GREENBERG'S U(NIVERSAL) 20:
NEW INSIGHTS AND PERSPECTIVES

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ACCEPTED VERSION

THE FINAL VERSION WITH FURTHER REVISIONS
AND CHANGES TO THE TYPESETTING AND
FORMATTING CAN BE FOUND IN:

Abstract

Several attempts have been made in order to formulate an updated version of Greenberg's (1966 [1963]) U(niversal) 20. Although the various authors' goals and methodologies vary from one another, I tried to compare their observations, and it was a profitable effort. By connecting the dots among their works, I came up with a personal, brand new analysis of U20 which explains Cinque's (2005) and Dryer's (2018) data, both qualitatively and quantitatively. As the reader will see below, I claim that a «double F(inal)-O(ver)-F(inal) C(ondition)» can be on the right track to pursue a description and an explanation of U20: firstly, Greenberg's U(niversal) 18 derives as a corollary, since the «second» FOFC I posit complies with Culbertson's (2017) reflections on U18; secondly, such an assumption reinforces the iconicity principles formulated by Rijkhoff (2002) and Dryer (2018); thirdly, it suggests that in order to describe and explain U20 one needs to focus on what languages cannot generate, rather than on what they can, as Pullum (2013) and Müller (2016) point out. Lastly, a unifying proposal which draws from different methodologies suggests that in the future it will be necessary to pinpoint a consistent definition of the categories included within U20.

Keywords: U20, FOFC, Noun Phrase, syntax, typology.

Typological analyses of U20

A syntactic model that clearly distinguishes between admissible and impossible arrangements is apparently falsifiable in two complementary ways: on the one side, one could demonstrate that some of the attested orders are actually empirically spurious or theoretically inadequate, while on the other side future investigations could retrieve within a certain language an order which was previously unattested. If at least one of these two possibilities happened, the model under scrutiny would be falsified and consequently abandoned, but as far as it is verified, it should be kept as a valuable formalization.

However, there are certain matters that are so complex that it is hard to get even a general consensus on the very premises needed to begin such an inquiry. Greenberg's (1966 [1963]) U(niversal) 20 is one of these issues: given that several authors disagree on how to diagnose the presence of demonstratives, numerals, adjectives and nouns among different languages, the formulation of a generalization concerning their cross-linguistic syntactic organization (which is what Greenberg tried to do by stating U20) becomes hard and tentative. Some researchers apply these categories a priori without questioning their properties or without making an explicit definition, while others reject the availability of useful categories for any kind of cross-linguistic generalization (see Haspelmath 2014). In between these two extreme points there are several authors who adopt the four aforementioned categories with different degrees of strictness and coherence, so that the number of attested arrangements varies accordingly.

An example is represented by Rijkhoff (2002, 2015), who claims that the nominal domain complies in any language with an iconic nesting of the Aristotelian categories of "quality, quantity and location". Put differently, Rijkhoff (2015) claims that the eight surface unmarked orders he finds in the data actually mirror the formal "underlying clause structure" he posits in order to describe them. The following quotation reports such permutations (where "N" stands for "Noun"):

[N A Num Dem], [Dem Num A N], [Dem Num N A], [A N Num Dem],
[Dem N A Num] [Num A N Dem], [Num N A Dem] and [Dem A N Num].

However, in Rijkhoff (2002) six of them were already enough to cover
the attestations in the sample: the remaining two, viz. [A N Num Dem] and
[Dem A N Num], were absent. His difficulties in finding them is worth
noting, because they indicate that these orders are not equally likely, which
is a fact that contradicts their alleged iconicity.

One can easily acknowledge that Rijkhoff's description of U20 could be
falsified in the aforementioned ways. However, he would not agree with the
falsification process we sketched. According to Rijkhoff (2016 §5), any
researcher who reports a greater number of attested syntactic arrangements
(i.e. more than eight out of the twenty-four theoretically possible
permutations of the four syntactic elements involved in Greenberg's
original generalization) is actually "mixing apples and oranges". He claims
that within such works functional, semantic and syntactic criteria are
applied (if they are) in a fuzzy, non-replicable way, so that the data
considered abound with false attestations.

I think that Rijkhoff's statements can be furtherly clarified by putting
them in contrast with another analysis of U20: Steedman (2020). Even
though they adhere to different frameworks ("Discourse Functional
Grammar" and "Combinatory Categorial Grammar", respectively), they
nonetheless agree that there are six orders which are both rather common
cross-linguistically and coherent with Croft's (2003, 204) notion of
"structural isomorphism". However, their analyses diverge from this point
on. While Rijkhoff (2015) not only finds no counterexamples, but also
struggles to collect verifications of the two further permutations that his
formalization allows, Steedman (2020) claims on the other side that, among
the twenty-four possible permutations, six (i.e. the ones mentioned afore)
are the most common, sixteen are much rarer, and only two are never
attested. According to Steedman, [Num N Dem A] and [A Dem N Num] are
unattested because of the combinatory properties of the four categories
involved in U20 (which are effectively formalized by the framework he
adheres to). His analysis of U20 is confirmed by Nchare's (2012) analysis
of Shupamem, a language which allows a lot of syntactic scrambling. Given
that this feature of Shupamem is also used by its speakers for conversational
needs, one can easily understand why Rijkhoff rejects data that Steedman
would admit: the former narrows them by applying an explicit list of criteria
which exclude any marked use of a certain category, while the latter accepts
any order, no matter whether marked. Anyway, the fact that such loose a

criterion still excludes conceivable possibilities is, according to Steedman (2020), a result that cannot be the product of chance.

