

Passive *Do So*

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Abstract

The received view is that the VP pro-form *do so* cannot be a verbal passive, although it can be unaccusative. I show that this is incorrect: *do so* can be passive. It can also take a raising to subject verb as its antecedent. This means that *do so* is compatible with all types of A-movement, although it does not permit A-bar movement. I construct an analysis of *do so* where it is simply an intransitive verb plus an adverb. The verb combines with a Voice head, which can be unaccusative, passive, or active transitive. The subject of *do so* is base-generated in Voice, and does not move in unaccusatives or passives. Instead, *do so* must copy a function from its antecedent in the semantics. The proposal that lambda abstraction in A-movement is accomplished by the head that triggers the A-movement (here, Voice) results in the subject of *do so* being interpreted as an internal argument if Voice is passive or unaccusative. This reconciles the evidence against movement in *do so* itself with arguments for A-movement in its antecedent. The copy mechanism explains voice and category mismatches, as well as split antecedents and ellipsis-containing antecedents.

1 Introduction

It has long been observed that VP ellipsis is compatible with A-bar extraction from the ellipsis site (Lappin 1984, 282, Fiengo and May 1994, 229):

- (1) VP Ellipsis
 - a. I know which cases the Supreme Court will hear, and which cases they won't.
 - b. The director rejected every proposal that the deputy director did.
 - c. Bubble tea, I'll drink, but green tea, I won't.
 - d. The junior lawyers try more cases than the senior partners do.

In contrast, the VP anaphor *do so* (Lakoff and Ross 1966, 1976) is not compatible with A-bar extraction, as first noted by Bouton (1969, 237):

- (2) *Do So*
 - a. * I know which cases the Supreme Court will hear, and which cases they won't do so.
 - b. * The director rejected every proposal that the deputy director did so.
 - c. * Bubble tea, I'll drink, but green tea, I won't do so.
 - d. * The junior lawyers try more cases than the senior partners do so.

A typical account of this contrast is that VP ellipsis involves a full (silent) syntactic structure, but *do so* is a pro-form with no structure that could support a gap (e.g., Fiengo and May 1994).

The VP anaphor *do so* is also apparently incompatible with the passive (Bouton 1969, 237–238, Hallman 2004, Houser 2010):

- (3)
 - a. * The boy who we regularly annoyed had no idea why he was being done so. (Bouton 1969, 237, (21))
 - b. * The game that was done so by the midget team was won on raw courage. (Bouton 1969, 237, (22))

- c. * The vase was broken by the children, and the jar was done so, too. (Houser 2010, 22, (44))
- d. * These books were left in the classroom, and this cell phone was done so, too. (Hallman 2013, 77, (5d))

This appears as though it points to the same conclusion: the passive involves movement of an object from within the VP, but again the VP anaphor *do so* does not have the structure that would be necessary to support this movement.

However, Hallman (2013) points out data that seem to be at odds with this conclusion. One fact is that the VP anaphor *do so* is compatible with unaccusatives (Huddleston and Pullum 2002, 1532, Houser 2010):

- (4) Unaccusatives (Hallman 2013, 90, (50a–b))
 - a. The river froze solid, and the pond did so, too.
 - b. The towels dripped dry, and the socks did so, too.

Unaccusatives are thought to involve movement of an underlying object to subject position, just like passives. (Addition of the resultative secondary predicate ensures that the verbs have not been coerced into unergatives.) Unaccusatives pattern with passives in many ways, for instance in their compatibility with resultatives (e.g., Levin and Rappaport Hovav 1995), and this has led to the hypothesis that the surface subject of an unaccusative, like the surface subject of a passive, starts out as an object (e.g., Perlmutter 1978, Perlmutter and Postal 1984). The fact that *do so* is compatible with unaccusatives but not passives is then unexpected.

Additionally, adjectival passives permit *so*, contrasting minimally with verbal passives with *do so*:

- (5) (Hallman 2013, 78, (11a–b))
 - a. * The ship was damaged, and the dock was done so, too.
 - b. The ship appears damaged, and the dock appears so, too.

Many lexicalist analyses of adjectival passives do not posit movement from the underlying object position in adjectival passives (following Wasow 1977), but more recent analyses of adjectival passives do (e.g., Embick 2004, Bruening 2014).

The apparent ill-formedness of verbal passives with *do so* then could not be due to the incompatibility of *do so* with movement from object to subject. If unaccusatives and adjectival passives involve movement of an underlying object, then it is not possible to claim that *do so* is ungrammatical with verbal passives because *do so* is incompatible with movement.

Note that these data also rule out another possible account. As Lakoff and Ross (1966) and Ross (1972) noted, *do so* is degraded with stative predicates. A possible account might be that *do so* requires an agentive subject, as Culicover and Jackendoff (2005) explicitly claimed (cf. Baltin 2012). Unaccusatives and adjectival passives render this explanation untenable, however: neither has an agentive subject.

Additionally, Hallman (2013) points out that *do so* is still incompatible with A-bar extraction at the same time as it is compatible with unaccusatives and adjectival passives:

- (6) Unaccusatives (Hallman 2013, 90, (51a–b))
 - a. The towels dripped drier than the socks did (*so).
 - b. The roses grew taller than the sunflowers did (*so).
- (7) Adjectival Passives (Hallman 2013, 78, (12a–b))
 - a. The ship looks more damaged than the dock looks (*so).
 - b. The violin looks more expertly repaired than the cello looks (*so).

These examples involve comparatives, which require A-bar extraction (Chomsky 1977). We seem to be faced with a contradiction: one form of movement is grammatical, but another form of movement out of the same constituent is not.

Baltin (2012) and Hallman (2013) both propose accounts of *do so* that attempt to explain that anaphor's compatibility with unaccusatives and adjectival passives but its incompatibility with verbal passives and A-bar extraction.

However, I show here that any such account is based on the wrong data: in fact, *do so* does occur as a verbal passive. I present naturally occurring data that show that verbal passives are compatible with *do so*, given the right syntactic context. Additionally, we also find active-passive mismatches between *do so* and its antecedent, just as we do with VP ellipsis (Sag 1976; for recent discussion see Merchant 2008, 2013). Moreover, *do so* is compatible with raising to subject. This means that *do so* is compatible with all sorts of A-movement, although it is not compatible with A-bar movement. One could conclude from this that A-movement is not movement at all, but I give reasons to reject this view. At the same time, however, there is no A-movement with *do so* itself. What we need is some way to reconcile a base-generated, pro-form analysis of *do so* with A-movement in its antecedent.

I propose such a way here, building on a proposal in Bruening (2015) that A-movement involves abstraction being built into the semantics of the head that triggers the A-movement. As I will show, this proposal coupled with a view of *do so* as an intransitive verb plus adjunct (Bouton 1970) explains why A-movement is compatible with *do so* but A-bar movement is not. A-movement and A-bar movement work very differently, with A-bar movement quantifying over choice functions (Sauerland 1998, Ruys 2000) and requiring a copy in argument position (cf. Reinhart 1998). There is no argument position with *do so*, because it is intransitive. Just with *do so*, an NP can be base-generated as the subject of *do so* and be interpreted as though it were in an internal position, because of the way *do so* finds an antecedent. It requires an appropriate function to copy at the level of semantic interpretation, and if this function is of the appropriate form, the subject of *do so* can be interpreted as an internal argument. I show that this analysis successfully accounts for *do so* as an unaccusative or raising verb, adjectival and verbal passive, and all cases of active-passive and syntactic category mismatches, while maintaining that A-movement is always movement.

Section 2 presents the new data involving verbal passives and raising to subject. It also argues that A-movement really is movement, but the subject of *do so* is base-generated, even when its antecedent is unaccusative or passive. Section 3 presents the proposed analysis and shows how it accounts for all of the facts.

