

Workshop TAG+5, Paris, 25-27 May 2000

Economy in TAG*

Robert Frank

Department of Cognitive Science
 Johns Hopkins University
 3400 N. Charles Street
 Baltimore, MD 21218 USA

1. On the role of economy in grammatical derivations

Much recent work within generative grammar has made use of the idea that grammatical derivations exhibit a certain type of economy. The intuition behind this application of economy is a familiar one: that the well-formed sentences of a language are as simple as they can be (given the demands of expressiveness), and do not involve any unnecessary lexical items or dislocations. There have been a variety of formalizations of the relevant notion of economy, with a range of empirical consequence. Let us look at one of these, proposed by Chomsky (1995, ch.4) to account for the contrast between the examples in (1).

- (1) a. There seems [t to be [a unicorn in the garden]]
 b. * There seems [a unicorn to be [t in the garden]]

From a certain perspective, the derivations of both of these sentences are equally complex: both involve a single instance of syntactic movement. In (1a), it is *there* which raises from the subject of the infinitival to the subject of *seems*. In (1b), *a unicorn* undergoes raising, from within the small clause to the subject position of the infinitival clause. Why, then, should (1b) be blocked? Chomsky adopts a derivational model in which phrase structure is built in a bottom-up fashion. In such a model, the derivation of both examples in (1) will begin by constructing the following representation:

- (2) [_T to be [a unicorn in the garden]]

Chomsky assumes that every T(ense) head (for example, *to*) has a feature that must be checked during the derivation by the insertion of a DP subject in its specifier position, an instantiation of the Extended Projection Principle (EPP). At the point in the derivation depicted in (2), then, some element must be inserted into the specifier of TP position. Under the assumption that merging a new lexical item into a structure is a simpler operation than syntactic movement, Chomsky formulates the following principle of derivational economy:

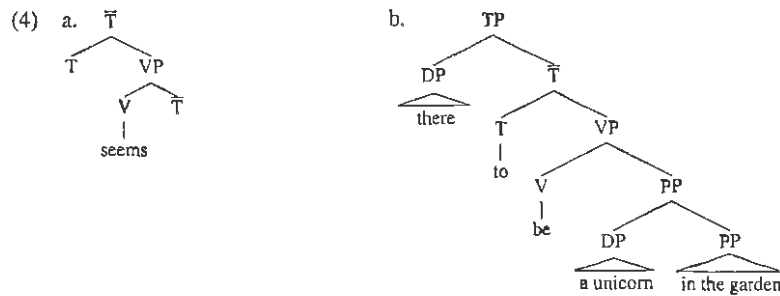
- (3) Prefer Merge over Move

By (3), we are forced to merge *there* into the specifier of the TP in (2), rather than moving *a unicorn*. When we reach the matrix clause, however, the fact that no additional lexical items remain to merge forces us to employ the more costly move operation. (Note that the presence or absence of *there* in these examples is, for Chomsky, determined prior to the onset of the derivation. Further, on Chomsky's theory structures with distinct numerations are not compared for economy. See Chomsky (1995; 1998) for further discussion.)

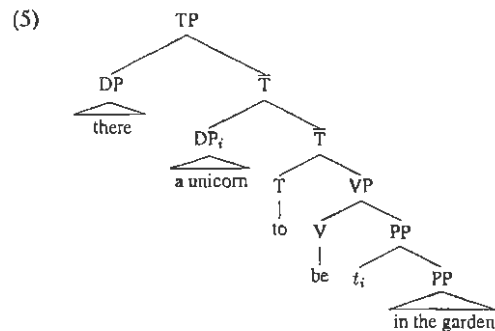
* Thanks to Colin Wilson, and Paul Hagstrom for helpful discussion, to two anonymous reviewers for comments, and to the National Science Foundation for their monetary support in the form of grant SBR-9710247.

2. Eliminating the need for economy with TAG

What becomes of the contrast in (1) in a TAG context? Under the assumptions of Frank (1992; to appear) concerning elementary trees, example (1a) derives from the adjoining of the *seems*-headed auxiliary in (4a) to the \bar{T} node of the tree in (4b).



What about the example in (1b), then? On analogy with the derivation of (1a), we might derive (1b) by adjoining (4a) into the initial tree in (5) at the higher \bar{T} node.



The ill-formedness of this example would then derive from the impossibility of elementary trees like (5), which I take to derive from the absence in English of so-called transitive expletive constructions (TECs), in which both an expletive and lexical DP appear in VP-external subject positions.

