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# Why we still don't need/want variables: Two SALTy case studies

Pauline Jacobson
*Brown University*

**Abstract** This paper defends the claim that variables and assignment functions are not needed as part of the semantic machinery against two apparent challenges. The relevant domains appear at first glance to show for the need for variable names - but only if the variable-ful theory is supplemented with a stipulation preventing 'meaningless coindexation'. I argue that not only are both domains amenable to variable free analyses, but that indeed the variable free analyses have advantages over the analyses using variable names.

**Keywords:** variable fee semantics, antecedent contained deletion, TVP ellipsis, VP ellipsis, MaxElide, competition effects, no meaningless coindexation

## 1. Introduction

This paper examines two domains that have been taken (implicitly or explicitly) to necessitate the use of variable names (and assignment functions) as part of the semantic machinery. There are two goals: (a) to show that variable names are not necessary, and (b) the variable-free analyses of these domains actually does better than the analyses with variables. As SALT has played a central role in the debate, I take the unusual step in the text below of pointing out explicitly those references that have appeared in SALT proceedings.

## 2. Variable Free Semantics: A brief review

We begin with a brief review of variable free semantics (hereafter, VFS) as developed in particular in, e.g., Jacobson, 1999, 2014 (the latter containing some updates and revisions). A central tenet is that there are no assignment functions as part of the semantic machinery and, similarly, no indices in the syntax. The key consequence of this for the cases of interest here is that this means *there can be no crucial use of variable names.*

I assume the following bits of machinery. (1) Any expression with an 'unbound' pronoun within it has as its meaning a function from individuals to the type of meaning that a corresponding expression would have had it contained no unbound pronouns. (I use the term 'unbound' informally but in a way whose intuition is clear; the grammar itself has no formal notion of 'binding'.) If an expression has two unbound pronouns it can (but need not) denote a function

from two individuals, but we will not consider such cases here. (The 'need not' is because the conventions in Jacobson, 2014 allows the two pronoun slots to be merged with each other, such that an expression like *she loves her mother* can either be a function from two individuals - analogous to the case in the standard view where the pronouns are not co-indexed, or can have the meaning informally represented here as λx[x loves x's mother], analogous to the case where the two pronouns in the standard view are co-indexed). (2) A pronoun itself denotes the identity function on individuals, hence of type <e,e>. (3) This is all also tied in with a Categorial Grammar syntax. To save space, we will not develop the syntactic details here, save to say that the syntax keeps track of the fact that an expression has an unbound proform with it by means of a superscript denoting the category of the unbound proform. Hence a VP (or, in CG terms, an S/NP) like *loves him* is of category $VP^{NP}$ or, more fully $(S/NP)^{NP}$, and an S with an unbound proform within it is of category $S^{NP}$. I assume further the conventions for extraction in Jacobson, 2014, 2019a, which are inspired by earlier work by Steedman, 1987 and Dowty, 1989. A sentence with an extraction 'gap' will mark this in its syntactic category, which we notate as S|NP, and this (like S/NP and $S^{NP}$) is (extensionally) of type <e,t>. As is customary in much of the CG literature we also use the term 'NP' rather than 'DP'; a native speaker of DP-language can make the needed translations. (4) What allows an expression like *lost* to combine with *she* to give a sentence like *she lost*? After all, the former is of type <e,t> and the latter of type <e,e>. The answer to this is what is known in much of the CG literature as the "Geach" mapping, which we notate here as **g**. Thus for any function f of type <a,b>, **g**(f) is of type <<c,a>,<c,b>> and is $\lambda C_{<c,a>}[\lambda X_c[f(C(X))]]$. Note that this is just a unary (Curry'ed) version of function composition. For any two functions f and h, **g**(f)((h) = g ∘ h By this operation, [[lost]] maps to the function $\lambda f_{<e,e>}$ [λx [ [[lost]](f(x)]] (of type <<e,e>,<e,t>>). When this is applied to the identity function the result is [[lost]] (modulo the contribution of gender from the pronoun). Thus the grammar contains a rule mapping any expression α into **g**(α) (with the predictable change in syntactic category as well as the meaning shift). Informally, one can see this as allowing a function to combine with an 'incomplete' argument, and the result inherits the incompleteness. (In the syntax, the superscript feature, or the extraction | works the same way and is passed up.) Thus in a case where a pronoun is never 'bound', as in, for example *She lost* the result is a function from individuals, and is of category $S^{NP}$. Lest it find it strange to think of *she lost* not as a sentence nor as denoting a proposition, we remind the reader that in the standard view it is not a proposition either; it is an assignment dependent proposition, which is equivalent to saying it is a function from assignment functions to propositions. (The same, of course, is true of a 'closed' sentence like *Hillary lost* - but in that case in the standard view it is a constant function from assignments, so the assignments go

unnoticed.) By the same token, *his mother* under the view here denotes the function λx[the-mother-of(x)] (or, 'the mother-of function).

(4) We also need a way to have the pronoun 'bound'. To this end there is one other rule mapping an expression of one category and type to another; this is the **z** mapping. Thus we allow any expression α which denotes a function [[α]] of type <a,<e,b>> to map to one of type <<e,a>,<e.b>> by an operation I call **z**, such that **z**([[α]]) =$\lambda g_{<e,a>}[\lambda x_e[$ [[α]] (g(x))(x)]]. (This is given in greater generality in Jacobson, 1999, 2014.) To illustrate: To **z**(call) some function f is to be an x who calls f(x). Hence to z-call the mother-of function is to be an x who calls the mother of x. Take *every 3d grade boy calls his mother* on the bound reading. The VP is as above, and is taken as argument of the subject.

Key to note is that variables in the above are used only to name meanings; they play no role in the grammar. We could in fact name the meanings without any recourse to variables if, for example, we used a Combinatory Logic as the tool for naming meanings (Curry and Feys, 1958). But since these formulas are difficult to read, we continue to use the variables. The important prediction of relevance to the material below: *There can never be any crucial use of variable names as a way to keep track of different unbound pronouns (or gaps/traces).*

But there are two interesting challenges to this prediction. Both have been accounted for by use of variable names supplemented with an additional stipulating that there is No "Meaningless" Coindexation (hereafter NMC). This condition says that two variables bound by different things cannot have the same variable name. Note that there can be nothing analogous to this in VFS. Take, for example, (1) (the indices here are used to indicate the intended meaning only):

(1) Every third grade $boy_i$ thinks that Lee nominated $him_i$ and every fourth grade $boy_j$ thinks that Sandy nominated $him_j$.

In VFS, [[nominated him]] in the 3d grade boy clause has exactly the same meaning as that expression in the 4th grade boy clause. This is not the case in the standard view combined with NMC, since there are assignments g such that $[[\text{nominated him}_i]]^g \neq [[\text{nominated him}_j]]^g$, and this fact (or an analogous one with gaps/traces) play a role in the challenges to be elucidated - and answered - below.

## 3. Background pieces

### 3.1. VP Ellipsis

Consider ordinary VP Ellipsis as in (2):

(2) A: Lindsay can ski that course in 4 minutes. B: Yup. (and) Bode can too.