2 New Data

In this section, I present new data showing that verbal passives are compatible with *do so*. Moreover, voice mismatches occur between the voice of *do so* and the voice of its antecedent. I also show that *do so* is compatible with raising to subject, meaning that it is compatible with all varieties of A-movement. At the same time, A-movement really is movement, except with *do so*.

2.1 Verbal Passives

Using the web as a corpus, I have found many examples of passive *do so*. I present a few of these examples below. All of them are judged by native speakers to be grammatical.

- (8) a. For those who do not know Devil Fruits are extremely rare to find and the ones that are found and eaten **are done so** in mere happenstance unless you know what to look for.
(<http://shannaro.wordpress.com/2012/11/30/>)
- b. I then take notice and observe when the food is brought to table that the meal is picked apart and what is eaten **is done so** in a controlled and seemingly not pleasurable manner.
(<http://www.psychologytoday.com/blog/when-food-is-family/201208/reflections-the-2012-olympi>)
- c. Every photo taken and every update written **is done so** with the adoptive parents in mind.
(<http://godslittlestangelsinhaiti.org/andlifegoeson/2013/07/19/words-of-encouragement-adds->)
- d. It is thrillingly written, and **done so** with the clarity and poignancy of a man who waited 62 years to reveal the full account of his experience, after first being approached by American prosecutors in 1947.
(<http://theboar.org/2013/04/19/denis-avey-believe-or-not-believe/>)

- e. And I think everyone can agree that some of the most beautiful music ever written **was done so** in the name of God or gods.
(quote attributed to Anand Wilder, <http://en.wikipedia.org/wiki/Yeasayer>)
- f. The first “Rosicrucian” writings, the Fama Fraternitatis, Confessio Fraternitatis and the Chemical Wedding of Christian Rosenkreuz, all when written **were done so** anonymously and then later traced to be the works of Johannes Valentin Andreae, . . .
(Tobias Churton, http://www.bonisteelml.org/invisible_history_of_rosicrucians.pdf)
- g. Therefore, with a book bound in human flesh comes a feeling that something “bad” happened in order for these people’s flesh to be used as book binding in the first place, even if it **WAS done so** legally.
(<https://roadtrippers.com/stories/harvard-discovers-three-of-its-library-books-are-bound-in-human-flesh>)
lat=40.80972&lng=-96.67528&z=5)
- h. Although coffee was brewed in the shops, it **was done so** only at the request of customers and dispensed as free samples, . . .
(<http://www.entrepreneur.com/article/197692>)

All of the above data indicate that Bouton (1969) and Hallman (2004, 2013) are incorrect in their assertion that *do so* cannot be passive. Now, the question arises of why previous researchers concluded that *do so* cannot be passive. Even the speakers who find the above examples grammatical reject the examples given in the literature, like those in (3). Why is there a discrepancy in these judgments?

One thing to notice is that most (but not all: 8g–8h) of the attested examples have the antecedent of *do so* inside a relative clause that modifies the subject of *do so*. Houser (2010) noticed that counterexamples to the requirement that *do so* be eventive are attested in the same environment. For instance, he presents the following contrast:

- (9) (Houser 2010, 3–4, (7b), (8b))
 - a. * Felix knows French from school, and Sammie does so, too.
 - b. The students who know French best do so because they lived in France for a year.

Houser’s explanation for this effect relies on the fact that VP ellipsis is unavailable in this context. For instance, the above contrast reverses when we use VP ellipsis instead of *do so*:

- (10) a. Felix knows French from school, and Sammie does, too.
- b. * The students who know French best do [—] because they lived in France for a year.

All of the passive examples collected above also do not permit VP ellipsis in place of *do so*:

- (11) a. * The Devil Fruits that are found and eaten are [—] in mere happenstance unless you know what to look for.
- b. * When the food is brought to table the meal is picked apart and what is eaten is [—] in a controlled and seemingly not pleasurable manner.
- c. * Every photo taken and every update written is [—] with the adoptive parents in mind.
- d. * It is thrillingly written, and (is) [—] with the clarity and poignancy of a man who waited 62 years to reveal the full account of his experience.
- e. * And I think everyone can agree that some of the most beautiful music ever written was [—] in the name of God or gods.
- f. * The first “Rosicrucian” writings, all when written were [—] anonymously and then later traced to be the works of Johannes Valentin Andreae, . . .
- g. * Therefore, with a book bound in human flesh comes a feeling that something “bad” happened in order for these people’s flesh to be used as book binding in the first place, even if it **WAS [—]** legally.

- h. * Although coffee was brewed in the shops, it was [—] only at the request of customers and dispensed as free samples, . . .

In contrast, in (3c–d), where *do so* is judged to be unacceptable, VP ellipsis is perfect:

(12) *Do So* (=3)

- a. * The boy who we regularly annoyed had no idea why he was being done so. (Bouton 1969, 237, (21))
 b. * The game that was done so by the midget team was won on raw courage. (Bouton 1969, 237, (22))
 c. * The vase was broken by the children, and the jar was done so, too. (Houser 2010, 22, (44))
 d. * These books were left in the classroom, and this cell phone was done so, too. (Hallman 2013, 77, (5d))

(13) VP Ellipsis

- a. * The boy who we regularly annoyed had no idea why he was (being).
 b. * The game that was by the midget team was won on raw courage. (Bouton 1969, 237, (22))
 c. The vase was broken by the children, and the jar was, too.
 d. These books were left in the classroom, and this cell phone was, too.

Bouton's examples in (3a–b) are not acceptable with VP ellipsis, but this seems to be because they have other things wrong with them. Modifications to these examples show that passive *do so* and VP ellipsis are again in complementary distribution:

- (14) a. A: That boy is being picked on. B: Kids often are (*done so) at this school.
 b. A: The game will be won on raw courage. B: Yes, it will be (*done so).

Another factor in the acceptability of *do so* is the inclusion of a non-contrastive adjunct. Huddleston and Pullum (2002, 1531) note that VP ellipsis is degraded compared to *do so* in the presence of a non-contrastive adjunct:

(15) (Huddleston and Pullum 2002, 1531, (44))

- a. She agreed to help, but she {did so / *did} reluctantly.
 b. Those who take part {do so / *do} at their own peril.

All of the attested examples of passive *do so* have non-contrastive adjuncts. In fact, searching for “were/was done so with” turned up many more relevant examples than just searching for “were/was done so.” Consider the effect of the adjunct on the following:

- (16) a. Although coffee was brewed in the shops, it was **done so** only at the request of customers and dispensed as free samples, . . .
 (<http://www.entrepreneur.com/article/197692>)
 b. * Although coffee was brewed in the shops, it was [—] only at the request of customers . . .
 c. A: Was coffee brewed in the shops? B: It was [—]. / *It was done so.

Thus, we see that the acceptability of passive *do so* is negatively correlated with the acceptability of VP ellipsis in the same environment. Passive *do so* is acceptable just when VP ellipsis is not.

Houser's (2010) account of this effect is that there are grammatical constraints on *do so*, for instance a constraint that it be eventive, but these constraints can be overcome by the need to use some kind of VP anaphora. If VP ellipsis is unavailable, then *do so* must be used. Houser refers to the suspension of constraints on *do so* as *subtractive coercion*: a constraint is removed by some other need.

I will not adopt this account, since it is not clear to me how something could ever be generated by the grammar if something blocks it. Instead, I will hypothesize that there are no grammatical constraints on *do so* forcing it to be eventive or active. The grammar freely generates stative and passive instances of *do so*. I propose that the preference for *do so* being eventive and active is just that, a preference, which is strong enough that when VP

ellipsis is available, speakers will have such a strong preference to use VP ellipsis for a stative or passive VP that they will judge *do so* to be unacceptable. When VP ellipsis is unavailable, however, the true grammatical potential of *do so* comes to the surface.