Another analysis of U20 is given by Dryer (2018). Dryer finds eighteen orders (out of twenty-four) in his typological inquiry of more than five hundred languages. The methodology he applies in order to get such a result lies between Steedman's openness and Rijkhoff's strictness. On the one side he rejects marked orders (such as topicalisations), while on the other side the criteria he adopts for determining the syntactic elements are less narrow than the ones used by Rijkhoff. One can easily ascertain this fact by confronting the different approach they have into considering what is an adjective. While Dryer (2013a) claims that "the term adjective should be interpreted in a semantic sense [...] with meanings such as 'big', 'good', or 'red'", Rijkhoff (2015 §3.3.2) rejects the adoption of the semantic criterion by itself by stating what follows:

> [B]y employing [only] semantically defined categories, the same constituent ordering patterns (e.g. the order of adjective and noun) can be investigated in all the world's languages, even when it is clear from the grammatical description of a language that the constituents involved belong to different form classes, whose members can have their own, form-based ordering preferences.

Thus, the difference between these two approaches becomes rather evident when Dryer and Rijkhoff deal with languages which use only noun modifiers or relative clauses as descriptive modifiers of the head noun: while the former considers them adjectives because of their semantic sense, the latter (2002, 100) claims that these solutions are consistently adopted for modifying a noun whenever "a language does not have a distinct category of adjectives".

A syntactic analysis of U20

Dryer's (2018) results are somehow similar to the data taken for granted by another strand of proposals which try to analyse U20. These works all rely on Cinque (2005), who collected the data on U20 from previous inquiries of any theoretical fashion and came up with fourteen attested orders. In fact, Dryer (2018) pays attention to the quantitative distribution of the attested permutations so to compare his data with the one given by Cinque's earlier work, which were divided between orders attested in "very many languages", "many languages", "few languages" and "very few languages".

Cinque's analysis of U20 relies on the formal dissertation given by Kayne (1994) within the generativist approach, in which Kayne re-thinks many generativist tenets by starting from a new principle defined as the "L(inear) C(orrispondence) A(xiom)". Instead of taking X-bar theory as a basic principle, Kayne (1994 §4.1) derives it as a corollary by stating that a phrase marker can only be made of a S(pecifier), a H(ead) and a C(omplement). Moreover:

> No matter how complex the specifier or the complement, it will always be the case, in any phrase marker, that specifier and complement are on opposite sides of the head.

Two options are then available for the syntactic hierarchical structure: S-H-C and C-H-S, depending respectively on whether LCA determines relations of precedence or of subsequence. Kayne opts for the former to be the basic one, and such a choice is also somehow typologically grounded: C-H-S would be the mirror image of the Word Order O(bject)-V(erb)-S(ubject), which according to Greenberg (1966, 76) is "excessively rare". Hence, Kayne concludes that the syntactic spine can only grow downwards from left to right, with any Specifier occupying a higher position in the syntactic structure in comparison to the other two formal elements contained within the same phrase marker.

On a theory-independent fashion, Kayne's motivations for this last statement show some advantages and some withdrawals at once. On the one side, the reasons which lead him to state that S-H-C prevails over C-H-S could be attributed to a typological observation and to a functional pressure, respectively; one may hence note, as Newmeyer (1998 §6.7) does, that Kayne's (1994) generativist approach leaves room for a few reflections which could be actually typical of a functionalist one. On the other side, Kayne's functional explanation is nonetheless ascribed to a formal reflection concerning the "asymmetry of time", rather than to a functional pressure per se. Moreover, the typological observation is inadequate. In fact, Kayne's (1994, 35) typological statements are based on "[a] rapid look at (a small subset of) the world's (presently existing) languages", a fact that leads him to assert that S-V-O order, being the linear mirror image of the hierarchical S(pecifier)-H(ead)-C(omplement) structure, must be the base order from which any syntactic structure of any language is derived. As Newmeyer (1998, 360) notes, this contradicts "[t]he literature in language typology [...] which [...] gives little credence to the idea that [that] order predominates". In particular, it is hard to believe S-O-V to be derived via syntactic movement from S-V-O, especially if one considers that the former

is more than equally likely on a cross-linguistic level as compared to the latter.

 Cinque's (2005) analysis of U20 inherits strengths and weaknesses from Kayne's proposal. In particular, Cinque tries to describe the cross-linguistic quantitative and qualitative variation of the attested arrangements by assuming that any attested permutation can be derived from the [Dem [Num [A [N]]]] base. The reader should recall that, in order to comply with Kayne's antisymmetric principles the elements in such a structure are disposed on a spine going downwards from left to right. Hence, according to Cinque's representation the demonstrative is the topmost element of U20, while the noun is the lowermost.

Any attested order which differs from the base-generated one is supposed to be derived from it via movement. If one order is less attested than another, it is because the steps required to derive the former are more marked than the latter. If a permutation is not attested (and it is worth recalling that Cinque counts ten orders featuring this typological property), it is because there is no legitimate syntactic movement that can derive it from the base structure. In particular, Kayne (1994, 50) states that elements cannot be moved nor adjoined to the right, so that the only available option is raising them via leftward movement.