Broadly speaking, there are two main accounts. The most generally accepted one is that B's utterance contains silent linguistic material and is 'really' *Bode can ~~ski that course in 4 minutes~~ too*, where the strikethrough indicates material that the semantics 'sees' but the phonology doesn't pronounce. Call this the Silent Linguistic Material (SLM) view. SLM also posits that the silencing is licensed by an identity condition - I will assume throughout a view which relies on meaning identity between an overt VP and the silenced material. But a different view - which will be essential here - is that B's utterance is just incomplete and is 'missing' an <e,t> function, much like the case of free individual pronouns. In variable free terms, then, the meaning of B's Bode sentence is, informally, *λP[Bode can P]*. The listener applies this to a contextually salient property. Surely a way to make a property salient is to have recently named it. Thus under this view there is only the illusion of an 'antecedent'; the role of the first clause here is not to provide material licensing silencing under identity, but merely to name the function which is salient (in this case [[ski that course in 4 minutes]]).

Of course Hankamer and Sag, 1976 argued against just this sort of account. they claimed that (unlike the case of ordinary personal pronouns), VP ellipsis cannot access the missing meaning purely from context: VPE must always have an overt linguistic antecedent. But since that time the literature has noted numerous cases - both constructed and naturally occurring ones - which show that this is not correct. See, e.g., Miller and Pullum, 2014 for some very natural cases without an overt antecedent. But why were Hankamer and Sag almost correct? Why is it so much more difficult to access the property from context than supplying an antecedent for a free pronoun? I speculate here (and this will be crucial below) that this is because what must be recovered here is a meaning of a more complex type; and that it is harder to pull out an <e,t> type meaning from context than to pull out an individual. The latter are highly salient in our cognition. The fact that it appears that often VPE needs an 'antecedent' is simply that the missing <e,t> meaning is easily made salient by having recently been named. Other cases require a high degree of contextual salience.

Still one might at this point say 'wait a minute! Wasn't it shown in Hankamer and Sag, 1976 that that this line is likely to be incorrect in view of the contrast between true VP Ellipsis and, e.g., *do it* as shown in the (3)? Context: it appears that someone is about to jump off of a 3 story building. I turn to you and say:

(3) (a) ??Oh boy. I sure hope he doesn't.
(b) Oh boy. I sure hope he doesn't do it.

Note first that (3a) is degraded, but - contra the predictions in Hankamer and Sag, 1976 - not impossible (as confirmed by several informants). But Hankamer and Sag are surely correct that (3b) is much better. Does this threaten the claim that functions of type <e,t> are merely difficult to pick up from context? No, because their logic was based on the assumption that (a) and (b) have basically the same meaning and that *it* was picking up the same type of thing as the missing material in (a). But this is incorrect: *it* picks up events only and here is the complement of main verb *do,* the missing material in (a) is not quite the same. Notice, for example, that VPE allows ellipsis in (4) while *do it* is not possible here:

(4) Sally believes that snow is white, and Sarah does too/*Sarah does it too.

There is a crucial point which I think has been underappreciated in the vast literature on VPE. This is that as long as there is a *single case* of VPE without an overt antecedent, any theory needs (a) some mechanism to allow this and an account of the fact that what is understood as the 'missing meaning' at the ellipsis site is supplied by context, and (b) some explanation as to why cases like this are rare. This - and nothing more - is exactly what is needed in the theory put forth here; there is no extra burden placed on the theory here. As long as there are cases where the context supplies the understood meaning, then surely the fact that it had recently been named can make it highly salient. So the theory of VP Ellipsis here is the null hypothesis. One other syntactic detail will be useful below. I treat the relevant auxiliaries as, basically, proforms over VP meanings. The lexical category of auxiliaries in Categorial Grammar is VP/VP but these shift (with no meaning change) to $VP^{VP}$. A sentence with a VP ellipsis site in it is of category $S^{VP}$. See Jacobson, 2003, 2019a for details.

### 3.2. Missing 2 place relations (TVP or Transitive Verb Phrase ellipsis)

Are there also cases of 'missing' 2-place relations? And if so, are these expected given the apparatus here? The answer to both is yes. Note first that in the standard view, the types of cases below which show this point are just cases of VPE - where the 'antecedent' just happens to contain a pronoun or gap/trace within them (and hence a variable) and so these are completely expected and nothing new needs to be said. But these are also expected here. Full details are spelled out in Jacobson, 2003, 2019a; we note here that the VPE auxiliaries can further shift to $(VP|NP)^{(VP|NP)}$ (an anaphor over VPs that contain gaps) and to $(VP^{NP})^{VP^{NP}}$(an anaphor over VPs containing pronouns). Hence when auxiliary like *will* undergoes this set of shifts its meaning is of type <eet,eet>. I take the lexical *will* here to be of type <<e,t>,<e.t>>, and so a sentence like *Sarah will* is

of category $(S^{NP})^{VP^{NP}}$ or $(VP|NP)^{(VP|NP)}$ with meaning λR[λx[Sarah will R(x)]]. Nothing extra is needed for these types of cases; their existence follows from the basic machinery in place for other reasons.

As to whether such cases exist: an obvious case is ACD (Cormack, 1984, Jacobson, 1992 (*SALT 2*) and others). This is a special case since, in the standard view, the gap/trace and the material in the antecedent are 'bound' by the same thing (via, of course, QR in the antecedent clause; a step not needed here). But of greater interest - and of more relevance to the present concerns - are cases containing pronouns or gaps where - in standard terms - the pronoun/trace are bound by different things in the two clauses. Indeed, Sag, 1976 looked at such examples, and concluded that they are actually on the basis of cases like (5b), which is at least degraded compared to (5a). (Both are being considered under the sloppy reading; and the material in strikethrough here is not meant as a an endorsement of SLM but just a way to notate the intended meaning).

(5) a. Warren$_i$ hopes that Iowa will seal the nomination for her$_i$ and Harris$_j$ also does ~~hopes that it will vote for her$_j$~~.

b. ?*Warren$_i$ hopes that Iowa will seal the nomination for her$_i$ and Harris$_j$ also hopes that it will ~~vote for her$_j$~~.

Turning first to (5a), the goodness of these under the sloppy reading is unsurprising under a number of different accounts of 'binding' and VPE. Here, the meaning of the VP in the Harris-clause is *z(think)(Iowa vote-for)* which in turn is the property of being an x who thinks that Iowa will vote for x. This supplies the understood meaning in the second clause. The particular details under SLM depends on various choices, but we note that the sloppy reading in (a) follows if semantic identity is required and if both clauses contain an expression (perhaps at LF) whose meaning is also λx[x thinks Iowa vote for x]. The two pronouns can have different indices, but since both are bound within this meaning, this makes no difference. The interesting question is why (5b) is degraded. A variant of Sag's particular account is one which assumes that meaning identity is required *and* maintains the NMC condition. The antecedent VP in the Warren clause does not have the same meaning as the silenced VP in the Harris clause as the pronouns are not bound within the meaning of the VPs (or some other LF expression which corresponds to this). While different from Sag's actual account, this view captures the spirit of his. We return to these in Sec. 4.2

But ever since Sag's seminal discussion, it has been noted that there are many good cases of just this sort. Evans, 1988 notes cases like (6), and Jacobson, 1992 (*SALT 2*) cases like (7) and (8) (lexical items in (8) changed). To these I add (9):

(6) Bagels, I like. Donuts I don't.

(7) Context: Mary and Sue are both going on vacation, and both need plant watering while they are gone.

Mary$_i$ asked Bill to water her$_i$ plants, while Sue asked John to.

(8) Professor Carberry nominated several students for the ceramics team, although none of them$_j$ really wanted him to ~~nominate her$_j$/him$_j$~~.