Determining the exact distribution of passive *do so* is not the point of this article, so I will not try to decide between Houser's account and my own suggestion, or other possible explanations. It is sufficient to show that in some contexts, *do so* can be passive. Given this, we need a model of grammar that can generate passive *do so* in the environments that allow it. Such a model is what I will attempt to construct in section 3.

2.2 Active-Passive Mismatches

In addition to occurring in a passive form, *do so* also tolerates mismatches between it and its antecedent in voice. Active-passive mismatches between *do so* and its antecedent were noticed as long ago as Bouton (1969):

- (17) (Bouton 1969, 232–233, (7), (9))
- a. Mary was contacted by the same man in Boston who had done so in New York.
 - b. Because the issue had been discussed so thoroughly in our committee that afternoon, we were asked not to waste time doing so again that night.

A broader range of examples are provided by Dalrymple, Shieber, and Pereira (1991), Kehler and Ward (1999), and Merchant (2013, 81, note 9); I also include an example from Huddleston and Pullum (2002):

- (18)
- a. It is possible that this result can be derived from some independent principle, but I know of no theory that does so. (Mohanar 1983, 664, cited by Dalrymple, Shieber, and Pereira 1991, 440, (60b))
 - b. Section 1 provides the examples to be derived by Gapping, and a formulation of Gapping capable of doing so. (text of Neijt 1981, cited by Kehler and Ward 1999, 246, (35))
 - c. As an imperial statute the British North America Act could be amended only by the British Parliament, which did so on several occasions. (*Groliers Encyclopedia*, cited by Kehler and Ward 1999, 247, (36))
 - d. To the extent that victory can be achieved with a minimum of personal sacrifice, the Bush administration will try to do so. (Ted Koppel, "The long, cost-free war." *New York Times*, 6 November 2006, p. A23, cited by Merchant 2013, 81)
 - e. Apple's lawyers sent Gizmodo a letter asking that the phone be returned, and the Web site did so. (Brian Stelter and Nick Bilton, "Computers seized from home of blogger in iPhone inquiry." *New York Times*, 27 April 2010, p. B7, cited by Merchant 2013, 81)
 - f. The intention behind the legislation was to ensure the money should be used for reinstatement where it was possible and economic to do so. (Huddleston and Pullum 2002, 1531, (46i))

All of the above cases have a passive antecedent while *do so* is active. The previous literature has not cited examples of an active antecedent with passive *do so*, because passive *do so* was always viewed as impossible. However, I have been able to find a number of attested examples:

- (19)
- a. Some of the sites that we have located were done so with the help of people we met while in the process of trying to locate the site.
(<http://www.check-six.com/lib/origin.htm>)
 - b. Each of the 444 ACME oysters Sonya consumed were done so with a fork, as required by MLE.
(<http://www.majorleagueeating.com/contests.php?action=detail&eventID=437>)
 - c. LaValle has said all of the funds that he withdrew for Friendship Ridge were done so with the permission of County Commissioners.
(<https://beavercountian.com/content/daily/bank-slips-show-3-4-million-unilaterally-withdraw>)

- d. While the D-Backs will have a new face at shortstop in Jean Segura, the majority of other moves that the team made this offseason were done so with the pitching rotation in mind.
(<http://isportsweb.com/2016/02/07/arizona-diamondbacks-projected-batting-lineup/>)
- e. The practice they carried on underground was done so with a limited understanding of their new-found faith.
(*Japan at War: An Encyclopedia*, p170, accessed by Google Books)

There is no way to accommodate these mismatches within previous syntactic accounts of *do so* like those of Baltin (2012) and Hallman (2013), since passive *do so* cannot even be formed in those analyses.

Note that all of the examples of this pattern that I have found have the antecedent of *do so* embedded in the subject of *do so*. This was the context that permitted passive *do so* generally. Now we see that *do so* has its own voice, distinct from that of its antecedent, and it does not have to match its antecedent in voice. It can be active while its antecedent is passive, and it can be passive while its antecedent is active.

2.3 Raising to Subject

We saw above that A-bar movement is not compatible with *do so*. So far, at least passive A-movement and unaccusative A-movement are. According to Houser (2010), another form of A-movement, raising to subject, is not grammatical with *do so*, but as he points out, his examples involve stative raising verbs, and statives are not generally acceptable with *do so*. They are acceptable in the syntactic context identified above, however. If we put a raising to subject verb in that context (embedded in the subject of *do so*), raising to subject is acceptable:

- (20) a. ... we can see how two objects that appear to be close together do so only because they lie along the same line of sight.
(<http://www.redchairblogs.com/starstruck/2015/04/24/a-cosmic-dance/>)
- b. The horse which appears to be grey does so because it received the greying agent from the parent.
(<http://www.hitechbloodstock.com/coat%20colour.htm>)

There are also raising verbs that are eventive, and these are compatible with *do so* even outside of this one syntactic context (although they might be better in this context):

- (21) a. The rooster that began to crow right outside my window this morning always seems to do so at the first crack of dawn. (possible interpretation: ‘begin to crow’)
- b. A rooster began to crow right outside my window. It did so because the sun came up, I assume.
- (22) a. The screws that are threatening to pull away from the wood right now have been doing so for years. (= ‘threatening to pull away from the wood’)
- b. One screw is threatening to pull away from the wood. It’s doing so because the threads are stripped.

This means that all types of A-movement are grammatical with *do so*: passive, unaccusative, raising.

2.4 A-Movement is Not Movement?

Because A-movement is compatible with *do so* but A-bar movement is not, we might conclude that A-movement is not movement at all, as in many lexical analyses of passives, unaccusatives, and raising (e.g., Bresnan 1982, Müller 2006, Müller and Wechsler 2014). Then the generalization would be that *do so* is simply incompatible with movement. However, there are many good reasons to believe that A-movement is in fact movement. One reason is the possibility of reconstruction (e.g., May 1977, Fox 1999, Moulton 2013). Another is the distribution of expletives. Expletives can undergo A-movement in the passive and in raising to subject (Rosenbaum 1967, 64):

- (23) a. There was believed to have been a spy at the Department of Domestic Surveillance.
- b. By the eleventh century, there began to be widespread dissatisfaction with the wealth and power the monasteries possessed.

Importantly, expletives are *not* possible with *do so*:

- (24) a. * There was believed to be a spy, and done so by everyone. . .
- b. * On that site there were built numerous monuments and temples, apparently before there were done so on the adjacent one.
- c. * In the eleventh century, there began to be widespread dissatisfaction with the monasteries, and there also did so in the thirteenth century.

No relevant examples turn up in web searches of “there were done so” and “there was done so” (searches performed 6/10/2015).

In section 3.1, the analysis of adjectival passives that I will adopt (from Bruening 2014) does not have direct movement of the surface subject of the adjectival passive from object position of the base verb. Instead, a null operator moves from object position. We then expect that expletives would be incompatible with adjectival passives as well, and this is correct. Adjectival passives can be formed from raising to object verbs, as in (25a), and such verbs as verbal passives allow expletives, as in (25b), but the adjectival passive does not (25c):

- (25) a. The real solution is to use a secure script, and the only one that appears acknowledged to be secure in these forums is called NMS FormMail. (Bruening 2014, 370, (17b))
- b. There was acknowledged to be a spy at the Department of Domestic Surveillance.
- c. * There appears acknowledged to be a spy at the Department of Domestic Surveillance.

If all cases of putative A-movement were actually accomplished by some kind of lexical rule instead, we would have no explanation for why expletives are compatible with verbal passives and raising to subject, but not with adjectival passives or *do so*. I take the distribution of expletives to show that verbal passives and raising to subject involve direct movement. Adjectival passives do not. Importantly, *do so* does not either. The subject of *do so* must be base-generated as the subject of *do so*, even when it is passive in form. On the other hand, the subject of the passive in the antecedent of *do so* is derived by movement. While it is not possible to show that a subject must be undergoing movement in a clause at the same time as that clause serves as the antecedent for *do so*, in the absence of a reason to think that A-movement must sometimes have a non-movement derivation, a uniform theory where passives, unaccusatives, and raising to subject are always accomplished by A-movement is to be preferred.