Cinque expands this set of tenets in order to give a full description of U20. Together with a ban on any rightward movement, he adds a prohibition concerning the autonomous raisings of Dem(onstrative), Num(eral), and A(djective): Cinque (2005, 317) posits that their movement can occur only when the N(oun) raises (leftward) past them and then "pied-pipes" them, just like the pied-piper of Hamel(i)n used to enthrall out of town the rats and then the children. Moreover, Cinque (2005) explicitly states that in the syntactic spine any moved constituent must raise to an upper slot that is empty before its arrival. Because of this, such a representation "postulate[s] an abundance of unpronounced material", as Medeiros (2018, 3) notes, and it "involves articulated structures and quite a lot of movement, [... which is] even more general than previously thought", as Koopman (2000, 324) acknowledges. Koopman herself (2000, 351) actually contributes to such a development of Kayne's framework, since she postulates a principle that is widely (though often tacitly) accepted among many authors of his framework, including Cinque:

> Languages are expected to have overt heads with silent Specs or silent Specs with overt heads. [... At least in] some cases [...] the actual surface word orders derive from the interaction of leftward movement to Spec and the presence of a head.

Combining the aforementioned approaches

By keeping the proposals and the formal details given this far, it is now possible to move to a generativist analysis of U20 which sets against Cinque's explanation while still recognizing the validity of Kayne's antisymmetric assumptions. Such an approach is known as the "F(inal-) O(ver-) F(inal) C(ondition)". As Holmberg (2017a) shows, FOFC is a basic general principle which is supposed to explain many syntactic phenomena, both intralingual (as Holmberg 2000 shows for example regarding Finnish) and cross-linguistic in nature (see Biberauer *et al.* 2014), on both a synchronic and a diachronic tier (see Ledgeway 2012a and 2012b, 239 about the latter issue), though without being what Mobbs (2008, 44) would call a "panchronic [...] theory of typology". Moreover, a single principle that can help explain phenomena apparently different fits with their possible interrelation supposed by Greenberg *et al.* (1966, xxiii) and Givón (2002, 217).

Holmberg (2017a, 1) gives two formulations in order to illustrate FOFC, being the first one (a) the "informal" variant (see Biberauer *et al.* 2014, 171) and the second one (b) its formal alternative:

a. A head-final phrase αP cannot immediately dominate a head-initial phrase βP, if α and β are members of the same extended projection.
b. *[$_{αP}$ [$_{βP}$ β γP] α], where β and γ are sisters and α and β are members of the same extended projection.

Thus, FOFC predicts the bracketing above to be ruled out, but also states that [$_{αP}$ α [$_{βP}$ γP β]] is less likely than the other two possible syntactic configurations, i.e. [$_{αP}$ [$_{βP}$ γP β] α] and [$_{αP}$ α [$_{βP}$ β γP]], a fact that explains why Biberauer *et al.* (2014, 170) explicitly posit FOFC as a fruitful combination of "both the Greenbergian and the Chomskyan traditions". On the one side, the better chance for the last two structures mentioned to occur is due to their structural consistency, so that the theorists of FOFC claim that these configurations faithfully reflect Greenberg's (1966, 97) notion of "Harmony", both on an empirical and on a structural ground, and mirror the cross-categorial harmonic configurations posited by Dryer (1992) (and visually illustrated by Newmeyer 1998, 344) through his "B(ranching) D(irection) T(heory)". On the other side, FOFC posits not only that [$_{αP}$ α [$_{βP}$ γP β]] and *[$_{αP}$ [$_{βP}$ β γP] α] are disharmonic bracketings, but also that Greenberg's (1966, 97) notion of "Dominance" can be applied, since the ruling out of the latter matches "the logical factor of a zero in [a] tetrachoric

table", thus reflecting the outcomes of a unidirectional implication (i.e. the logic relation that inspires Greenberg's *et al.* 1966 §4 "universal implications" and "statistical correlations").

It may seem unclear how can these four structures support Kayne's (1994) antisymmetry (as I claimed before), given that only $[_{\alpha P} \alpha [_{\beta P} \gamma P \beta]]$ and $[_{\alpha P} \alpha [_{\beta P} \beta \gamma P]$ stand for a syntactic spine going downwards from left to right. The answer lies on the fact that the structures discussed through FOFC do not exhibit the same granularity of Kayne's ones, which involve single phrase structure. On the contrary, in the bracketings given above α and β are heads of different phrases, which may be obtained after the syntactic movements posited by Kayne (1994), Koopman (2000 [1996]) and Cinque (2005) applied. However, these phrases belong to the same "extended" projection, i.e. they bear some common syntactic properties which cross-categorially relate them, as it is acknowledged by Hawkins (2013, 391-392):

> [FOFC] incorporates principles of Minimalist Syntax (Chomsky 2000 [...]) and has, in effect, limited the applicability of FOFC to those instances [...] in which YP[hrase] and XP[hrase] are of the same or similar syntactic type, e.g. both verbal heads of some kind [...].

This restriction to the applicability of FOFC entails two consequences. Firstly, the only thing that makes FOFC fit into Kayne's antisymmetric framework is Greenberg's relation of "Dominance" applied to such a syntactic constraint, as pointed out by Biberauer *et al.* (2014, 207-208):

> The proposal here, as in Kaynean work more generally, is that surface head-final order is also always the result of movement. In order to precede a given head, a complement must move from its position as sister of that head to a position where it asymmetrically c-commands the head (Kayne 1994, 47–48). Head-initial order, on the other hand, can (but need not) be derived without any movement. That is to say, head-final order is derivationally more complex than head-initial order, in the sense that it must involve a step of movement that head-initial order does not absolutely require.