(9) Professor Carberry nominated Kim for the pot-cracking prize. But it was Lee$_i$ who had really wanted him to.~~nominate him$_i$~~ /who had really hoped that he would ~~nominate him$_i$~~.

Cases like (8) were subsequently rediscovered in Merchant, 2001 under the rubric of 'rebinding', which term has persisted in much subsequent literature. (Note that (9) shows that Merchant's subset generalization is incorrect.) All of these force a proponent of SLM to either abandon (a) NMC, or (b) the condition that the meanings of the elided and antecedent VP must be identical. The two proposals below which advocate NMC abandon (b), although they do require semantic identity in a higher domain. Following Jacobson, 1992 we refer to all of these cases with a missing 2-place relation as TVPE ("Transitive Verb Phrase ellipsis").

Given the claim that these follow from the same mechanism as allows for ordinary VPE, we would predict that TVPE is also possible with no overt antecedent. Jacobson, 2003, 2008 gives examples: here I provide a new one. The key scenario is that Dad is with two of his kids, Keela and Zack. Keela (the older) has been trying to tell Dad for quite some time that she is very independent and doesn't need help typing her shoes. But Dad is a creature of habit, so he reaches down to help Keela - who says (10a). Dad then reaches down to help Zack. But Zack likes to copy his big sister and so says (10b):

(10) (a) Keela: Dad. Please! Stop! I DON'T WANT you to!!!
(b) Zack (after Dad tries to help him): And I don't want you to either!!!!

Note that while (10b) could in a slightly modified context have the strict reading *Zack doesn't want Dad to tie Keela's shoelaces* it easily - and in fact most naturally in this context - has the sloppy reading: *Zack doesn't want Dad to tie Zack's shoelaces*. It is clear that Zack's utterance involves picking up the two place relation [[tie the shoelaces of]]. In other words, (10b) can be analyzed as, informally "λR[I don't **z**(want) [you R]]" (the open individual slot that we saw in something like *Sarah does* is no longer there as it has gotten 'swallowed' up by **z** on *want*). Filling in the missing relation, this is equivalent to Zack saying I don't

want to be an x such that you tie-the-shoelaces of x. Lest one think that one can simply force (10b) to be composed instead as λP[I don't want [you P]] where what this picks up the missing property of tying the shoelaces of Zack, we note that we can modify the scenario to add in a few more kids who want to be independent. Let Leah be the oldest of our new younger siblings, and imagine her now saying:

(11) Yeah, Dad. Don't you get it? None of us want you to!

There is no meaning of type <e,t> that we could use here; the missing meaning must be <e,<e,t>> where the object-slot of *tie the shoelaces of* is 'bound' (hence **z** on *want)*. Incidentally there are two ways to compose Keela's utterance to get the relevant understanding; the simplest way to think of hers is that all that is missing is the property [[tie-the-shoelaces-of-Keela]] (although it could equivalently be taken as analogous to our analysis of Zack and Leah's utterance). But this does not matter, all that matters is that this makes salient the tie-the-shoe-laces-of relation which allows Zack and Leah to utter their sentences with sloppy/bound readings. (We return to these cases in Sec. 4.2.)

But while one can construct cases of missing 2-place relations which were not previously named, these have certainly been observed with much less frequency than the corresponding type of case for just ordinary VPE. And, as one who has constructed these, I can attest that they seem harder to construct. Why should this be? A speculation here - which will be crucial in Sec. 4.2 - is that accessing <e,<e,t>> functions from context is harder than accessing <e,t> functions for the same reason that the latter is harder than accessing individuals. The more complex the type of some meaning - the harder it is to just pull out from context and the less likely it is to be sufficiently salient. This will be key below.

### 3.3. Focus in Variable Free Semantics

The next needed piece concerns the treatment of focus in a variable free semantics; for further discussion of this see Jacobson, 1998 (*SALT 8),* 2004 (*SALT 14*). I assume basically the computation of focus values as given in Rooth, 1985 but the question arises as to what is the focus value of something that contains an unbound pronoun or gap within it (where the focus is not on the pronoun itself; that is a somewhat different issue set aside here). What, for instance, is the focus value of an $S^{NP}$ such as *KEELA scolded him* or the S|NP *KEELA scolded* (which occurs in, e.g., relative clauses)? The regular value is the set of individuals seen by Sue. Is the focus value a set of alternative sets such as {λx[keela scolded x], λx[zack scolded x], λx[leah scolded x], ...}? Or, is it a

function form individuals to alternative propositions about other individuals scolding them; i.e., λx[{keela scolded x, zack scolded x, leah scolded x, ....}]. It turns out that there are many reasons to adopt the latter - or at least to maintain that this will have to be its focus value *at the point in the computation at which focus is interpreted*. Thus, e.g., Golden, 2014 proposes a system whereby both are possible, and whereby the latter is derived in a systematic way from the former (by what he did not call the Golden rule, but I will). We return to this briefly below, we need assume here only that when focus is interpreted, the 'Golden rule' must have applied and that focus can only interpret objects of the latter kind. This will follow from the remarks below. I also assume that where there is no overt focus sensitive operator (such as *also, only,* etc.) focus must somehow get 'resolved' (this is needed in order to specify the level at which the alternatives play a role. Borrowing loosely from Rooth's ~ operator, I thus adopt here a silent operator ~ which resolves the focus and gives it its scope. (I will assume that this is not present if, e.g., *only* is - there merely needs to be some way to 'resolve' focus and to set the scope of where the alternatives play a role, but as far as I can tell this is not crucial.) Incidentally, the use of a 'silent operator' is not at all essential: one can always recast any silent operator as a unary rule mapping one expression to another. I adopt the silent operator approach purely for expository convenience. I will, however, make one key assumption - acknowledging that indeed at this point this is just a stipulation. This is that ~ in the lexicon is listed combining only with Ss, NPs and generalized quantifiers (GQs). (In the end this stipulation might not be necessary; it might be that ~ in the lexicon can combine with any category. Whether or not this is the case depends on exactly the compositional computation of focus values. Here I am adopting the system in Golden, 2014, and if this is correct we need to make sure that ~ is restricted in this way. This is discussed Sec. 4.1.3.) Thus given our at least temporary assumption, only propositions and individuals/generalized quantifiers (GQs) are things for which the lexical version of ~ can look for appropriately contrasting objects. What is the syntax and semantics of ~ ? In terms of the syntax, it combines with an expression of category S or NP (or S/(S/NP) in a Categorial Grammar treatment of generalized quantifiers) and returns an expression of the same category. We illustrate its semantics for the S case (the NP and GQ case is similar). When combining with an expression of category S, it takes as argument a proposition p (the meaning of S) and a set of propositions X (the focus value of S), and returns p, but is defined only for those Ss such that there is a contextually salient p' such that $p' \neq p$ and $p' \in [[S]]^{FOC}$. (Similarly for the case where ~ combines with NP and GQs.) I also assume that ~ 'swallows up' the alternatives so that the focus value of ~S is the singleton set {[[S]]}; nothing hinges on this.