Note also that the facts of expletives are incompatible with an account like that of Baltin (2012), where *do so* actually involves ellipsis. In Baltin’s account, A-movement as in unaccusatives truly is movement, even with *do so*. If this were correct, *do so* should allow an expletive subject (VP ellipsis does). The fact that it does not indicates that *do so* really is a pro-form, with no deleted structure for an internal argument position.

This means that we need a pro-form theory where the subject of *do so* is base-generated even when it is passive or unaccusative, but the subject of its antecedent is derived by movement. In the next section I will show that a simple proposal for how A-movement works, independently proposed to account for depictive secondary predicates, permits such an apparently contradictory theory.

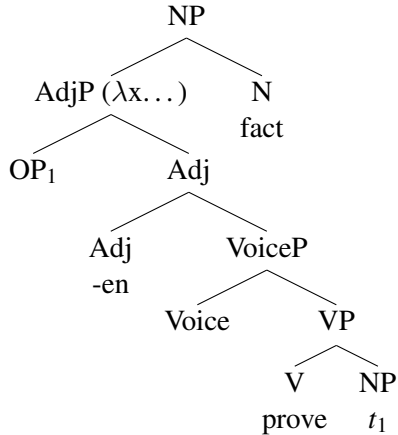
3 An Alternative Analysis

To recap, here are the facts that an analysis should capture: First, A-bar extraction is incompatible with *do so*. Second, A-movement is compatible with *do so*, although there is no actual A-movement with *do so*. A-movement with other predicates is movement, however. Third, *do so* has its own voice (active vs. passive), distinct from that of its antecedent.

3.1 Adjectival Passives

I will begin with adjectival passives. I will adopt the analysis of these proposed by Bruening (2014). In this analysis, a null operator moves and abstracts over a VoiceP projection that has been rendered passive and stative by an Adj(ective) head (the following tree has been slightly simplified from the source):

(26) a proven fact (Bruening 2014, 386, (63))



Following Kratzer (2005), the denotation of an adjectival passive is that shown in (27), with “λx” coming from abstraction effected by the moved operator. The label “Init” stands for “Initiator,” what I take to be the external argument role, introduced by Voice. See below.

(27) $\llbracket [\text{AdjP proven}] \rrbracket = \lambda x \lambda t. \exists e, y [\text{prove}(e, x) \ \& \ \text{Init}(e, y) \ \& \ \tau(e) \leq t]$

The exact analysis is not particularly important here, what is important is that the adjectival passive denotes a predicate of individuals, just like any adjective. It is also important that the surface subject of the adjectival passive (the noun *fact* in the tree above) did not move directly from object position. This is why expletives are incompatible with adjectival passives, as was shown above. See Bruening (2014) for more details and supporting evidence.

Turning now to the pro-form *so*, it is able to take any sort of predicate of individuals as its antecedent, including adjectives:

- (28) a. Looking back now, I know it wasn't *normal*, but it seemed **so** then. (AP)
 b. I still remember the interview because I was *so damn nervous* and probably appeared **so**. (AP)
 c. I'm *extremely busy* at the moment, and expect to be **so** for the next two hours at least. (AP; Cornish 1992, 167, (11a))
 d. Gabriella Montez was *a good luck charm*. At least, Troy Bolton considered her **so**. (NP)
 e. If these were *lighter moments*, they hardly seemed **so** then. (NP)
 f. She was not really *on drugs* although she seemed **so** at the time. (PP)
 g. The figure was not really *under the tree* although it appeared **so** from a distance. (PP)

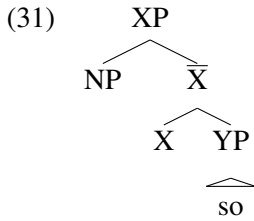
I propose that the predicate pro-form *so* simply denotes a function that takes an individual and a state as arguments (cf. Landman 2006):

(29) $\llbracket \text{so} \rrbracket = \lambda x \lambda s. f(x, s)$

As the derivation unfolds and the compositional semantics is calculated, the function *f* must be replaced by an appropriate function from the discourse. For instance, in the following example, *f* is replaced with the function denoted by the AP *normal*:

- (30) It wasn't [normal] but it seemed so then.
 a. $\llbracket \text{so} \rrbracket = \lambda x \lambda s. \mathbf{f}(x, s)$
 b. Antecedent: $\lambda x \lambda s. \text{normal}(x, s)$
 c. Copy: $\lambda x \lambda s. \mathbf{f}(x, s) \rightarrow \lambda x \lambda s. \mathbf{normal}(x, s)$

As for the syntax, it does not matter here what the syntax of non-verbal predication is. One possibility is that all predicates, including *so*, are the complement of some head X in whose specifier the subject of the predicate is projected:



The head X would simply be vacuous semantically on this analysis. Alternatively, the subject is the specifier of Y, whatever category Y is. Either alternative will work for the purposes of this article, as would other conceivable alternatives (for instance, the denotation of surface *so* could be built up compositionally from YP *so* and X, so that *so* itself would have a uniform semantics in both non-verbal *so* and *do so*, below). What is important is that the syntax of *so* does not change during the course of the derivation; it is not replaced with the structure and content of its antecedent (as in Hallman 2013), nor is any structure deleted (as in Baltin 2012). It is only in the semantics that copying takes place.

Adjectival passives are just like other adjectives, although they have a more complicated derivational history. This derivational history is irrelevant to *so*, however, which just needs the semantics of a stative predicate to copy. Consider examples of adjectival passives like the following:

- (32) a. The ship was not damaged, though it appeared so at the time.
 b. Many people are convinced that global warming is a hoax, and they will remain so no matter what evidence is presented.
 c. That knowledge was lost, and remained so for centuries.

In (32a), the *f* of *so* will be replaced with $\lambda x \lambda t. \exists e, y [\text{damage}(e, x) \ \& \ \text{Init}(e, y) \ \& \ \tau(e) \leq t]$. The other examples will be similar.

This is a very simple analysis of *so*, and as far as I can see, it accounts for all the facts of pro-predicate *so*. Now, we could try to extend this analysis to *do so*, and suppose that *do so* is just $\lambda x \lambda e. f(e, x)$, the eventive version of *so* (Landman 2006 proposes something essentially like this). Then *do so* would just need to find a function to fill in for *f*. That function could come from an active, passive, or unaccusative antecedent VP.

The problem is that if this analysis were correct, the form of *do so* would always be active *do so*, regardless of the voice of its antecedent. The fact is, however, that *do so* cannot be interpreted as a passive unless it itself is passive in form:

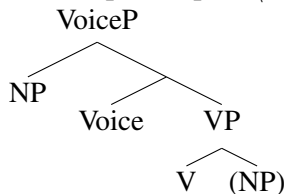
- (33) a. Although coffee was brewed in the shops, it was **done so** only at the request of customers.
 b. * Although coffee was brewed in the shops, it **did so** only at the request of customers.

If *do so* just needed to find a predicate of individuals to copy, the passive *be brewed in the shops* should be an appropriate replacement for active *do so*. It is not, however; as we saw above, *do so* has its own voice. We therefore need a theory of voice, and how it might combine with *do so*.