- (6) a. * There a cat has eaten the mice.
b. * There has a cat eaten 3 mice.

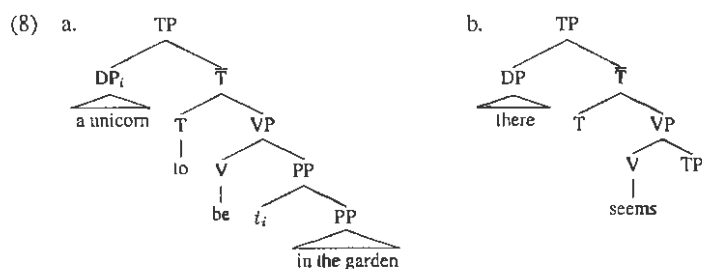
This analysis makes the immediate prediction that a language that permits TECs, and therefore elementary structures like (5), ought to permit examples like (1b). This prediction is confirmed in Icelandic. As seen in (7), Icelandic permits both transitive expletive constructions and the partial raising construction (examples from Bobaljik and Thráinsson (1998) and Jonas (1996)).

- (7) a. það hefur einhver köttur étið músar
there has some cat eaten mice-the
'A cat has eaten mice.'
b. það virðast margir menn vera í herberginu
there seem many men be-inf in the room

Economy in TAG

3. Expletives and the return of economy

It seems then that by using TAG we are able to explain the contrast motivating Chomsky's principle of derivational economy in (3) without resort to any such principle. This constitutes another case in which the use of TAG allows us to eliminate otherwise needed stipulations from the grammar. There remains a hole in this line of argument, however, as there exists an alternative derivation for the example (1b) that we have not yet ruled out. This derivation involves the combination (either by substitution or adjoining) of the elementary tree in (8a) with the *seems*-headed tree in (8b).

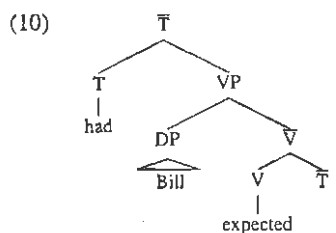


Clearly, there is nothing wrong with the elementary tree in (8a), as we take this tree to participate in the derivation of well-formed examples like the following:

(9) A unicorn seems to be in the garden.

The culprit, therefore, must be the elementary tree in (8b). What then is wrong with this tree?

To answer this question, we must first face the issue of what licenses the presence of *there* within an elementary tree. For Chomsky, the insertion of *there* is driven by the need to check the EPP feature of T, which guarantees the insertion of a specifier. The proposal that T always demands a specifier is not easily incorporable into a TAG context, at least not as a constraint on elementary trees: otherwise we would exclude trees like (4a) whose T heads lack specifiers. Nonetheless, there are situations in which we will need to invoke some form of the EPP to constrain elementary trees. For example, we will want to prevent the possibility of an auxiliary tree like the following, in which the subject *Bill* has not raised to the specifier of TP position:



Such an auxiliary tree, if allowed in the grammar, could adjoin into a TP infinitival elementary tree like (8a), just as a raising auxiliary like (4a) would. In this case, however, the result would be anomalous:

(11) * A unicorn had Bill expected to be in the garden
(meaning 'Bill had expected a unicorn to be in the garden')

I suggest that TAG elementary trees are in fact subject to an EPP requirement along the lines that Chomsky suggests. That is, I assume that elementary trees are constructed in a derivational

process along the lines proposed by Chomsky, but one which is restricted in the size of the structures that it may construct. Every T head that occurs in such a derivation will include an EPP feature that can be checked only by a DP in its specifier position. However, while Chomsky assumes that all such EPP features must be checked at the conclusion of the derivation, I assume that the checking of such features is subject to the following economy condition that constrains the process of elementary tree formation:

- (12) **Maximal Checking Principle (MCP):** Check as many features (i.e., satisfy as many grammatical requirements) as possible within an elementary tree.

The MCP renders violable within an elementary tree domain the requirement that features that need to be checked, if there is no way for them to be satisfied within an elementary tree.¹ This means that the unchecked EPP feature in the tree in (10) is fatal since there is an element within the elementary tree, the DP *Bill*, that could be raised to check this feature. The elementary tree in (10) is therefore blocked by the alternative elementary tree in which the subject is raised to specifier of TP.