The second consequence of FOFC ruling only across constituents sharing some common syntactic feature, e.g. either a verbal one or a nominal one, is that it helps the analysis of the syntactic elements taken into account by Greenberg's U20. The analyses carried out by Biberauer *et al.* (2014 §2.4) and Roberts (2017 §8.2) explicitly exclude the category A(djective), since it is probably an non-unified one: they claim, like Cinque (2014) and Rijkhoff (2002, 100) do, that many adjectives are actually "R(estricted) R(elative) C(lauses)",[i] both on an intralingual and on a cross-linguistic tier, while other adjectives are not.

Because of this exclusion, only Dem(onstrative), Num(eral) and N(oun) are considered by Biberauer *et al.* (2014 §2.4) and Roberts (2017 §8.2). On this basis they state that FOFC applies by replacing α with Dem, β with Num and γ with N. Hence, the configuration *[$_{DemP}$ [$_{NumP}$ Num NP] [Dem]] is ruled out (being it the recessive, disharmonic one), while [$_{DemP}$ [$_{NumP}$ NP Num] Dem], [$_{DemP}$ Dem [$_{NumP}$ Num NP]], and [$_{DemP}$ Dem [$_{NumP}$ [NP] Num]] may occur, the last one being less likely than the other two.

After bringing the A(djective) back into the picture, it turns out that the linear order [Num N A Dem] is widely attested among VSO languages like Welsh and Scottish Gaelic, thus apparently violating FOFC, and this happens as well with the order [Num N Dem A]. Biberauer *et al.* and Roberts justify these empirical data by stating that they do not represent a true violation of FOFC, i.e. in these cases the linearization of [Num N Dem] should feature a different inner bracketing. Their reflection mainly dwells on the order [Num N A Dem], since the languages which feature it have determinative articles and demonstratives that tend to co-occur separately within a single string. According to them, this happens because in these languages articles and demonstratives cover two complementary functions which do not overlap, i.e. they are markers of definiteness and deixis, respectively.

According to Roberts (2017, 160-161) definiteness and deixis are carried out in the other languages either by a syntactic portmanteau or by elements which either co-occur adjacently or alternate with one another. He (2017 §8.5.1 and 2018, 118) furtherly claims that every attestation of articles and demonstratives that is not syntactically comparable either to Welsh or to Hebrew shows a syntactic phenomenon that he calls "incorporation". He posits that in these languages the D(eterminer) exhibits both its syntactic features[ii] and the ones of the Dem(onstrative), so that the former triggers the syntactic movement of the latter, thus leading to either their adjacent co-occurrence, or to their paradigmatic alternation, or the non-pronunciation of the latter. Strikingly, every typological alternative considered by Roberts (2017, 160-161) and his subsequent explanations do not contradict Rijkhoff's (2002) "Principle of Scope", nor they go against the observations that "diachronically [...] a demonstrative (Location) may turn into a definite article (Discourse-Referential), and the numeral one (Quantity) may become an indefinite article (Discourse-Referential)" (see Rijkhoff 2009, 62) and that "an adnominal demonstrative is a LOCALIZING MODIFIER in its deictic function, but a DISCOURSE-REFERENTIAL MODIFIER when it merely marks definiteness" (see Rijkhoff 2015, 651. Caps kept from the original layout).

Criticising the aforementioned approaches

However, a comparison between the predictions of such an application of FOFC and the typological data gathered by Cinque (2005) shows that the empirical cross-linguistic attestations vary too much. Since the orders featuring [N Num Dem] and [Dem Num N] are deemed to be harmonic, they all should be consistently more frequent than any other order, but it seems not to be the case. Put it another way, such a FOFC fails to be explanatory on a quantitative basis, even though it leads its theorists to some insightful observation. Roberts (2017) tries to give a justification to this quantitative matter through a Minimalist approach which resembles the one adopted by Cinque (2005), i.e. he posits a base-generated structure and then tries to correlate the quantitative data available with the eligibility of the syntactic movements necessary to obtain the other orders. However, six orders still result problematic through Roberts's (2017) analysis, because they contradict his expectations either on a structural or on a quantitative basis.

A formalist analysis that refuses both Kayne's antisymmetric approach and Cinque's (2005) explanation of U20 is advanced by Abels and Neeleman (2006, 2012). They reject the validity of what they call Kayne's "S(pecifier-) H(ead-) C(omplement) H(ypothesis)", since they dispute Kayne's LCA to have effective knock-on restrictions on the generativist X-bar theory. According to them, the main flaw on Kayne's argument is that LCA fails to explicitly provide a theory of labeling for X-bar theory,[iii] and because of this Abels and Neeleman (2012, 41-42) prove themselves able to bring back to the picture hierarchical structures which do not violate LCA, even though they should be unacceptable according to Kayne's (1994) terms.

That being said, Abels and Neeleman come to the conclusion that the hierarchical structure does not need to go forcedly downwards from left to right as in Kayne (1994). Moreover, an effective explanation of U20 based on Cinque's (2005) typological data can be posited after dispensing with any syntactic label and after "shrinking" Cinque's tree, i.e. after eliminating the silent slots that are supposed to host raised element.