3.2 Voice

I propose that there are (at least) three varieties of Voice head: active, unaccusative, and passive. Active Voice (notated “Voice_{tr},” for transitive Voice) adds an external argument which is projected in its specifier (Kratzer 1996):

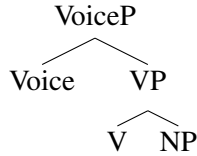
- (34) Active: $\llbracket \text{Voice}_{tr} \rrbracket = \lambda f_{\langle v, t \rangle} \lambda x \lambda e. f(e) \ \& \ \text{Init}(\text{iator})(e, x)$



I will refer to the external argument as bearing an “initiator” role (Ramchand 2008, Bruening 2013). This is meant as a cover term for agents, causes, and possibly other external argument roles.

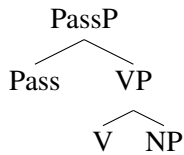
Unaccusative Voice does not add an initiator, and no NP is projected in its specifier. The Voice head is vacuous semantically:

(35) Unaccusative: $[[\text{Voice}]] = \lambda f_{\langle v,t \rangle} \lambda e.f(e)$



Passive Voice (abbreviated Pass here) adds an initiator, but instead of projecting it in its specifier, it existentially quantifies over it (Bruening 2013):¹

(36) Passive: $[[\text{Pass}]] = \lambda f_{\langle v,t \rangle} \lambda e.\exists x.f(e) \ \& \ \text{Init}(e,x)$



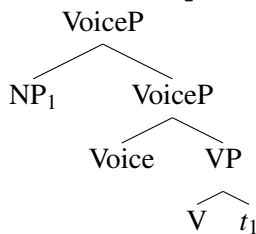
Furthermore, both passives and unaccusatives require A-movement. Even when an expletive occupies the surface subject position, Spec-TP, we can still see short A-movement in the passive and with unaccusatives (this is the “thematization/extraction” process of Chomsky 2001):

- (37) a. There was a study done in 1979 which concluded. . .
 b. * There was done a study in 1979 which concluded. . .
- (38) a. For there fell down many slain. . . (1 Chronicles 5:22)
 b. * For there fell many slain down. . .

The underlying object cannot stay in object position in the passive (see Akmajian and Wasow 1975, Bowers 2010). With unaccusatives, there is also necessarily short movement to the right, displacing the underlying object across a particle (Doggett 2004).

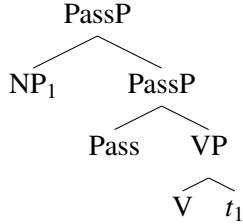
I propose that this short movement is triggered by Voice. Unaccusative Voice and Pass require that an NP move to their specifier (this also rules out impersonal passives in English, where there is no NP to move). Additionally, and non-standardly, I will follow Bruening (2015) in proposing that the head triggering the movement also performs lambda abstraction, so that “ λx ” is part of the denotation of the head, as shown below. Adopting this proposal will permit a base-generation analysis of *do so*, even in the passive and unaccusative.

(39) Unaccusative: $[[\text{Voice}]] = \lambda f \lambda x \lambda e.f(e,x)$



¹In the analysis in Bruening (2013), and in the analysis of adjectival passives in Bruening (2014), existential quantification is accomplished not by Voice itself, but by an additional head selecting an unsaturated projection of active Voice_{tr} as its complement. This approach would also be compatible with the proposal regarding *do so* here.

(40) Passive: $\llbracket \text{Pass} \rrbracket = \lambda f \lambda x \lambda e. \exists y. f(e, x) \ \& \ \text{Init}(e, y)$

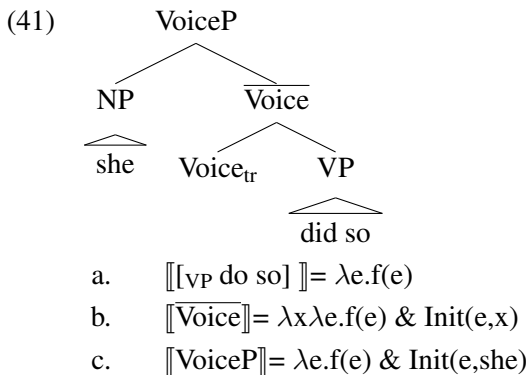


I will represent the moved NP as adjoined to VoiceP/PassP, to distinguish it from a thematic specifier with Voice_{tr}. This is merely for representational convenience, however.

Bruening (2015) proposes this as a way of accounting for depictive secondary predicates, and why A-movement opens new possibilities for modification by a depictive secondary predicate (Koizumi 1994, Pytkänen 2008). See Bruening (2015) for details. The effect of this head-accomplished abstraction in the current context will be that the subject of unaccusative and passive *do so* will be a semantic argument of a function, even though it never occupies the internal argument position (nor is it semantically the external argument). When that function is filled in by an appropriate antecedent, the correct semantics will result.

3.3 Analysis of Do So

I now propose that the too-simplistic account of *do so* from above is essentially correct: *do so* is simply $\lambda e. f(e)$. However, it is also a VP, which necessarily combines with Voice. If this is active Voice_{tr}, an initiator is added:



Once again, as the compositional semantics is constructed, a function must be found in the discourse to replace *f*. Voice is outside of *f* (because *do so* has its own Voice distinct from that of its antecedent); but the semantics of *f* must be compatible with the rest of $\llbracket \text{VoiceP} \rrbracket$. We will go through numerous examples below.

As for the internal structure of *do so*, I follow the line of analysis that treats *do* as intransitive main verb *do* and *so* as an adjunct (Bouton 1970, Ross 1972, Kehler and Ward 1999, Ward and Kehler 2005, Houser 2010). *So* is clearly not the object of *do*. It contrasts with the *it* of *do it* in not being passivizable (as the references just cited have all noted):

- (42) a. It will be done.
 b. * So will be done.

So can also occupy preverbal positions not available to objects (again, see the works cited, especially Kehler and Ward 1999 and Ward and Kehler 2005):

- (43) a. Mangroves may salinize the soil and **in so doing** limit their transpiration rate.
 b. I can live alone, if self-respect, and circumstances require me **so to do**.

Not only is this ordering not compatible with *so* being the object of *do*, it also does not fit the line of analysis where *so* represents some verbal XP complement to *do*, analyzed as something like light verb *v* or the head *Pr* or similar

(Stroik 2001; Hallman 2004, 2013; Haddican 2007; Baltin 2012). The position *so* occupies in the examples above is impossible for a verbal projection in English. I therefore reject that sort of analysis and treat *so* as an adjunct of some kind. Further reasons for treating *so* as an adjunct can be found in the works cited (and summarized in Houser 2010).

The relative contributions of V and *so* to the semantics are unclear; I will simply assume that they only have meaning in combination (Huddleston and Pullum 2002, 1532 consider *do so* a non-compositional idiom). Importantly, analyzing *do so* as intransitive *do* plus an adjunct immediately explains the facts of A-bar extraction. The fact is that all forms of A-bar extraction are ungrammatical with *do so*, as we saw above:²

- (44) a. * I know which cases the Supreme Court will hear, and which cases they won't do so.
 b. * The director rejected every proposal that the deputy director did so.
 c. * Bubble tea, I'll drink, but green tea, I won't do so.
 d. * The junior lawyers try more cases than the senior partners do so.

In the adjunct analysis, *do so* is simply an intransitive verb and an adjunct (on *do* being intransitive, see especially Houser 2010). Since the verb is intransitive, there is no place for a trace of an NP. The above examples are ungrammatical for the same reason an in situ object is:

- (45) a. * Bill didn't do the book so.
 b. * Bill did (to) everyone so.
 c. * Max did more books so.

I will return to this point once we see how A-movement is possible with unaccusatives and passives (in section 3.10).