This is similar to Rooth's use of ~ in, e.g., Rooth, 1992 but with one very important difference. Rooth's ~ has two arguments - the expression it combines with and *an index of some other expression*. The other expression is the one whose meaning is (or supplies) the contrasting meaning. In other words, ~ is anaphoric, and the index says what it is anaphoric too. But there is to be little motivation for having the grammar keep track of this. As noted by Rooth himself, the linguistic expression which provides the contrast doesn't actually have to have a meaning in the focus value of the expression [~S] (or [~NP]); the contrast can be something which just follows from the meaning of another expression. And 'follows from' does not mean entail; the contrasting material can be follow given pragmatic assumptions (i.e., 'implicational bridging). This, for example, is at work in the famous case of *Sally called John a Republican and then HE insulted HER* (Lakoff, 1968). The first clause is what supplies the contrast, but only by the pragmatic inference that 'calling a Republican' is an insult. But since anything can follow from any expression given the right contextual assumptions, the requirement that ~ be coindexed with another expression amounts to nothing more than a requirement that focus (or deaccenting) have some prior linguistic material, and so the coindexation does little work. And in fact, even this requirement is too strong; we know quite well that deaccenting is possible without any kind of linguistic 'antecedent'; we only need to be able to conjure up a salient alternative. Imagine, for example, you and I standing at the top of a scary ski slope and seeing Bode about to ski down it, and I turn to you and say : Well, SALLY wouldn't ski that. Thus in my formulation above, ~ requires only that there be contextually salient contrasting material; Rooth's required coindexation with an antecedent cannot be maintained.

I have (at least for now) stipulated that ~ combines only with S and NP/GQs (thus propositions, individuals, and GQ meanings are the sort of things looking for contrast). But we will see directly below, there are also cases in which ~ combines with $S^{NP}$ and S|NP - i.e., with sentences that contain within them unbound pronouns or gaps Recall that the focus value of such an expression is (or can be) a function from each individual to alternative propositions about that individual. The focus value of *KEELA scolded him/KEELA scolded* maps each individual into the set of alternative propositions about who scolded them. So how can these combine with ~? The answer is that ~ like any other item, can undergo a generalization of the **g** rule (which generalization is laid out and motivated in Jacobson, 2014 for entirely other purposes). The semantic type of ordinary ~ takes as argument a pair of a proposition p and a set of propositions T (the focus value) and returns a pair consisting of the same proposition as regular meaning and, as focus value, T' which is the singleton set {p} (again nothing hinges on this decision for how ~ operates on the focus value. But crucially ~ is defined only for those p,T pairs such that there is a salient $p' \neq p$ in T. Using V as

a variable over functions from individuals to sets of propositions, **gen-g**(~) = $\lambda P_{<e,t>,} V[\lambda x[\sim(P(x),V(x)), \{P(x)\}]]$. Note that ~P(x) is defined only for those properties and individuals such that there is a p ≠ P(x) in V(x). Hence the individuals for whom, say, *~KEELA scolded (him)* are defined are only those x whom there is a contextually salient alternative y scolded x for y ≠ Keela. What this means is that the regular value for an expression like *KEELA scolded* or *KEELA scolded him* is an <e,t> function defined only for those individuals such that there is a salient proposition in the discourse context about someone else scolding them.

### 3.4 Ellipsis and Focus

It is well known that ellipsis is sensitive to there being something focused 'higher up' - i.e., there is contrastive stress somewhere in a constituent containing the ellipsis site. Following the terminology of Rooth, 1992 call the expression containing both the focused material and the ellipsis site $C_{ELL}$. It is tempting to think that this just follows from other considerations. For example, in a theory where ellipsis involves silencing under identity, this would almost follow from the fact that the elided VP must have previously been uttered, and if it were uttered with all of the higher material being the same, the speaker would simply be repeating themselves. So if something is different, there will have to be contrastive stress/focus on that. The view here is similar. If the 'missing material' is salient, this means that something about this meaning is in the discourse context. But if that something is exactly what is being said with the missing meaning supplied, nothing new is being conveyed. Since utterances usually give some new information, then some expression surrounding the elided/missing material must contrast what something else that is in the air (or said) about that meaning. But tempting though this story is, it unfortunately (in either version) is not quite right. For speakers *do* repeat themselves and in such cases the elided (under SLM) or 'missing' (under the view here) material will have been said - hence no contrast. Stockwell, 2018 (*SALT 28*) shows that even in these cases ellipsis ot allowed. For example, speakers utter tautologies for various reasons but these do not allow ellipsis (compare *If he wins, he wins,* vs. **If he wins, he does*.)

Hence exactly why ellipsis must be within the scope of some contrastively stressed material is not entirely clear. Rooth just builds this in to the conditions licensing ellipsis. He assumes a 2-fold condition. One is that the elided material (the 'reconstructed phrase' in his terminology) must be identical to some antecedent, which he calls the 'reconstruction antecedent'. The second is his focus condition: "some phrase identical with or dominating the reconstructed phrase

[the ellipsis site] can be related by the ~ relation to some phrase identical with or dominating the reconstruction antecedent" (italics mine). Call the phrase identical to or dominating the ellipsis site $C_{ELL}$ and call the other phrase $C_{ANT}$. His condition ensures that there is a $C_{ANT}$ whose meaning or something following from its meaning is a member of the focus value of $C_{ELL}$. But we have already seen that this version cannot be maintained. Leaving aside the fact that ellipsis itself does not require an overt antecedent, we have also shown that ~ does not take two arguments; material with contrastive stress and subsequent deaccenting need not be preceded by any linguistic material. Thus Rooth's condition can be restated simply as: the ellipsis site must be within the scope of ~.

Here the hope would be that this is part and parcel of what is needed in order to make some meaning sufficiently salient: a missing meaning of type <e,t> or <e,<e,t>> can be supplied only if supplying it gives something for which there is a contextually salient alternative. Of course this requirement by itself is not enough to make something sufficiently salient. If it were then the conditions on deaccenting and on ellipsis retrieval would be the same. But they aren't; this is exactly one of the lessons from Rooth, 1992 But that does not mean that this is not part of what makes something salient. However, lacking real justification at this point for this hunch, I will - like my recasting of Rooth - just stipulate that the conventions allowing for missing VPs or TVPs must be within the scope of ~ or, possibly, some other focus sensitive operator. (I use the term '~ etc.' from now on to cover the class of focus sensitive operators.) Of course in either view there remains the question of how to enforce this. In a view with LF this is not difficult: the grammar gets to 'see' an entire LF and can make sure that an ellipsis site (whaever that corresponds to in the syntax) is c-commanded by ~ etc.. The worldview here assumes a direct compositional architecture (without LF) and so we do not have that luxury. But there are brute force ways to encode by means of feature passing the need for the ellipsis feature to ultimately find ~ etc.. We will not do this here (the interested reader can probably figure out how) because this seems to be the wrongheaded approach, but we can note that probably any theory would hope to derive the ~etc. condition on ellipsis from something deeper.

## 4. Are variable names ever needed? The two SALTy case studies

### 4.1. Case 1: Kennedy's puzzle: Heim's account with variable names

With this background we turn to the two case studies which, have been taken to show the crucial need for variable names. Both make use of a No Meaningless Coindexation condition to accomplish their goals. The first of these is Heim's analysis of 'Kennedy's puzzle' in Heim, 1997 (*SALT 7*) and which was revisited (also using variable names) in Kennedy, 2014(presented at SALT 24, although published in Kennedy 2014). The material below overlaps in some respects with

the discussion in Jacobson, 1998 (*SALT 8*), 2004 *(SALT 14*), and 2009, is refined here in a number of ways. I also address the newer version of Heim's proposal in Kennedy, 2014.

The original puzzle is this. While ACD in (12) is just fine, it is - without some kind of additional prior context - not possible in (13):

(12) Sarah likes every newspaper that KATIE does ~~like~~.

(13) *Sarah likes every newspaper that reviewed a book that KATIE does ~~like~~.