Under the MCP, what becomes of the elementary tree in (4a)? One might reasonably expect that this tree would be blocked by the tree in (8b), since the latter lacks an unchecked EPP feature (having been checked by the insertion of *there*).² I suggest, however, that the set of elementary trees that are compared for the purposes of the MCP is restricted to those that are constructed from the same set of lexical resources, or numeration in Chomsky's terms. In the TAG context, I assume that a numeration will also include the non-projected non-terminals that become the foot nodes of auxiliary trees and sites for substitution. Since the elementary trees in (4a) and (8b) are derived, respectively, from the distinct pair of numerations given below, the MCP does not choose between these trees.

- (13) a. { T, seems, \bar{T} }
b. { there, T, seems, TP }

This leaves us in the position of correctly allowing the tree in (4a), but incorrectly allowing (8b) as well. To rule out the latter tree, I assume that feature checking in elementary trees abides by the following principle:

- (14) **All or Nothing Checking Regimen (ANCR):** In an elementary tree, if some of the features of head are checked, they must all be checked.

I assume that T possesses not only its EPP feature, but also contains agreement features that must be checked. Thematic subjects in specifier of TP will typically check both of these features, satisfying the ANCR. Since *there* does not determine agreement, as seen in (15), I will assume that its insertion into specifier of TP does not suffice to check T's agreement features.

- (15) a. There is a unicorn in the garden.
b. There are three unicorns in the garden.

¹I maintain Chomsky's original intuition that all uninterpretable features must eventually be checked, though the relevant point here is the conclusion of the TAG derivation. To ensure this, we will translate all features that remain unchecked within an elementary tree into constraints on adjoining. One can do this in terms of the unification-based system of adjoining constraints of Vijay-Shanker (1988), though alternatives are possible that more directly link up with the feature checking machinery discussed here. See Frank (to appear, ch.4) for more discussion.

²For the purposes of simplicity, I assume that expletives can be present in a verbally-headed elementary tree, without inducing a violation of the Condition of Elementary Tree Minimality (Frank, 1992; Frank, to appear). Alternatively, we can assume the presence of a DP frontier node containing features that restrict substitution to expletive-headed DPs.

Economy in TAG

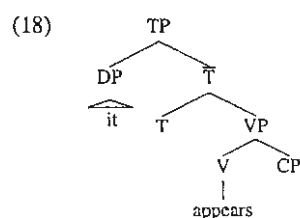
As a result, after insertion of *there*, only the EPP features of the T head in the elementary tree in (8b) are checked. Since there are no lexical DPs within this elementary tree that could check the agreement features of T, as occurs with the post-copular DPs in (15), the agreement features will necessarily remain unchecked in this elementary tree, leading to a violation of the ANCR. An anonymous review suggests that the ill-formedness of (8b) receives a simpler explanation under a constraint I gave in Frank (1992) that was called, perhaps misleadingly, the Projection Principle:

- (16) If α is a non-terminal which appears along the frontier of an elementary tree τ , then α is part of a chain whose tail is selected in τ , either through theta role assignment or predication.

Under this constraint, T cannot project past \bar{T} in an elementary tree headed by a raising predicate because there is no thematic role or predication relation that could be assigned to (the chain) of an element in the specifier of TP position. While the lack thematic role is clear enough, it is less clear that there is no licensing predication relation. In Frank (1992), I discussed two instances of predication relations, the first between a modifier and the XP foot node of its elementary tree, irrelevant to current concerns, and the second between a T head and an expletive subject. This was meant to allow for the presence of expletive *it* in subject position in constructions like the following:

- (17) a. It appears that Gabriel has finally fallen asleep.
 b. Il a été tiré sur la bateau
 it has been fired upon the boat
 'The boat was fired upon.'

To generate (17a), we will need an elementary of something like the following form:



This tree is strikingly similar to the illicit one in (8b), and differs only in the content of the expletive. Since the projection principle in (16) imposes no restriction on the content of elements that can enter into a predication relation, and indeed there seems no principled reason for assuming that *there* cannot enter in a predication relation with T, it leaves unexplained the contrast between (8b) and (18).

The ANCR, in contrast, allows us to explain why the elementary tree in (18) is well-formed. To see how, observe first that *it*, unlike *there*, systematically induces third person singular agreement on the verb, even in the face of a clausal conjunct that could induce plural agreement on the verb when in subject position (McCloskey, 1992).