Abels and Neeleman (2012, 33) prove their claims by providing an alternative analysis of Cinque's data concerning U20. They begin from the same hierarchical relations that Cinque posits for the elements of the noun phrase (i.e. "Dem≻Num≻A≻N, where ≻ indicates c-command"), but since they reject the necessity of an antisymmetric spine which develops downwards from left to right, they come up with eight base-generated orders

that are mutually symmetric. Because of that, Abels and Neeleman call their proposal a "symmetric framework" which opposes to Kayne's antisymmetric one. Such eight orders can be illustrated through the following symmetric pairs of bracketed structures:[iv]

[[[[N] [A]] [Num]] [Dem]]   [[Dem] [[Num] [[A] [N]]]]
[[Dem] [[Num] [[N] [A]]]]   [[[[A] [N]] [Num]] [Dem]]
[[Dem] [[[A] [N]] [Num]]]   [[[Num] [[N] [A]]] [Dem]]
[[Dem] [[[N] [A]] [Num]]]   [[[Num] [[A] [N]]] [Dem]]

In order to predict all the fourteen orders which are attested according to Cinque's (2005) survey, Abels and Neeleman (2012, 33) posit that the six remaining orders are obtainable via syntactic movements, which are deemed to "target a c-commanding position" and may occur only if they "move a subtree containing N". These assumptions regarding syntactic movements are somehow similar to the ones posited by Cinque (2005), but they still would generate more than the six missing orders. Because of this, Abels and Neeleman postulate that such movements can only occur leftwards. Even if such an assertion is similar to Kayne's (1994) one and has analogous consequences, it is formulated on a different basis, since it is credited to the speaker's ability to parse the linguistic strings, as Abels and Neeleman (2012, 69) clarify:

 [T]he parser needs to recover hierarchical structures from input strings that are presented to it incrementally. In other words, there is an inherent asymmetry in the parsing process: bits of the input presented to the parser earlier on are associated with a structure before substrings presented later. [...] It follows from this that leftward and rightward movement are different with respect to parsing. [...] Under certain circumstances th[e latter] is hard or impossible[.]

In sum, Abels and Neeleman (2006, 2012) analysis of U20 shows some unavoidable analogies with Kayne (1994) and Cinque (2005), but their foundational axioms aim to be as contrastive as possible against the antisymmetric framework. However, their proposal fails to give a quantitative justification for the data towards which their discussion is moving, i.e. the ones given by Cinque (2005): even if they can explain the same orders as he does, their proposal would lead us to expect the eight base-generated orders to be evenly more common than the six ones derived via leftward movement, but such an expectation is disproven by the data.

Towards a new analysis of U20

Some readers might have noticed an interesting coincidence: the eight base-generated orders posited by Abels and Neeleman and shown above perfectly match the iconic ones formulated by Rijkhoff (2002, 313). Two observations follow from this fact. Firstly, these orders present many outstanding properties, so that different authors with different methodological approaches and different goals are nonetheless lead to posit them as base-generated or iconic orders. Secondly, given that Abels and Neeleman (2012) do not utter any direct reflection on a quantitative point of view, it might be profitable to recall that in Rijkhoff (2002) two of them (i.e. [Dem A N Num] and [A N Num Dem]) are not featured by any language of his sample.

Another intriguing coincidence is the following: the first four hierarchies described by Abels and Neeleman display a structure which is somehow different from the four ones below them. Such a distinction can be underlined through Krivochen's (2018, 10) statement:

> In a derivational theory like the Minimalist Program, in which structure is built in a dedicated syntactic component by means of discrete combinatorics, we need to distinguish between operations that extend the phrase marker uniformly introducing a single terminal at a time (thus producing a series of structures {head, non-head}[...]) and operations which extend the phrase marker by introducing not a terminal, but a complex object (itself derived by the combinatoric operation). The first case [...] is referred to as monotonic Merge because the phrase marker grows uniformly (a single terminal at a time); the second [...] is referred to as non-monotonic Merge.

By applying Krivochen's distinction to the eight structures proposed by Abels and Neeleman (2012, 33-34), it turns out that the four topmost structures given above are examples of what Krivochen calls "monotonic Merge", while the remaining four look like instances of "non-monotonic Merge". By following this distinction one can hence divide the eight orders into two subgroups, each of which contains two couples of structures that are mutually symmetric. Such groupings, here called respectively G(roup) 1 and G(roup) 2, are thus the following:

G1: {[Dem Num A N]; [Dem Num N A]; [A N Num Dem]; [N A Num Dem]}

G2: {[Dem A N Num]; [Dem N A Num]; [Num A N Dem]; [Num N A Dem]}

Concerning the permutations in G1 (i.e. the instances of monotonic Merge), Cinque (2005, 319-320) claims that [N A Num Dem] and [Dem Num A N] both appear in "very many languages", while [Dem N A Num] appears in "many languages" and [A N Num Dem] in "very few languages".

If one looks at these permutation as if they were a Greenbergian tetrachoric, one would note that such quantitative distributions mirror the predictions makeable through the "F(inal-) O(ver-) F(inal) C(ondition)". However, none of the four orders within G1 features the linear order *[Num N Dem], i.e. the only one explicitly ruled out by Biberauer *et al.* (2014 §2.4) and Roberts (2017). Hence, the inquiry I have summarized so far leads me to make the following statement: there is another FOFC operating on those linear orders, and it applies by substituting α with Num(eral), β with A(djective) and γ with N(oun) to Holmberg's aforementioned formalization, thus obtaining the avoidance of *[A N Num].

Actually, such a further constraint within the nominal domain would not be an utterly new finding. Greenberg's (1966 [1963]) U(niversal) 18 hints at it by noticing that "when the descriptive adjective precedes the noun, the demonstrative and the numeral, with overwhelmingly more than chance frequency, do likewise". This fact is furthermore reformulated by Culberson (2017, 26) as a stricter implicational universal which sets the demonstratives aside: "if Adj-N, then Num-N". Moreover, Culbertson's statement is not only perfectly matching with the claim of a second FOFC operating withing U20, but seems also to be supported by "A(rtificial) L(anguage) L(earning)" tests.