With Heim, 1997 we assume that what goes wrong in (13) is that the focus condition on recovering the two-place relation is not met. Of course none of these are ever said out of the blue and we supply background contexts when reading examples like these, but it is clear that nothing out of the ordinary in terms of background context is needed for (12), unlike (13).

Heim's insight is that the contrast between (12) and (13) is that in (13) there is no appropriate contrast, i.e. no way to satisfy the focus condition. I believe that Heim's basic intuition is correct: the focus condition in (12) is satisfied but not in (13) because in (12) the issue of what Sarah likes is about the same things as is the issue what Katie likes, but this is not the case for (13). But while I think the insight is correct, I will disagree that this insight requires (or should) make reference to variable names. Note, incidentally, that the difference between (12) and (13) does not reduce to the fact that the head nouns of the relative clauses are different, although Sauerland, 1998 did propose that that was the crucial difference. But even with the same head there is a contrast:

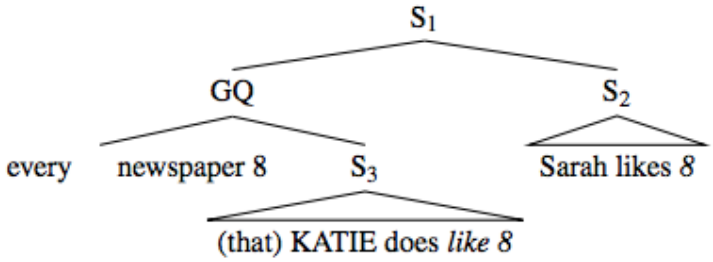
(14) ?*Sarah interviewed every senator whose office is next door to a senator that Katie did.

This is an improvement over (13) but it is not perfect. Jacobson, 2004 argues that this is better simply because it is easier to construct the necessary background to supply the focus condition: we easily imagine this in a context where what is at issue is which reporter interviewed which candidate. (See also Kennedy, 2014.)

Let us consider Heim's implementation of her insight. Her analysis rests on three crucial ingredients. The first is the focus condition, which she takes to reference the *meanings* of two expressions at LF. We saw above that requiring some actual linguistic expression $C_{ANT}$ cannot be correct, but with Heim let us for the moment suppose that we do need to find a $C_{ANT}$ containing the ellipsis 'antecedent', and where $[[C_{ANT}]]$ (or something which follows from it) must be a member of the focus value of a higher expression $C_{ELL}$ containing the ellipsis site. Consider first the case of ordinary ACD which - assuming a QR analysis - gives the LF in (15) for (12); I use a plain integer in object position but if one prefers,

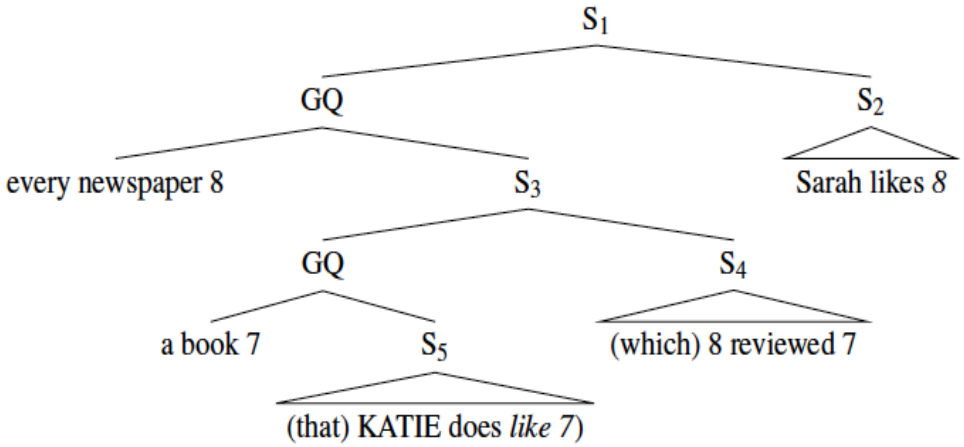
take that as an index on the trace. Moreover, the material in italics is intended as the unpronounced material in a theory with SLM. Also, for simplification I leave ~ out from this (and the subsequent trees, as it is obvious where it would go).

(15)




Notice that for all g, $[[S_2]]^g$ is a member of the focus value of $S_3$ on g, for the focus value of $S_3$ on any g is the set of propositions {sarah likes g(8), katie likes g(8), suzie likes g(8), ....} And so here the focus condition is met. But consider the bad case of (13), whose LF is (16):

(16)




In (16) there are assignments g such that $[[S_2]]^g$ is not a member of the focus value of $S_5$ on g, because each contains unbound variable. (Note that there is no other expression besides $S_2$ which could satisfy Rooth's focus condition.) And even under the view here that the alternative need not be supplied by an overt expression, without additional context there no way to supply the alternative to $S_5$.

But notice that this account relies on the assumption that the traces in the Sarah and Katie clauses don't happen to have the same index. Without additional assumptions, nothing in the general theory of variables/assignment functions precludes this possibility. It should be noted that in the particular case of (16)

matters are more complex: if the two had the same index we would just get an odd and irrelevant interpretation. If both traces were indexed 8, the LF here would mean something like "Sarah likes every newspaper which is such that Katie likes a book that reviewed itself", making the contribution of the restrictor on *every* vacuous: the restrictor contains no unbound occurrence of 8. Thus some variant of a constraint against vacuous quantification would rule this out. But, as discussed in Jacobson, 1998 the general problem resurfaces if we construct a 3-level case:

(17) *Sarah likes every newspaper which reviewed a book which was written by an author that KATIE does ~~like t~~.

Here a prohibition against vacuous quantification does not preclude co-indexing of the lowest trace with the trace of *every newspaper....* that results from QR, as the interested reader can verify. Hence the LF of the matrix clause could be [$_S$ Sarah likes 8] and the LF of the Katie clause could be [$_S$ KATIE likes 8] where the meaning of the matrix will be a member of the focus value of the Katie clause. Indeed, then, we need a way to make sure that these traces are not co-indexed.

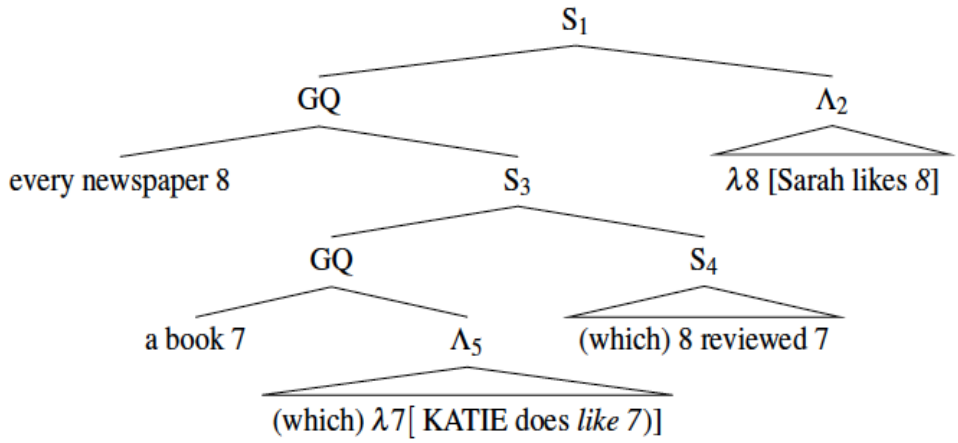
To this end, Heim introduces NMC given earlier. This is extra: nothing in the general theory of variables would lead us to expect this. Moreover implementing something like this constraint requires a definition of 'bound'; see Jacobson, 2014 for the point that even under the standard view of 'binding' of variables this is actually a notion whose definition does not follow in any simple way from the mechanics of 'binding'. Finally, note that if one also assumes that VPE involves the silencing of material under *identity of meaning with some other overt VP*, then the adoption of NMC entails that the cases above in (7) - (9) (discussed here as examples of TVPE) necessarily require that the identity condition can overlook the difference in variable names. Since these are unbound within the domain of the antecedent and elided VPs the two VPs have different meanings. Heim does allow for this difference (taking the identity condition to be a more syntactic one than the focus condition), but it is a mystery why any appeal to 'identity' (formal identity at LF or meaning identity) should allow the names to differ.