- (19) a. It seems/*seem equally likely at this point that the president will be reelected and that he will be impeached.
 b. That the president will be reelected and that he will be impeached seem equally likely at this point.

Consequently, we will assume that *it*, unlike *there* is able to check T's agreement features. As a result, T's EPP and agreement features are both checked in the elementary tree in (18), with no ANCR violation.³

If the preceding discussion is correct, we must assume that dative experiencers, as occur in raising examples like (20), are incapable of moving to subject position to check the EPP feature of T.

(20) A unicorn seems [to Gabriel] to be in the garden.

If such movement were possible, the presence of a dative in a *seem*-headed elementary tree would affect the potential satisfaction of T's EPP features (putting aside for the moment questions about checking of agreement features and the ANCR). And as a result, the MCP would rule out an auxiliary tree in which this dative was not raised to specifier of TP position, effectively blocking raising past experiencer arguments as in (20). In a language in which datives could move to subject position, checking EPP and agreement features, we would expect to find just this pattern, where raising without experiencers is grammatical, but raising across experiencers, as in (20), is impossible. In fact, this is exactly what is observed in Icelandic (Sigurðsson, 1996).⁴ It has been convincingly demonstrated that Icelandic allows dative arguments to surface in subject position (see, among others, Zaenen *et al.* (1985)).

(21) Strákunum leiddist
the boys-dat bored-3sg
'The boys were bored.'

As seen in (22), Icelandic allows raising when the raising verb has no experiencer argument.

(22) Margir menn virðast vera í herberginu
many men seem-3pl to be in the room

However, when the raising verb projects an experiencer, such raising is impossible, with the grammatical form having the experiencer in subject position.⁵

(23) a. *Margir menn virðast mér vera í herberginu
many men seem-3pl to me be-inf in the room
b. Mér virðast margir menn vera í herberginu
to me seem-3pl many men be-inf in the room

4. Further implications of the MCP: superiority effects

The effects of the MCP can also be observed in the context of *wh*-movement. Let us assume that *wh*-movement is driven by a *wh*-feature in the C head to whose specifier movement takes place. This means that in the standard TAG derivation of examples like (24), the auxiliary tree representing the matrix clause will contain an C head with an unchecked *wh*-feature.

³Though space considerations prevent me from demonstrating this here, the ANCR has a number of consequences, allowing us to predict the differing distributions of *it* and *there*, as well as deriving Burzio's generalization that the possibility of structural case assignment by a verb implies the existence of an external argument (Burzio, 1986). See Frank (to appear, ch.4) for details.

⁴See also Boeckx (1999) for extensions to Romance.

⁵For reasons of space, I omit discussion of how the matrix T's agreement features are checked on the DP in the lower subject position, and how the elementary tree with the dative experiencer subject satisfies the ANCR. In brief, I assume that T enters into an agreement relation with the dative subject and also (at least optionally) with the raising verb's TP complement, into which the agreement features of the embedded nominative subject have percolated. Evidence in favor of this view comes from the optionality of such agreement, and the locality conditions on such agreement. See Frank (to appear, ch.4) for extended discussion.

Economy in TAG

(24) Which song did Daniel think that Gabriel was playing?

As before, the presence of this unchecked feature, *per se*, is not problematic for the well-formedness of this elementary tree, since there is no element within this tree capable of checking the feature. If however such an elementary tree included a *wh*-phrase capable of checking this feature, the MCP would rule out any elementary tree in which the C feature remains unchecked, for example (17a), in favor of one where it is checked, as in (17b).



This leads us to predict the impossibility of long-distance extraction of a *wh*-element into the specifier of CP of a clause which itself contains a *wh*-phrase. Such extractions are, in fact, impossible, as shown in the following English and German examples (the latter from Heck and Müller (2000)):

- (26) a. * Which song does who think that Gabriel was playing?
 b. Who thinks that Gabriel was playing which song?
- (27) a. * Wen hat wer gesagt, daß Maria liebt?
 whom has who said that Maria loves
 b. Wer hat gesagt, daß Maria wen liebt?
 who has said that Maria whom loves

This explanation does not extend to local “superiority” cases, in which one *wh*-phrase moves across another within a single clause, as the MCP does not dictate which element *must* move when there are two local possibilities. Consequently, all else being equal, we would expect that such cases to be well-formed, an expectation that is borne out for German:⁶

- (28) a. ~~Wen hat wer getroffen?~~
 whom has who met
 b. * Which song was who playing?

