[\begin{array}{c} \text{SS} \mid \text{LOC} \mid \text{CAT} \left[\begin{array}{c} \text{HEAD} \left[\begin{array}{c} \textit{verbal} \\ \text{NULL} \mid + \\ \text{IC} \mid - \end{array} \right] \end{array} \right] \end{array} \right] \\ \left[\begin{array}{c} \text{CAT} \mid \text{SUBJ} \langle \boxed{1} \rangle \end{array} \right] \quad \boxed{1} \text{NP} \end{array} \right]$$

Rather than stipulate the other properties of reduced ECQs (e.g. their *question* semantics), we would prefer to inherit this information from elsewhere. Since all reduced ECQs are *wh*-interrogatives, the obvious super-type for this inheritance is *wh-inter-clause*. Unfortunately, this cannot be implemented directly, since *wh-inter-clause* is a subtype of *head-filler-phrase*, itself a sub-type of *headed-phrase*, and the analysis we are developing here assumes that reduced clauses are un-headed. To accommodate this, we can amend the CLAUSALITY dimension of G&S’s type hierarchy as in Figure 2, distinguishing *regular-wh-interrogative-clauses* (i.e. normal *wh*-interrogatives – what were formerly called just *wh-interrogative-clauses*) and *reduced-wh-interrogative-clauses*, which we are concerned with here.

The revised dimensions can be combined as in Figure 3 (where for readability we omit all sub-types of *inter-cl* except *wh-inter-cl*).

Notice that this leaves G&S’s hierarch essentially unchanged, and allows us to derive the properties of reduced ECQs almost without stipulation. Because they are a sub-type of *reduced-phrase* they are clauses, they consist of a predicative phrase and its subject, and they are restricted to embedded contexts, and contexts that permit [NULL +] clauses. Because they are a sub-type of *wh-inter-clause* they have the semantics of questions, and contain a *wh*-expression.

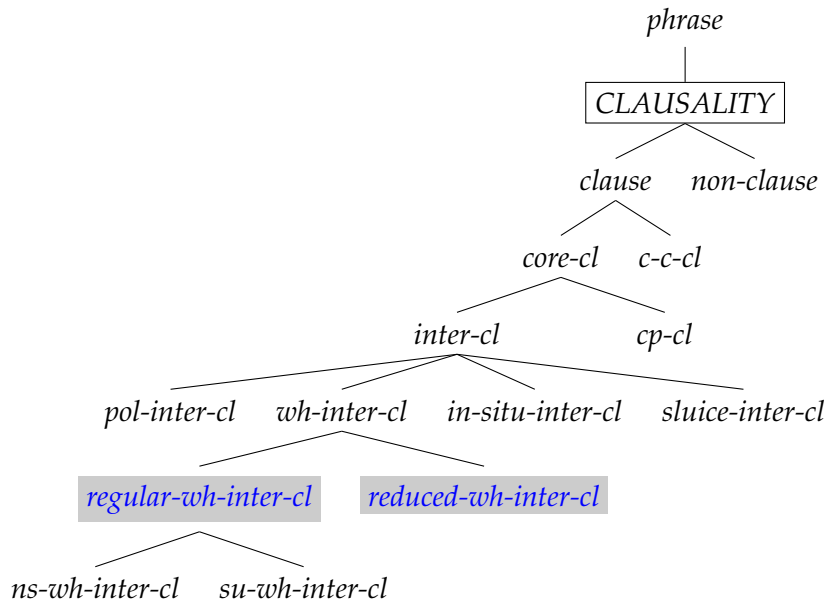


Figure 2: The CLAUSALITY dimension

Essentially the only constraint we require is one that will derive the semantics of the reduced clause from the semantics of the initial *wh*-phrase:

(88) *reduced-wh-inter-cl*:

$$\left[\text{CONT} \left[\text{PROP} \boxed{1} \right] \right] \rightarrow \left[\text{CONT} \boxed{1} \right], \text{ NP}$$

This is comparable to the G&S's Propositional Head Constraint (p229) which makes the semantics of a regular *wh*-question depend on the propositional semantics produced by its head, so that in *How good are the students?*—roughly ‘the students are x-much good’. (88) will ensure we get the same semantics for a reduced ECQ (*no matter how good the students*).

4 Problems, Discussion

In the previous sections we have given a basic HPSG analysis of ECs, including reduced ECs. It consists of a lexical entry for *no matter*, and a novel construction (*reduced-wh-interrogative-clause*), a non-standard predicative construction, which has similarities with comparative correlatives, and which captures the properties of reduced ECs (for un-reduced ECs there is nothing to say – the ECQ is just a normal interrogative). This is still some way from a complete account of the phenomena, however. In this section, we summarise some of the remaining problems and open questions.