Furthermore, the fact that *do so* requires that a function be found in the discourse to replace *f* explains why it requires a linguistic antecedent (Hankamer and Sag 1976). *Do so* has always fit poorly in the division between ellipsis and pro-forms (see especially Kehler and Ward 1999 and Baltin 2012). On the one hand, it does not allow A-bar extraction, making it look like a pro-form, but on the other hand, it requires a linguistic antecedent, making it look like ellipsis (Hankamer and Sag 1976). The proposed analysis explains both facts. It is a pro-form, so no extraction is permitted, but it also has to find a function in the discourse as its antecedent. The discourse therefore has to have included an overt linguistic form to serve as the antecedent for *do so*. (Kehler and Ward 1999 argue that *do so* needs a linguistic antecedent because *so* can only refer to a discourse-old antecedent; this is compatible with the analysis proposed here.) Moreover, the antecedent function to replace *f* has to fit into the semantics imposed by Voice; this puts further limits on possible antecedents.

²Baltin (2012), citing an anonymous reviewer, states that quantifier raising (QR) must be possible with *do so*, because the following example permits inverse scope:

- (i) Many men read five books, and many women did so as well. (many > five, five > many; Baltin 2012, 418, (1))

This example does not illustrate the possibility of inverse scope, because bare numerals, like indefinites, can be interpreted specifically (e.g., Szabolcsi 1997). Using true quantifiers in examples like the following, I have received very mixed reactions from native speakers:

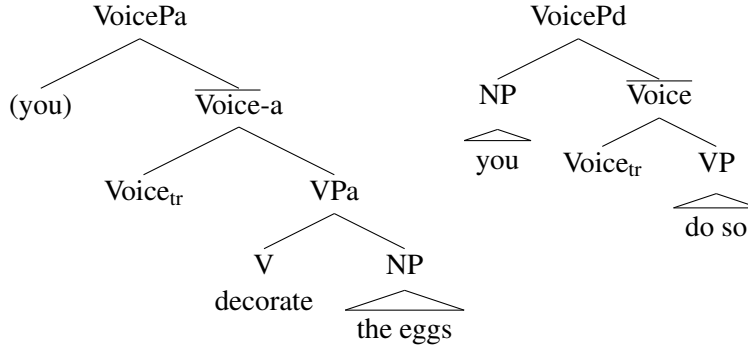
- (ii) a. A: At least two people should check every calculation.
 B: At least two people will do so.
 b. A different PI shadowed every suspect, and a different FBI agent did so, too.
 c. If a different police detective shadows every suspect, and a different FBI agent does so as well, then there will be at least sixteen law enforcement officers on the streets at once for this case.
 d. John couldn't read many books, and Bill couldn't do so either, but the many books that they could read were classics. (based on Baltin 2012, 387, (15))

Some speakers reject inverse scope in all these examples, while others say they "think they can get it." Since it is not clear to me what the facts are, I will leave scope and quantifier raising aside here.

3.4 Finding an Antecedent

A simple active transitive as antecedent will work as follows, with the antecedent on the left and *do so* on the right. Throughout, I mark the relevant node of the antecedent as “VPa” (or “VoicePa,” and so on). The relevant node in the structure of *do so* will be marked “VPd” or “VoicePd” (and so on).

(46) You need to decorate the eggs, but before you do so,...

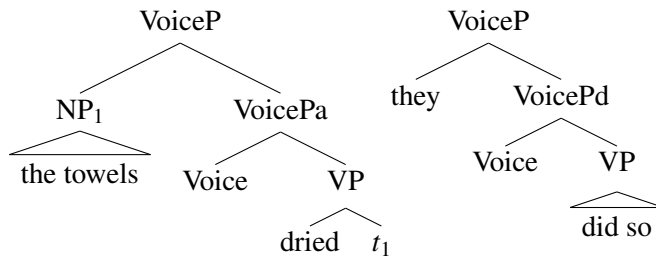


- a. $\llbracket \text{VoicePd} \rrbracket = \lambda e.f(e) \ \& \ \text{Init}(e, \text{you})$
- b. $\llbracket \text{VoicePa} \rrbracket = \lambda e.\mathbf{decorate}(e, \mathbf{the\ eggs}) \ \& \ \text{Init}(e, \text{you})$
- c. $\llbracket \overline{\text{Voice-a}} \rrbracket = \lambda x \lambda e.\mathbf{decorate}(e, \mathbf{the\ eggs}) \ \& \ \text{Init}(e, x)$
- d. $\llbracket \text{VPa} \rrbracket = \lambda e.\mathbf{decorate}(e, \mathbf{the\ eggs})$
- e. Copy: $\llbracket \text{VoicePd} \rrbracket = \lambda e.\mathbf{decorate}(e, \mathbf{the\ eggs}) \ \& \ \text{Init}(e, \text{you})$

The semantic value of the VoiceP of *do so* is shown in (46a). The function *f* needs to be replaced with an appropriate function from the discourse. Some possibilities from the antecedent VoiceP are shown in (46b–d). In all three, the function “dry(*e*, the towels)” will work. Copying this function is shown in (46e), which yields exactly the right result.

An unaccusative example is shown below. As stated above, the VP *do so* can combine with any Voice. In addition to active Voice_{tr}, it can also combine with unaccusative Voice. Unaccusative Voice does not project an argument in its specifier, but it does have a specifier to which an NP must normally move. The head itself is an abstractor. In the case of *do so*, I assume that an NP can be merged directly into the non-thematic specifier of unaccusative Voice. If this happens with any other VP, the result will be ill-formed, because semantic interpretation will not go through. For instance, if an NP is merged in Spec-VoiceP and an object is merged in object position, there will be no interpretation for one of the NPs. If no object is merged with the V, its selectional requirements will not be met. With *do so*, though, *do* does not select an object, and if an appropriate function can be found to replace *f*, then the NP merged in Spec-VoiceP can be interpreted. Consider the following:

(47) The towels dried, but before they did so,...



- a. $\llbracket \text{VoicePd} \rrbracket = \lambda x \lambda e.f(e, x)$
- b. $\llbracket \text{VoicePa} \rrbracket = \lambda x \lambda e.\mathbf{dry}(e, x)$
- c. Copy: $\llbracket \text{VoicePd} \rrbracket = \lambda x \lambda e.\mathbf{dry}(e, x)$

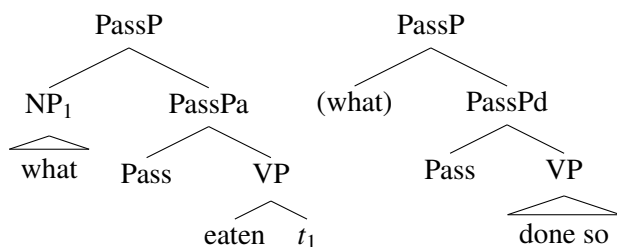
Here and below, the computation will be simplest if *f* is replaced before VoicePd combines with the NP in the non-thematic specifier. I will therefore assume that that is how it works in general (this would also work in

the example of the active transitive above). In this case, the function in VoicePa is appropriate and can be copied directly, again leading to the right result. Once the NP combines, the denotation of the full VoiceP of *do so* will be $\lambda e.dry(e,they)$.

As can be seen, building lambda abstraction into the denotation of unaccusative Voice enables a base-generated subject of *do so* to be interpreted as the logical object, if the antecedent can supply a function of the appropriate form.

An example of the verbal passive is shown below, which will work in the same way. *Do so* can combine with Pass, as it can combine with any Voice. Again, an NP can be merged in the non-thematic specifier of Pass. This would lead to a failure of semantic interpretation with any VP other than *do so*, but again, if an appropriate function can be found to replace *f* with, then the result will be interpretable.

(48) ... what is eaten is done so in a controlled and seemingly not pleasurable manner.