One can also state that the hierarchical structures posited by the theorists of FOFC do coincide with the first four structures given by Abels and Neeleman (2012), if one sets aside the different syntactic labelings and cuts off the Dem(onstrative) from the latter ones. These preconditions apparently weaken the previous general statement, but in my humble opinion it is not actually the case. It is true that the absence of labels in Abels and Neeleman's analysis of U20 is what leads Roberts (2017, 178) to claim that "it is impossible to evaluate the[ir] structures in relation to FOFC", but a wider comparison that includes also Rijkhoff (2002) and Cinque's (2005) analyses adds some interesting, overlapping points that, as one can see, shed light on a solution for this incompatibility.

An immediate question arises: how would such new a FOFC behave in relation with the one formerly stated? The answer I propose is that they both apply on a single nominal domain. Since the orders considered above in G1 do not violate the FOFC posited by Bibeauer *et al.* (2014 §2.4) and Roberts (2017), this kind of interaction might not seem straightforward, but it becomes more evident through an analysis of G2, i.e. Abels and Neeleman's

four base-generated order that represent an instance of non-monotonic Merge.

In order to distinguish the eight bracketings involved in the two aforementioned FOFC-s I use Greek and Latin letters as follows:

[DemP [NumP NP Num] Dem]	=	α
[DemP Dem [NumP Num NP]]	=	β
[DemP Dem [NumP [NP] Num]]	=	γ
*[DemP [NumP Num NP] Dem]	=	δ
[NumP [AP NP A] Num]	=	A
[NumP Num [AP A NP]]	=	B
[NumP Num [AP [NP] A]]	=	C
*[NumP [AP A NP] Num]	=	D

It is now possible to highlight which structures may apply to the eight orders of G1 and G2 (I show the orders belonging to G1 first), together with the cross-linguistic frequence given by Cinque (2005).

[N A Num Dem]	α (harm)	+ A (harm)	*very many*;
[Dem Num A N]	β (harm)	+ B (harm)	*very many*;
[Dem Num N A]	β (harm)	+ C (dis)	*many*;
[A N Num Dem]	α (harm)	+ D (r.o.)	*very few*.
[Dem N A Num]	γ (dis)	+ A (harm)	*many*;
[Num A N Dem]	δ (r.o.)	+ B (harm)	*very few*;
[Num N A Dem]	δ (r.o.)	+ C (dis)	*few*;
[A N Num Dem]	γ (dis)	+ D (r.o.)	*very few*.

As one can see, both groups show similar results: the orders that are harm(onic) to both FOFCs occur in "very many languages". If one of them is dis(harmonic) (though still allowed), the overall string appears in "many languages". If one of the two structures is r(uled) o(ut by a FOFC), the languages featuring them are (very) few.

This evidence has interesting consequences. For a start, a violation of only one of the two constraints does not seem to make a linear string generally impossible in a neutral context. This supports of course what Rijkhoff (2002) and Abels and Neeleman (2012) claim, i.e. that these orders are eligible, but nonetheless it does not seem to contradict Sheehan's *et al.* (2017) claim that FOFC, whether applicable, is a universal without exceptions: both FOFCs cannot be violated at once. In fact, such a violation would require a redundancy of one of the two elements shared by both FOFC-s, i.e. either the Num(eral) or the N(oun) would appear twice in the linear surface order.

Secondly, the further restriction I set forward fits with the fact that "[n]umerals [...] have a tendency to precede the noun", as Rijkhoff (2002, 308) states, although it adds an actual preference (which Rijkhoff does not posit) for the adjectives to follow the noun, as in Culbertson's reformulation of U18. Moreover, these two findings strongly comply with the five principles adopted by Dryer (2018, 801) in order to sketch a description of his data concerning U20. In particular, the former overlaps with his "Asymmetry principle: the iconicity principles apply more strongly to prenominal modifiers than they do to postnominal modifiers", while the latter overlaps with the fact that "Noun-Adjective order is preferred over Adjective-Noun order".

Thirdly, such a «double FOFC» does not seem to contradict Croft's (2003, 204) assertion that "[i]n some cases, it might be argued that economy, rather than iconicity (or perhaps combined with iconicity) motivates syntactic structure". If FOFC had a cognitive basis, i.e. its principles could be analogously retrieved elsewhere outside of language, it would actually give a way out of "the primary difficulty in evaluating hypotheses of iconic motivation in language: the shortage of firm evidence for the structure of experience outside of language itself" (see Croft 2003, 203).

The fourth consequence is that such an explanation gives further arguments about why U20 can be satisfyingly analyzed both via a symmetric and an antisymmetric approach. On the one side, there is evidence that four couples of mutually symmetric orders display from a qualitative point of view a list of properties that make them more eligible than the others. On the other side, the data regarding quantitative cross-linguistic attestations are unevenly attested and can be explained in a better way through a structural antisymmetry.

Two FOFC-s within the nominal domain

However, FOFC exposes itself to some other aspects which require further attention. For instance, it considers four permutations out of the six actually possible given an array of three elements. This implies that the aforementioned «double FOFC» does not consider within its scope four structural configurations out of the twelve overall ones. The excluded ones show nonetheless some interesting properties that can be brought into the picture of «a FOFC applied in a broad sense», not to mention that they are actually necessary to examine the sixteen remaining linearizations. Such orders previously excluded by Biberauer *et al.* (2014 §2.4) and Roberts (2017) are [N Dem Num] and [Num Dem N], which I call respectively N(ot)

C(overed by FOFC) 1 and NC2; in a similar fashion I indicate with NC3 and NC4 the orders not analyzed in the FOFC I stated before, i.e. [N Num A] and [A Num N], respectively.