### 4.1.1. Interlude: The Formulas Hypothesis

There is one further ingredient invoked by Heim, although I point out below that the (albeit stipulative) solution to a potentially analogous problem in my account could equally well be adopted in Heim's. Thus notice that the trees above are rather simplified. Under most theories, the material that I have shown as, e.g., *newspaper 8* does not combine directly with a proposition. Rather 8 is a direction to the semantics for λ–abstraction over $t_8$ (or $x_8$, or just 8). In other words

*newspaper* combines with an <e,t> function not a proposition, and a more thorough rendering of the LF for (13) would actually be roughly (18):

(18)




But now a new problem arises, since [[$\Lambda_2$]] is a member of the focus value of $\Lambda_5$. Although one expression contains 7 and the other contains 8, these are both bound within the dominating Λs, so the difference in variable names no longer matters.

Heim's solution to this is to adopt the 'formulas hypothesis' (in fact, that is the main point of her paper) whereby quantification is over assignment functions, not individuals. Space precludes full discussion here, but I note that this incorrectly blocks (19). The contrast here cannot be resolved at the level of the relative clauses for the reason above, but neither can the GQs in this system be what is in contrast. I refer the reader to Jacobson, 2004 for details. A quick hint at the problem: this treatment of quantification is such that both the subject and object in (19) are actually open expressions (they vary according to assignments) unlike in the standard view where these are just closed GQs and can contrast. Under the formulas hypothesis, neither GQ is a member of the focus value of the other:

(19) Every candidate KATIE voted for hates every candidate SARAH did.

The problem then is to understand why relative clauses don't count as contrasting with each other while GQs do. As noted above, one can simply stipulate this as a solution rather than adopting a formulas hypothesis, and my account (at present) has an analogous stipulation. But since a subplot of the current paper here is to trace the SALTy history of this domain, I turn to a solution to the badness of (13) vs. the goodness of (19) in Kennedy 2014 (presented at SALT 24) in order to show that this also will not due the job. This

solution maintains, NMC, but Kennedy notes that we can allow (19) while still disallowing (13) by adopting three assumptions. (a) Relative clauses do denote properties (and hence are 'closed'), as in the more conventional semantics. (b) GQs are indeed be type <<e,t>,t> as is standard (hence no quantification over assignment functions). (c) But crucially, Kennedy adopts something akin to Montague's Quantifying In rule (albeit in a different framework). The key ingredient in (c) is that Montague, 1974 did not make use of a step which $S_2$ in, e.g. (15) and (16) is first mapped into an <e,t> type meaning by λ-abstraction, followed by a separate step where this is taken as argument of the GQ. Rather, he folds abstracting over the open variable in $S_2$ and taking the result as argument of the GQ into a single step. The consequence is that one can maintain the more standard semantics both for relative clauses and GQs. (12) is good because - as in the tree in (15) the open sentences involved are [[KATIE likes 8]] and [[Sarah likes 8]] and these contrast (the former also maps to λ8[ [[KATIE likes 8] as in the tree in (16), but this is irrelevant). (13) is bad because - although the LF for *Katie likes 8* has as its representation one node whose meaning is λ8[ [[KATIE likes 8], *Sarah likes 7* has nothing analogous. It is never dominated by a node which closes off 7, hence no appropriate contrast. 7 is closed off only in the step where this is argument of [[every newspaper]]. Note: this still requires NMC.

But this can't be the right solution; we can recreate the original puzzle in examples where both of relevant expressions are relative clauses. So, take the following context. Imagine that Sarah is such that you will like any candidate that she dislikes (and vice-versa). Moreover, to avoid an irrelevant reading in (21) assume further that Sarah cares about candidates but has no idea about what they do, and knows nothing about particular bills that they may or may not have like. With this much background, consider (20) vs. (21):

(20) Speaker A: Which candidate are you going to give money to?
B: The one that Katie likes.
A: Well, but she likes a lot of them.
B: You're right. Okay - the one that Katie likes that SARAH doesn't ~~like~~.

(21) Speaker A: Which candidate are you going to give money to?
B: The one that sponsored a bill (that) I like.
A: Gee, aren't there a bunch of candidates who sponsored good bills?
B: You're right. *Okay, the one that sponsored a bill (that) I like that SARAH doesn't ~~like~~.

compare to: ...?the one that sponsored a bill I like that SARAH doesn't like

B's final utterance in (21) is of course good under a reading where Sarah's opinion is about the bill, but we have set up the background context to avoid this. It cannot have the stacked relative interpretation shown in (22). One might hypothesize that the unavailability of this reading is due to the fact that the lower attachment reading - where the *Sarah* relative clause modifies *bill* - is so much more prominent. After all, it is well known that such ambiguities generally have in a strong preference for low attachment. But this cannot be the full story: if one has a corresponding sentence where *like* is overt the reading that is unavailable for (21) emerges (as shown above). Again one needs to carefully construct the background context to bring out the relevant reading; this is done in (21). The representation of B's bad ellipsis utterance - where $RC_3$ *(that Sarah doesn't like)* modifies *one that sponsored a bill that I like* is:

(22) the [$one_3$ [$_{RC\text{-}1}$ that 3 sponsored a [$bill_4$ [$_{RC\text{-}2}$ that I like 4]]]
[$_{RC\text{-}3}$ that SARAH doesn't *like 3*]]

Under Kennedy's account each of the relative clauses denote properties, so RC-2 should be able to be a member of the focus value of RC-3. While the object traces are not coindexed, both are closed (bound by a λ) at the RC level. My account avoids a potentially analogous problem by simply stipulating that in the lexicon ~ can combine only with S, NP, and GQ; the reasons for this are discussed below. A similar account can be given here. While stipulative, this is surely less drastic than the formulas hypothesis, and avoids the problem of incorrectly blocking (19).