As seen in (28b), however, even these local cases are ill-formed in English. This does not falsify the MCP, but merely renders its effects untestable. One might fear that there is redundancy between the principle responsible for the ill-formedness of (28b) and that underlying the ill-formedness of (26a). However, there is evidence that these are distinct. As noted originally by Baker (1970), local superiority violations are obviated in multiple *wh*-questions so long as the in-situ *wh*-phrase, *who* in the example below, is interpreted in a higher clause.

- (29) Q: Who asked which song who was playing?
 A: Alice asked which song Gabriel was playing/* Alice did.

The effect of this higher interpretation is that both the matrix and subordinate occurrences of *who* must be answered. This avoidance of superiority effects is not possible, however, when the superiority violation is of the long-distance sort governed by the MCP. Thus, the following example is not possible, regardless of the scopal interpretation of the in-situ *wh*-phrase *who*.

⁶The German pattern of well-formed local superiority, and ill-formed long-distance superiority is replicated in Serbo-Croatian (Richards, 1997, p.32).

(30) * Who asked which song who thought that Gabriel was playing?

5. Conclusions

I take the range of data discussed here to provide substantial support for the role of economy in determining the well-formedness of TAG elementary trees, particularly in the form of the MCP and ANCR. The fact that these economy principles apply to TAG elementary trees enforces a certain locality on the process of determining which structures are most economical. Such a local notion of economy has in fact been proposed by a number of authors including Collins (1997) and Chomsky (1999) on rather different empirical grounds. I would like to suggest that we are seeing a convergence to the idea, familiar from work in the TAG tradition, that syntactic structure is composed from non-recursive structural elements whose well-formedness is independently determined.

References

- BAKER C. L. (1970). Notes on the description of English questions: the role of an abstract question morpheme. *Foundations of Language*, 6.
- BOBALJK J. D. & THRÁINSSON H. (1998). Two heads aren't always better than one. *Syntax*, 1 (1 p.), 37–71.
- BOECKX C. (1999). Raising in Romance. In *Chomsky Celebration Website*. MIT Press. Available at <http://mitpress.mit.edu/chomskydisc/Boeckx2.html>.
- BURZIO L. (1986). *Italian Syntax*. Dordrecht: D. Reidel.
- CHOMSKY N. (1995). *The Minimalist Program*. Cambridge, MA: MIT Press.
- CHOMSKY N. (1998). Minimalist inquiries: the framework. MIT Occasional Papers in Linguistics 15, Department of Linguistics and Philosophy, MIT.
- CHOMSKY N. (1999). Derivation by phase. MIT Occasional Papers in Linguistics 18, Department of Linguistics and Philosophy, MIT.
- COLLINS C. (1997). *Local Economy*. Cambridge, MA: MIT Press.
- FRANK R. (1992). *Syntactic Locality and Tree Adjoining Grammar: Grammatical, Acquisition and Processing Perspectives*. PhD thesis, University of Pennsylvania, Philadelphia, PA.
- FRANK R. (to appear). *Structural Composition and Syntactic Dependencies*. Cambridge, MA: MIT Press.
- HECK F. & MÜLLER G. (2000). Repair-driven movement and the local optimization of derivations. Talk presented at Department of Cognitive Science, Johns Hopkins University.
- JONAS D. (1996). Clause structure, expletives and verb movement. In W. ABRAHAM, S. D. EPSTEIN, H. THRÁINSSON & J.-W. ZWART, Eds., *Minimal Ideas*, p. 167–188. Amsterdam: John Benjamins.
- MCCLOSKEY J. (1992). *There, it, and agreement*. *Linguistic Inquiry*, 22 (3 p.), 563–567.
- RICHARDS N. (1997). *What Moves Where When in Which Language*. PhD thesis, MIT, Cambridge, MA.
- SIGURÐSSON H. A. (1996). Icelandic finite verb agreement. *Working Papers in Scandinavian Syntax*, 57, 1–46.
- VIJAY-SHANKER K. (1988). Feature-structure based tree-adjoining grammars. In *Proceedings of the 12th International Conference on Computational Linguistics*, Budapest.
- ZAENEN A., MÁLING J. & THRÁINSSON H. (1985). Case and grammatical functions: the Icelandic passive. *Natural Language and Linguistic Theory*, 3, 441–483.