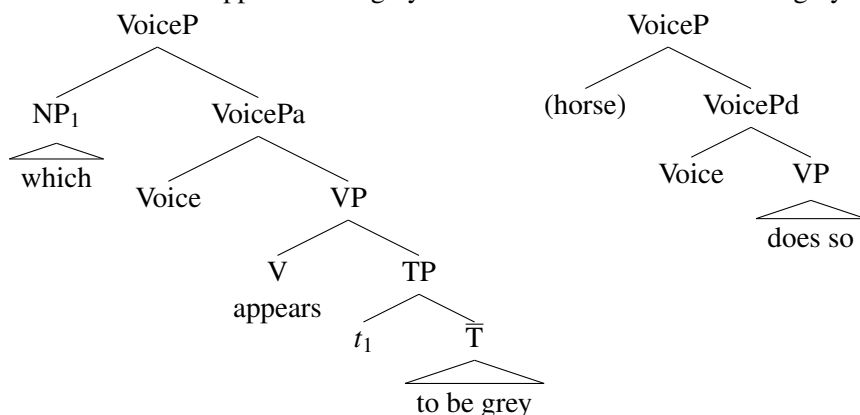
- a. $\llbracket \text{PassPd} \rrbracket = \lambda x \lambda e. \exists y. f(e, x) \ \& \ \text{Init}(e, y)$
- b. $\llbracket \text{PassPa} \rrbracket = \lambda x \lambda e. \exists y. \text{eat}(e, x) \ \& \ \text{Init}(e, y)$
- c. Copy: $\llbracket \text{PassPd} \rrbracket = \lambda x \lambda e. \exists y. \text{eat}(e, x) \ \& \ \text{Init}(e, y)$

In this case, the function $\text{eat}(e, x)$ in the denotation of the antecedent PassPa can be copied. Again, this leads to exactly the right result.

As with unaccusatives, building abstraction into the Voice head enables an NP generated there with *do so* to pick up an internal role from the antecedent, without actually moving. In the antecedent, the NP moves from object to subject position.³ The function created by abstracting is copied into *do so*, resulting in exactly the same interpretation.

As for raising to subject, I assume that the Voice that occurs with a raising verb is unaccusative Voice, which again triggers movement and abstraction. In this case, what moves will not be the complement of the verb, but the subject of the complement. Simplifying how that complement is treated semantically, we would then have the following analysis for a raising to subject verb as antecedent for *do so*:

(49) The horse which appears to be grey does so because it received the greying agent from the parent.



³An object of a preposition is also possible, in the pseudopassive:

- (i) What was stepped on was done so in a very deliberate manner.

I assume the head Pass just needs to attract *some* NP, but that NP does not need to be the object of the verb.

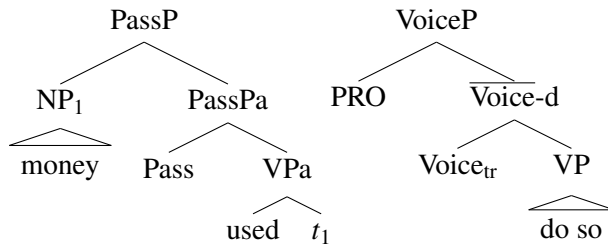
- a. $\llbracket \text{VoicePd} \rrbracket = \lambda x \lambda e. f(e, x)$
- b. $\llbracket \text{VoicePa} \rrbracket = \lambda x \lambda e. \text{appear}(e, [\text{grey}(x)])$
- c. Copy: $\llbracket \text{VoicePd} \rrbracket = \lambda x \lambda e. \text{appear}(e, [\text{grey}(x)])$

Once again, unaccusative Voice can combine with *do so*, so that the function *f* needs an individual argument. The function from the antecedent is appropriate, with the individual argument further embedded. Copying results in the surface subject of *do so* being interpreted in the same way as the surface subject of its antecedent.

3.5 Voice Mismatches

We now need an account of mismatches between the voice of *do so* and the voice of its antecedent. Let us begin with a passive antecedent and active *do so*. Since *do so* is active, it has active Voice_{tr}, which projects an initiator in its specifier:

- (50) The intention behind the legislation was to ensure the money should be used for reinstatement where it was possible and economic to do so.

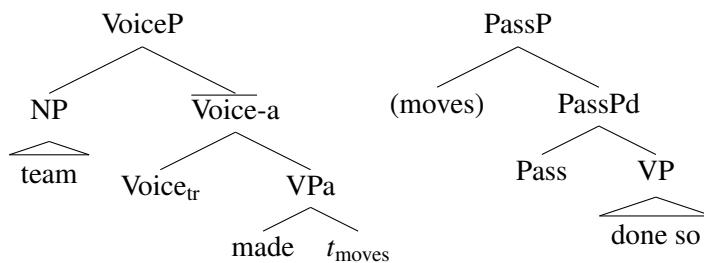


- a. $\llbracket \overline{\text{Voice-d}} \rrbracket = \lambda x \lambda e. f(e) \ \& \ \text{Init}(e, x)$
- b. $\llbracket \text{PassPa} \rrbracket = \lambda x \lambda e. \exists y. \text{use}(e, x) \ \& \ \text{Init}(e, y)$
- c. $\llbracket \text{VPa} \rrbracket = \lambda e. \text{use}(e, t_{\text{money}})$
- d. Copy: $\llbracket \overline{\text{Voice-d}} \rrbracket = \lambda x \lambda e. \text{use}(e, t_{\text{money}}) \ \& \ \text{Init}(e, x)$

Again, we need an appropriate function to replace *f* with. In this case, *f* must take only an event argument and not an individual argument. The function “*use(e,x)*” in *PassPa* is therefore not appropriate. However, we can copy the function from *VPa* in (50c). In this case, what will be copied will be the function ‘*use*’ applied to the trace of the surface subject of the passive in the antecedent. I will assume that, given the copy theory of movement (Chomsky 1993), we can treat this as *the money* itself. Once *PRO* is combined, the *VoiceP* of *do so* will then be “ $\lambda e. \text{use}(e, \text{the money}) \ \& \ \text{Init}(e, \text{PRO})$.” This is the correct interpretation.

Consider now the case of an active antecedent and passive *do so*. In this case, *Pass* requires a function with an individual argument:

- (51) ... the majority of other moves that the team made this offseason were done so with the pitching rotation in mind.



- a. $\llbracket \text{PassPd} \rrbracket = \lambda x \lambda e. \exists y. f(e, x) \ \& \ \text{Init}(e, y)$
- b. $\llbracket \overline{\text{Voice-a}} \rrbracket = \lambda x \lambda e. \text{make}(e, t_{\text{moves}}) \ \& \ \text{Init}(e, x)$
- c. Copy: $\llbracket \text{PassPd} \rrbracket = \lambda x \lambda e. \exists y. \text{make}(e, t_{\text{moves}}) \ \& \ \text{Init}(e, y) \rightarrow \lambda x \lambda e. \exists y. \text{make}(e, x) \ \& \ \text{Init}(e, y)$

Because the object of the antecedent has undergone A-bar movement, at $\overline{\text{Voice-a}}$, the function ‘make’ applies to a trace. Above we saw that a trace could be taken to be a copy of its antecedent. A trace can also be taken to be a variable. This gives the end result in (51c), which enables the subject in Spec-PassPd to be interpreted as the object of *make*.

Note that we independently need traces to be able to be interpreted as variables, for VP ellipsis. Consider a simple case of VP ellipsis in the passive:

(52) The destroyer was sunk, and the aircraft carrier was [—] too.

If traces could not be treated as variables, the missing VP in (52) would have to be [sunk the destroyer], and the elided VP would be uninterpretable, since there would be no interpretation for *the aircraft carrier*. At the same time, traces also need to be able to be interpreted as copies of their antecedents:

(53) The system can be used by anyone who wants to [—]. (Merchant 2008, 169, (1b))

The missing VP here has to be [use the system], which requires treating the trace of *the system* as *the system*.

In other words, both treatments of traces are independently necessary for VP ellipsis. If both treatments are possible in the grammar generally, then it is no surprise that they can both be used in resolving anaphora with *do so*.