### 4.1.2 The solution without variable names

We can maintain Heim's underlying insight, but recast it to assume that the focus condition is sensitive to the actual *individuals* rather than the variable names. The necessary pieces have already all been introduced in Sec. 3. This basic idea was also sketched in Jacobson, 2004 (see also Jacobson, 2008) though the mechanics here are more explicit. Above we noted that the focus value of something of category S|NP such as *KATIE likes* is (or at least can be) a function from individuals to a set of propositions about that individual which vary according to who likes the individual. Recall that ~ may combine with this only when it undergoes the generalized **g** rule. Hence, the regular value of *~KATIE likes* is a function of type <e,t>, but defined only for those x such that there is a contextually salient proposition about someone other than Katie liking them. Now take the case with TVP ellipsis *~KATIE does*. This is λR[λx[katie R x]] and it is defined only for those R and those x such that R is salient, and there is a y ≠ Katie such that the proposition that y R x is salient. To further simplify the exposition,

imagine that R is already set to [[like]]. (I assume that in fact the value of R is actually supplied by the listener only at the 'top level' - although from the point of view of on-line processing this might well be incorrect. But in any case the exposition is simplified by already setting R to [[like]].) Hence *~KATIE does (like)* is a function of type <e,t> defined for those individuals x such that there is some individual y ≠ Katie and there something salient about y liking x. What individuals meet this criteria? Although we admittedly have not provided a good definition of 'salience', we note that for any x we pick (such that Katie likes x) the semantics of the whole sentence does make it salient whether or not someone else - in this case Sarah - likes x. And it doesn't matter which quantifier we put in here. For we know that any quantifier denotes some relation between the Katie-liking set and the Sarah-liking set, and moreover makes a claim about their intersection. The semantics of the individual quantifiers of course differs, but given that the quantifier cares about the intersection of these sets, then for anything in the Katie liking set it is relevant whether or not it is in the Sarah liking set. So for something like (12) - *Sarah likes every newspaper ~ [that KATIE does ~~like~~]*) the missing two place relation R (set here to [[like]]) is within the scope of ~, and ~ is happy. For each x in the set that Katie likes, the focus value of the S|NP assigns the proposition *Sarah likes x* to that individual, and that proposition is salient. Note that we are not assuming QR here and not assuming that there is any single expression of the form *Sarah likes (t)*. This is not necessary, since ~ does not need to be co-indexed with an actual expression; it just needs the alternative to be salient in the context, which comes about here in virtue of the meaning of the entire S. In the bad case of (13), on the other hand, *~[that KATIE (likes)]* will again need to find for each Katie-liking x, something at issue about whether someone else likes them. But - without additional context - nothing about the semantics of (13) supplies this. The things for whom something is at issue about Sarah liking are entirely different from those which are at issue about Katie liking. This means that when R is set to [[like]], the Katie relative clause is defined for no one. Thus instead of tracking the relevant contrasts in representational terms using variable names (which in turn requires NMC) the suggestion here is that this is entirely about the meanings. In (12) the matrix and the relative clause are 'about' the same things; this is not the case with (13).

Of course there is something peculiar about the above story: the definedness condition is met only by in virtue of the 'top level' semantics. In the good case, for any x, the relative clause *that KATIE does (like)* is defined only because it is contained within a larger sentence which is about the Sarah-likers. While it is therefore a puzzle as to how the entire compositional semantics works, this problem is independent of any treatment of ellipsis or even of ~. For we find the same puzzle with *also* and without ellipsis: a similar conundrum arises here,

regardless of one's theory. This is detailed in Jacobson, 2009, which shows that the ACD pattern puzzle is perfectly mirrored (with or without ellipsis) for *also*:

(23) a. Sarah likes every newspaper that Katie also likes.
b. *Sarah likes every newspaper that reviewed a book that Katie also likes.

In some sense this contrast seems unmysterious, but a bit of thought reveals two important morals. The first is that here too the definedness of *also* requires reference to the meaning of the full S. To illustrate, assume the sake of discussion, that *also* is a propositional operator. (In the surface syntax, it occurs within, e.g., VPs and so must in a direct compositional approach must have a a fancier type.. See Jacobson, 2009 for details. But to save space here we will pretend that the semantics sees something like *[also [Sarah likes]]*.) I assume that [[also]] takes a proposition p and a focus value (a set of propositions) and returns p, but defined only for those p such that there is a true proper alternative to p in the focus value of the S with which it combines. In the theory here, where it is within a relative clause (such as *(that) also Sarah likes)* it is just like ~. It must undergo the generalized **g** rule so that its semantics (again using V as a variable over functions from individuals to sets of propositions) is λP,V[λx[also'(P(x),V(x)), {P(x)}]] but defined only for those P and x such that there is a proposition p' ≠ P(x) which is in V(x). Note that in the case where of *also* combines with the S|NP *Katie likes,* the fact that the <e,t> Katie likes is defined for every individual follows only because of the top-level semantics which ensures that Sarah also likes those individuals. And note that here - unlike the case for ~ - the quantifier matters Obviously (24) is bad (without additional context) because of the semantics of *no:*

(24) *Sarah likes no newspaper that Katie also likes.

In fact, this shows not only that there are examples where (in any theory) the definedness of a focus sensitive operator in an 'antecedent containment' environment requires the semantics of the full S, but Jacobson 2009 claims that it also argues against relying on variable names to get the facts. Space precludes discussion of this here; we simply refer the reader to that paper for details.

Before leaving this, note that I have adopted the stipulation that ~ is listed in the lexicon to combine only with S, NP, and GQs. It can combine with S|NP only in virtue of the generalized **g** rule, allowing it to combine with an something whose focus value is a function from individuals to a set of propositions. Why this stipulation? Why not allow list it in the lexicon to combine with any expression such that there is a salient meaning in the focus value of that expression? The reason is that I am assuming the analysis of the computation of focus values in Golden 2014, and this provides a stage in the computation at

which any S|NP (or $S^{NP}$) also has a focus value which is a set of alternative properties. This shifts to the focus value that we have been discussing all along. It is this very fact that these can denote sets of alternate properties that plagued the Heimian account, and will plague mine for the same reason. In my account, then, ~ must not have access to that stage in the computation, and this is ruled out by the stipulation limiting what it can combine with. It may well be, however, that one can devise a different method for the compositional computation of focus values; I leave this open. If so, we could remove that stipulation altogether.

### 4.2. Case 2: The Sag contrast

We turn now to a second SALTy case which also centers on TVP ellipsis and which has been argued to require variable names supplemented with NMC. (The discussion here is somewhat brief as a more thorough discussion can be found in Jacobson, 2019b). This, thus, brings us back to the contrasts originally noticed in Sag and given in (5). Recall that a proposal in the spirit of Sag, 1976 (if not exactly his) is to account for the degradedness of (5b) by a NMC constraint along with the assumption that ellipsis involves silencing under exact formal or semantic identity. But that cannot be right, for that combination of assumptions rules out the good cases in (6)-(9). Recall further that in VFS, all of (5)-(9) just involve missing 2-place relations. The fact that the object 'slot' in some of these is bound by different things is irrelevant. So the goodness of (6)-(9) is not surprising, but then why the Sag contrast?

Takahashi and Fox, 2005 (*SALT 15*) point out a key difference between the good cases and (5b): only in (5b) is there competition with a different possible ellipsis ((5b) competes with (5a)). They thus related this to 'MaxElide' as in Merchant, 2001 which (informally) says that a larger possible ellipsis blocks ellipsis of a smaller expression. I agree with Takahashi and Fox (hereafter, T&F): (5b) is degraded due to competition with (5a), but will frame the competition principle differently in a way which I argue is in any case more motivated.

Let us consider competition effects in general. We know that speakers and hearers compute competing utterances; Gricean reasoning relies on the claim that hearers compute alternatives that the speaker could have said, and blocking effects are another example. But should the *grammar* contain competition effects such as MaxElide? Or should all competition effects instead be located in principles regarding speakers and hearers? Various arguments have been given for the latter position (see, e.g., Johnson and Lappin, 1997). Of there is a huge body of recent literature claiming that the grammar *is* sensitive to Economy based competition effects, but even if one is willing to accept such principles in the grammar, MaxElide seems to have nothing to do with Economy. One might then

ask: can MaxElide be recast as a speaker/hearer principle? This seems plausible.. Call this the Lazy Speaker Hypothesis: A speaker will elide as much as possible. But this has two problems. First, it incorrectly predicts ellipsis is always required:

(25) a. Katie will vote, and Sarah will too.
b. Katie will vote, and Sarah will vote too.