In the previous section I lead a cross-comparison between the «double FOFC in a strict sense» and the quantitative attestations given by Cinque (2005). In Cinque's (2005, 319-320) table the permutations included in G1 and G2 were {x; a; b; w} and {o; r; s; n}, respectively. Below I repeat the same analysis considering the other cases (shown through Cinque's alphabetic arrangement), and in order to do so I combine NC1, NC2, NC3 and NC4 together with the Greek and Latin letters previously employed:

c.	[Dem N Num A]	γ (dis)	+ NC3	very few;
d.	[N Dem Num A]	NC1	+ NC3	few;
e.	[Num Dem A N]	NC2	+ B (harm)	none;
f.	[Num Dem N A]	NC2	+ C (dis)	none;
g.	[Num N Dem A]	δ (r.o.)	+ C (dis)	none;
h.	[N Num Dem A]	α (harm)	+ NC3	none;
i.	[A Dem Num N]	β (harm)	+ NC4	none;
j.	[A Dem N Num]	γ (dis)	+ D (r.o)	none;
k.	[A N Dem Num]	NC1	+ D (r.o)	very few;
l.	[N A Dem Num]	NC1	+ A (harm)	few;
m.	[Dem A Num N]	β (harm)	+ NC4	none;
p.	[N Dem A Num]	NC1	+ A (harm)	very few;
q.	[Num A Dem N]	NC2	+ B (harm)	none;
t.	[N Num A Dem]	α (harm)	+ NC3	few;
u.	[A Num Dem N]	NC2	+ NC4	none;
v.	[A Num N Dem]	δ (r.o.)	+ NC4	none.

Some striking observations are highlighted through this analysis. The first one is that linear orders featuring NC1 or NC3 occur in "(very) few languages". For the moment, the possible reasons for such a quantitative paucity rely on the previous analyses. However, attestations of these orders seem better explained through the «double FOFC» in a broad sense, rather than by Roberts (2017, 181-184). His approach fails to predict attestations of *n* and *w* (the recessive ones within G2 and G1, respectively), *g* [Num N Dem A], *h* [N Num Dem A], and *k* [A N Dem Num]. Even if *h* is not attested in Cinque's data, Dryer (2018) claims that it actually is, and this would comply with the present proposal.

A second observation is related to the fact that the linear orders featuring NC2 and/or NC4 appear in no languages (although some exceptions are found by Dryer 2018 concerning orders *m* and *e*).[v] Hence, these configurations seem more stringent than the ones actually violating one of the two FOFCs. This may be due to what Roberts (2017) state, i.e. "the

general impossibility of (nonfocusing) AP-movement, an assumption shared by Cinque and Abels and Neeleman", together with a similarly illicit (nonfocusing) NumP-movement (which is not posited by Roberts, though).

If on the one side a FOFC violation dramatically reduces the quantitative attestations of a certain order (though without ruling it out, according to my proposal) and on the other side NC2 and NC4 pursue an even harsher (maybe utter) restriction, the present analysis provides the basis not only for various degrees of positive attestations, but also for various degrees for the negative ones. Put differently, as much as there are harmonic and disharmonic orders, so there are some that are "more ruled out than the others" (by paraphrasing Orwell's original quotation), i.e. u (NC2+NC4) and v (δ+NC4).[vi] Because of this, such an approach suggests that in order to describe and explain U20 one needs to focus in greater detail on what languages cannot generate, rather than on what they can, as Pullum (2013) and Müller (2016) point out for different theoretical reasons.

This focus on what could be impossible for natural human languages is also given by the last analysis of U20 I want to mention here: Medeiros's (2018) stack-sorting algorithm. It is a model that takes surface word orders as "inputs to an algorithm that attempts to assemble the base as output". This implies that Medeiros is interested by the ability of the speakers to parse sentences, like Abels and Neeleman (2012, 69) do (as we mentioned afore). While Medeiros refers to the same concept of "base" used by Cinque (2005) and Roberts (2017), the term "algorithm" on the contrary refers to a dynamic process which involves the use of a stack memory in order to match the input strings with the output base. As he (2018, 6) clarifies:

> Word order and base hierarchy are disconnected sequences, related dynamically. Non adjacent input elements can perfectly well end up adjacent in the output. Displacement, rather than being the exception, is the rule; every element in the surface order is "transformed", passing through memory before retrieval for interpretation.

When he formalizes his model and shows the way it operates, Medeiros (2018, 4) represents the surface sequence [Dem Num Adj N] through the following numbering: [1234]. Hence, one can assume that 1 stands for Dem, 2 stands for Num, and so on. An input is properly analysed by the algorithm whenever the output numbering matches the one of the base hierarchy, which is [4321]. Hence, the ten input orders which cannot be properly computed by the algorithm are the ones that fail to give the desired output. Given that these orders are the ones that are never attested in Cinque (2005),

it is interesting to notice that Medeiros's approach not only excludes orders featuring NC2 and/or NC4, but also concentrates on them.

Conclusions

My analysis of U20 heavily relies on observations made by various authors who adopt different theoretical assumptions. Thus, such a proposal needs to be established on a set of bases which urge to be discussed explicitly, widely, and in a theory-independent way. The difficult points are for example establishing what is a basic, pragmatically neutral word order within a single language (see Dryer 2007 §2 and Rijkhoff 2002 §8, 2015) and understanding when a mathematical transitive relation can be properly applied in linguistics and when it is actually misleading (see Truswell 2009, Rijkhoff 2015 and Roberts 2017, 155).