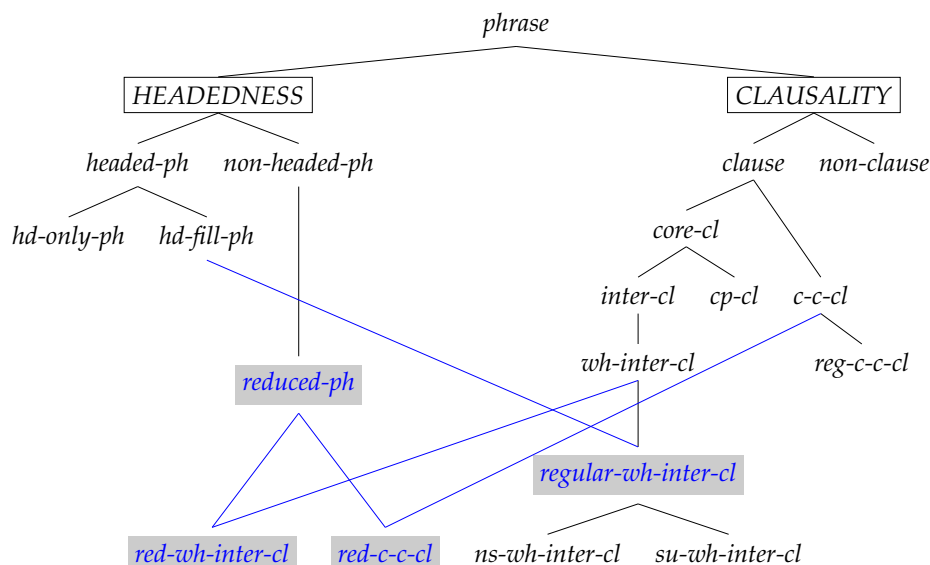


Figure 3: The revised hierarchy of *phrase* types

First, as noted at the end of Section 2, we have given only a partial account of ungoverned ECs, and of ECs governed by expressions other than *no matter*.

Second, as regards the *wh*-expression in reduced ECs, our discussion has focussed on APs involving *how*. However, other kinds of *wh*-expression are attested, the following are some examples (lightly edited from corpora):

- (89) They rarely find fault with paintings, no matter *what* their subject or style.
- (90) ... not to tolerate any further human rights abuses, no matter *who* the perpetrators
- (91) ... personnel can get the information they need, no matter *where* the incident.
- (92) ... must be completed, no matter *when* the deadline.
- (93) ... should be considered, no matter *what nationality* the applicant.
- (94) Massachusetts has a no-fault workers' compensation system that provides medical benefits. . . , no matter *whose fault* the accident.

For the most part, dealing with these involves a simple extension of the account we have presented. However, some of these have interesting theoretical implications. For example, our analysis involves the *wh*-phrase having a subject slot, i.e. being in some sense predicative. For APs, such as discussed in Section 3 this is clearly reasonable. For some other *wh*-expression it is less obviously correct. For example the question involved in (90) is 'identificational' (cf. a potential answer 'the perpetrators are General

X and Colonel Y'), and many approaches would assume that in such a case *who* would not have a SUBJ slot – in which case (90) would not fit any of the analyses we have looked at. While there are other approaches, including G&S (p195), which assume there is a SUBJ slot in such cases, and which would be consistent with our analysis, the issue deserves consideration.

There are also some restrictions on the kind of *wh*-expression that can occur in reduced ECs. Some, like (95), we can account for straightforwardly.

(95) *no matter which students successful

The ungrammaticality of examples like this is predicted on our account: on our account, a reduced ECQ consists of a predicate followed by a subject, but in a case like this the word order is subject-predicate – cf. the corresponding un-reduced example would be (96) (to put it another way, in this case the *wh*-phrase cannot be analysed as having an open SUBJ slot, and the second daughter is not an NP):

(96) no matter which students are successful

However, other examples are more puzzling: (97), is ungrammatical, and an initially appealing explanation is that this is because there is something wrong with the question it involves ('What geniuses are the students?' is not a question that has any very obvious range of potential answers, which is something that is required for an EC).¹⁵

(97) *no matter what geniuses the students

Unfortunately, this account is hard to reconcile with the fact that the un-reduced version is acceptable:

(98) no matter what geniuses the students are

Thus, there are a number of issues that require further investigation.

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¹⁵We are grateful to an anonymous referee for bringing examples like (97) to our attention.

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