(25b) is perhaps slightly degraded, but not to the extent of (5b). My own account has the reverse problem (see below), and the hoped for solution in my account could equally well be relevant here. But more seriously, T&F note that there are cases where the smaller ellipsis may be slightly dispreferred but only slightly:

(26) a. Katie thinks that Bode will win, and Sarah also does.
b. Katie thinks that Bode will win, and Sarah also thinks he will.

Hence the key generalization in T&F's account is this: MaxElide is relevant only when the smaller (potential) ellipsis site contains an unbound variable (trace or pronoun) within it. This covers not only the case in (5b) but also the original contrast for which Merchant proposed MaxElide. However, we set these aside here as Griffiths, 2019 shows that the original Merchant contrasts might have a completely different explanation. On the face of it the generalization sounds stipulative, but - to be fair - T&F derive this from their particular recasting of Rooth's focus condition on ellipsis. I give this only informally here, acknowledging that my informal rendering might not do full justice to the rationale for their particular formulation. It will, however, serve the present purposes. Thus first they define the following:

(28) The Parallelism Domain (PD) for some ellipsis site E is the lowest node for which there is (a) some (overt) expression in the discourse context with the same meaning as E, or (b) if there is no such expression then it is the lowest node meeting Rooth's focus condition.

In other words, any ellipsis site (recall they assume SLM) with an antecedent with a fully identical meaning is its own PD. If we have an ellipsis site with an unbound variable within it whose antecedent has a different unbound variable - hence the meaning of the antecedent ≠ [[E]] (as in (6)-(9)), then the PD looks up the tree to find a focus domain $C_{ELL}$ such that there is a $C_{ANT}$ whose meaning is a member of the focus value of $C_{ELL}$. They then propose that MaxElide holds only within the parallelism domain for some ellipsis. So (25b) does not compete with (25a) because the ellipsis site in (25b) is its own PD (it has an antecedent with the same meaning). What about (6)-(9)? In all of these, the ellipsis site contains an

unbound variable, and it is bound differently from the corresponding one in the antecedent. And so the PD must be bigger (in (7), for example, the PD for the ellipsis in the second conjunct is the entire second conjunct.) But ellipsis is allowed *because there is no possible higher ellipsis* - any higher ellipsis will not result in the same meaning. The crucial case is Sag's (5b). Here the PD for the Harris clause is the whole second conjunct. But here (5a) is a possible ellipsis. MaxElide comes into play, and blocks (5b) in virtue of the competition with (5a).

But note the following crucial ingredients here. First it requires a focus condition like Rooth's where both the ellipsis site and a higher constituent containing this need overt linguistic material as antecedents; neither of these are tenable. Moreover, this still requires NMC. For suppose that we allowed two variables bound by different things to have the same name. Then (5b) should not be degraded any more than, e.g., (26b). The elided VP and the antecedent VP could have exactly the same meaning, as they could have the same variable for the object pronoun.

T&F note that a variable free view does not make available anything analogous to their analysis. In the variable-ful view (supplemented with NMC) the two 'little VPs' in (5b) have different meanings, and this fact is crucial in their analysis. But under the variable free view, the missing material that is supplied in both cases (or, elided) is the 2-place relation [[vote-for]]. That the object 'slot' in both cases ultimately is filled by different things (Warren vs. Harris) this makes no difference in terms of the local meaning of supplied/elided material. They thus use the fact that there is no meaning difference here (unlike in their view where both contain unbound variables with different names) to argue against VFS.

But that argument is only as strong as is the assumption that it is the difference in meaning in the two that plays a fundamental role in accounting for (5b). In their account, that in turn ties in to their version of the focus condition combined with MaxElide. And we have seen above that MaxElide is a somewhat problematic competition based principle: it cannot be recast as a speaker/hearer principle (because it applies only when there is an unbound variable in the ellipsis site). Is there a different way to see these facts?

Indeed there is, while still adhering to T&F's insight that competition is what distinguishes Sag's degraded (5b) from the good cases in (6)-(9). And this is to suspect that the competition is about *types,* not *size.* Note that in the bad case (and all other cases in which there would be an 'unbound variable', in the standard view in the 'elided' material) what is missing is a function of type <e,<e,t>>. In (6)-(9), there is no competing ellipsis. But in Sag's (5b) case, there is a competing higher ellipsis: of type <e,t>. Let us suppose, then, that the relevant principle is as follows: when an ellipsis (e.g., 'missing meaning') of some type is such that one could convey the same message with a missing meaning of a less complex type then having the simpler type be the missing meaning is preferred. (This of course

assumes that in both cases the context/discourse is such that either can easily be supplied.) Call this the "Be good to your listener' hypothesis.

It is easy to see this (unlike MaxElide) as a speaker/hearer based principle. We have already speculated - for entirely different reasons - that <e,t> meanings are harder to access from the context than are missing individuals (as in the case of ordinary free pronouns), and that <e<e,t>> meanings are harder to access than <e,t> ones. The hypothesis that <e,t> meanings are difficult to access was motivated by the very fact that it is difficult to have VPE cases with no overt linguistic antecedent. The hypothesis that <e,<e,t>> meanings are even harder to access is motivated by the fact that it is even more difficult to construct/find cases with missing 2-place relations supplied only by context. And if we return to our scenario of Keela and Zack in (10) we find some additional evidence that what is going on in these competition cases cannot be a fact about a grammatical principle. For notice that the goodness of Zack's response (*I don't want you to either)* is at first glance surprising both under MaxElide and under the reformulation here. For this competes with the larger/simpler type ellipsis *I don't either*. Why, then, is this not degraded? I suspect that this is because of the copy-cat nature of Zack: he is copying the surface utterance of his sister and so this form seems quite expected. But if the relevant principle were a grammatical one, it should not be able to overridden - copycatness notwithstanding.

We note that there is an obvious conundrum presented by the "Be good to your hearer" hypothesis: by itself, it predicts that ellipsis should never be good. (This is the opposite side of the problem that the Lazy Speaker hypothesis has.) I assume that there is indeed a trade off between least effort on the part of the speakers and making things as easy as possible for the hearer (a tradeoff we find in many other domains). But the key point here is that the fact that the competition manifests itself only when there is an 'unbound' variable in the ellipsis site (or - in the terms here - where the degraded competitor is a function of type <e,<e,t>>) follows immediately from the hypothesis here. It is not obvious, on the other hand, why MaxElide should care about this (although to be fair, T&F try to make this follow from their condition on ellipsis).

There are two further points to note before leaving this. First, the interested reader can confirm that this extends to Merchant's original case for MaxElide, but we will not pursue this here as Griffiths, 2019 suggests that Merchant's bad case might have a totally independent explanation. Second, there are some cases where T&F's account and mine here make different predictions. Space precludes discussion here; see Jacobson: 2019b for further discussion, including a case where this makes the right prediction while T&F do not.

The final conclusion, then, is that neither of these SALTy domains require variable names. The variable free alternatives have various advantages, not least of which is no need for a surprising stipulation along the lines of NMC.

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Pauline Jacobson
Dept. of Cognitive, Linguistic and Psychological Sciences
Box 1812
Brown University
Providence, RI 02912
pauline_jacobson@brown.edu