I would like to conclude the chapter with a provocative question: what if the proposals I considered and mine mixed together "apples and oranges" (see Rijkhoff 2016 §5)? According to me there are roughly three consequent options: Cinque's (2005) data are either totally right, or totally wrong, or somehow acceptable. I opt for the last option, but in order to define what «somehow» means in this case, the major issue to discuss in the future (in order both to shed more light on the problem and to furtherly test my proposal) is how to establish explicitly a group of categories apt for a cross-linguistic, theory-independent analysis. What Rijkhoff (2015, 645) proposes to face this matter is:

> [S]ince the same constituent may have different discourse functions (and conversely, since the same function can be fulfilled by constituents belonging to different form classes), we need semantic, formal as well as functional categories to account for constituent order phenomena in all the world's languages.

On the premise that my first wish for the future research on (at least) U20 is to examine the data through these three filters applied in the proper way shown by Rijkhoff (2015), what I propose as an opening attempt to redefine the four categories[vii] is retracing somehow Rijkhoff's (2010, 98) notion of "one-trick-ponies" (italics not added):

> Linguistic esxpressions [...] can often be used in more than one function, and vice versa, different linguistic forms or constructions may do the same job in the process of verbal communication [...]. And whereas some linguistic expressions can be used in different functions (like a *jack-of-all-trades*),

other elements are only used in a single function (i.e. they are *one-trick-ponies*).

As we have seen before, Rijkhoff (2002) applies a list of restrictions in order to consider only a specific, homogeneous and cross-linguistically comparable class of nouns. Similarly, Roberts (2017) and Biberauer's *et al.* (2014 §2.4) analyses lead them to highlight a possible set of features that can help us trace a dividing line between what should be considered as a Dem(onstrative) in a strict sense and what are the consequential difficulties. Therefore, such approaches give some guidelines in order to set aside the more complicated "jack-of-all-trades" in favor of what tends to be a "one-trick-pony" in Rijkhoff's strict sense.

By following this approach I propose some criteria for the remaining categories: Num(eral) and A(djective). Concerning the former, I propose to start by setting aside complex numerals (see Dryer 2013b and Comrie 2013) and what Rutkowski (2006, 101-102) defines "A-numerals" (see also Rijkhoff 2009, 77-78 for some overlapping properties) and "N-numerals" (i.e. what Rijkhoff 2002 would classify as numerals belonging to an embedded domain). What remains after such exclusions are numerals from 5 to 9, and my personal wish for the future research is to cross-compare the typological behavior of these categories. If a generalization can be already made, fair enough; otherwise, one should then bring back more or less elements into the sample through a process of trials and errors, until the following cross-comparisons highlight some coherent property that demonstrates the elements to be truly comparable.

Concerning the A(djective), the situation is even more delicate: Biberauer *et al.* (2014 §2.4) and Roberts (2017) set them aside because of their miscellaneous nature, while I tried to bring them back into the picture because of the striking factors I have displayed. However, it is highly probable that the current notion should be split into at least two sub-categories, as pointed out by Alexiadou (2014, 95) and Roberts (2018, 126). A first distinction could be made between "direct modifiers" (see Cinque 2014) and other adjectives which are semantically restrictive, intersective and gradable (see Morzycki 2016 §2). The "gradability" of some of them is one of the major reasons which lead Dryer (1992, 2007 §7.1.1) to fail a harmonic generalization regarding them, as Newmeyer (1998, 329-330), Foolen (2002, 97-98) and Dryer himself (2007 §12) point out. Thus, the adjectives which seemly tend towards Rijkhoff's notion of "one-trick-ponies" are a bunch of constituents which according to Cinque (2014, 18) can be neither intersective nor subsective, i.e. modals (e.g. 'possible',

'potential'), adverbials (e.g. 'former', 'total', 'mere') and privative (e.g. 'false', 'fake').

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[i] This very specific expression is Cinque's, but as I said the other authors I cite make similar considerations.

[ii] It should be noted that Roberts (2018, 128) states that the formal syntactic features are universal on a functional basis: "Without φ-features, nominals can only function as logically proper names [...] in the Russellian sense [...]. To put things rather simplistically, if a system has no φ-features [...], there isn't much to talk about. [...] Hence, [...] no actual system takes the no- φ-feature option. [... T]he universality of φ-features derives from functional-communicative needs as is often claimed of various universals in the functional/typological literature."

[iii] Holmberg (2017b, 50) contrasts indirectly such a radical view. Since Kayne's framework posits a single obligatory head per phrase, his hierarchical structure is endowed with *endocentricity*, from which the labels follow as a consequence.

[iv] The reader might argue that some brackets are redundant. However, I inserted them in order to point out that Abels and Neeleman propose a labelless analysis which rejects a distinction between terminal and nonterminal elements.

[v] Even if both are problematic for the present proposal (and for the previous ones), they nonetheless reveal an interesting (and maybe explanatory) property: they are not linearly symmetric, but structurally symmetric. In fact, the former is (NC2 + B) while the latter is (β + NC4).

[vi] This last point somehow mirrors Steedman's (2020) claim of only two impossible permutations for U20, although he hinted at orders *g* and *j*. The mismatch between his analysis and mine requires further discussions in future works concerning U20.

[vii] This consideration leaves aside the fact that, as Rijkhoff (2002) notes and tries to make amends for, the future research of any paradigm ought to include also other

constituents within the overall typological analysis of U20, e.g. classifiers and nominal aspect markers.