One question is whether extraction of the object in the active antecedent is necessary for passive *do so*. All of the attested examples of this pattern that I have been able to find do have A-bar extraction of the object. This does not appear to be necessary, however. Speakers I have polled generally find at least some of the constructed examples below relatively acceptable:

- (54) a. The team made many moves this offseason. All of them were done so with the pitching rotation in mind.
b. Sonya consumed 444 oysters. None of them were done so with a fork.
c. LaValle withdrew a great many funds for Friendship Ridge. All of these funds were done so with the permission of County Commissioners.
d. They carried on ritual practices underground. However, these rituals were done so with a limited understanding of the new faith.

Merchant (2013, 79, (1c)) cites an example like these but involving VP ellipsis:

- (55) A: No one can [hypnotize me].
B: Usually the people who are certain they can't be [—] are the easiest to do it to.

Jason Merchant suggests (email communication) that in the antecedent, the object can undergo covert movement in order to produce an acceptable antecedent VP:

(56) me_1 [hypnotize t_1]

The trace can then be interpreted as a variable, so that it can be bound by *they* in *they_x can't be [hypnotized x]*. This covert movement would have to be allowed just when the elided VP is passive and itself has a trace in object position. Something similar would have to take place in the examples of active antecedent/passive *do so* in (54).

To sum up, both patterns of voice mismatches can be captured by the current account. *Do so* has its own voice, distinct from that of its antecedent. So long as traces can be taken to be either a variable or identical to their antecedent, both of which are independently necessary for VP ellipsis, an appropriate function can be found to replace *f* with in the denotation of *do so*.

3.6 Causative-Inchoative Mismatches

According to Bouton (1969), some speakers also accept mismatches between causative and inchoative, with the antecedent a causative and *do so* the corresponding inchoative. Houser (2010) presents additional examples. Speakers I have polled accept these to varying degrees, with some examples being better than others.⁴

(57) (Bouton 1969, 239, (23), (24), (26))

- a. The young men we marched into battle sang “Yankee Doodle” as they did so.
- b. The needle the current is oscillating at 40mgs has never done so before.
- c. The metal the damp weather rusted did so in spite of an extra heavy coating of grease.

(58) (Bouton 1969, 246, (40–42))

- a. Charley tried to curve his next pitch across the inside corner, and it did so beautifully—knee high!
- b. The water Jane was boiling when we arrived was still doing so when we left twenty minutes later.
- c. The stone we rolled down the hill raised a huge cloud of dust as it did so.

(59) I have tried pairing the N800 with other devices, and it does so easily. (Houser 2010, 20, (35))

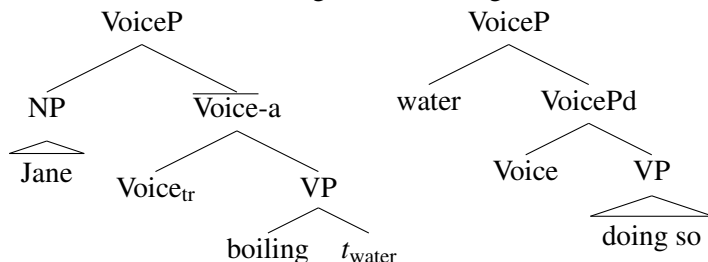
Interestingly, in this case the opposite pattern is ungrammatical, with the antecedent an inchoative and *do so* a causative:

(60) (Bouton 1969, 240, (29–31))

- a. The needle oscillated at 40mgs for the first time when the new current did so. (*oscillated the needle)
- b. The young men marched into battle because we did so. (*marched the young men into battle)
- c. The metal rusted in spite of a heavy coat of grease because the damp weather did so. (*rusted the metal)

The grammatical pattern follows from the current account without further addition. Consider the following example. The inchoative on the right has unaccusative Voice, while the causative on the left has Voice_{tr} (representation to be revised):

(61) The water Jane was boiling was still doing so . . .



- a. $[[\text{VoicePd}]] = \lambda x \lambda e. f(e, x)$
- b. $[[\text{Voice-a}]] = \lambda x \lambda e. \text{boil}(e, t_{\text{water}}) \ \& \ \text{Init}(e, x)$

⁴Houser’s example in (59) is presented as an example of a middle. However, it appears to be an example of a causative-inchoative verb instead. Houser also presents the opposite order as grammatical:

- (i) The N800 pairs with other devices easily, and I do so all the time.

This is not my judgment, however. I find this example as unacceptable as Bouton’s examples in (60). Judgments on mismatches with true middles are not clear to me:

- (ii) a. Politicians bribe easily, so don’t fail to do so while you’re in Washington.
- b. They were able to bribe that politician, because, as everyone knows, politicians do so easily.

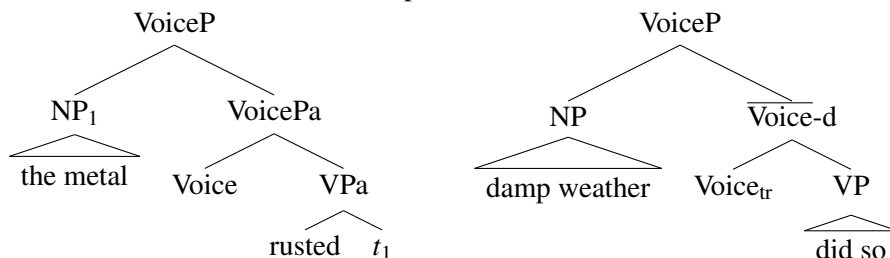
I will leave investigation of middles to future work.

- c. Copy: $\llbracket \text{VoicePd} \rrbracket = \lambda x \lambda e. \mathbf{boil}(e, x)$

The trace of the object can be considered a variable when the function is copied. Copying then leads to exactly the right interpretation.

If a causative were simply the inchoative VP plus Voice_{tr} , as just shown, then we incorrectly predict that the opposite pattern should be acceptable, too. Consider the following:

- (62) The metal rusted because the damp weather did so. . .

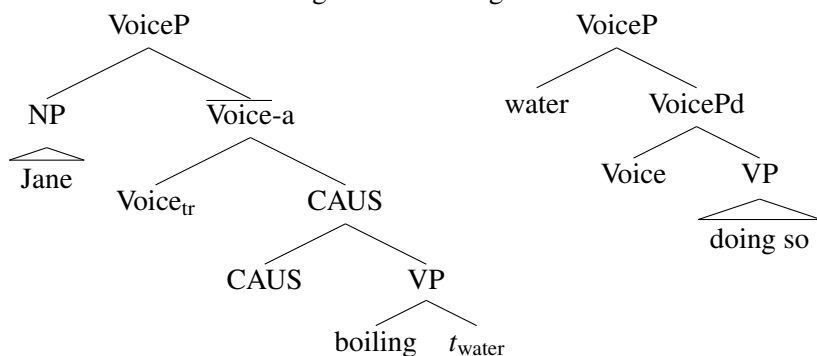


- a. $\llbracket \overline{\text{Voice-d}} \rrbracket = \lambda x \lambda e. \mathbf{f}(e) \ \& \ \text{Init}(e, x)$
 b. $\llbracket \overline{\text{VPa}} \rrbracket = \lambda e. \mathbf{rust}(e, t_{\text{metal}})$
 c. Copy: $\llbracket \overline{\text{Voice-d}} \rrbracket = \lambda x \lambda e. \mathbf{rust}(e, t_{\text{metal}}) \ \& \ \text{Init}(e, \text{damp weather})$

We should be able to copy the function from VPa , and treat the trace as a copy of its antecedent. The result would be interpretable, in exactly the way that is unavailable.

I take this to indicate that the causative version of a causative-inchoative pair is more than just Voice_{tr} added to VP. There must be another head in between, call it CAUS(ative). This head adds a causing event but no external argument, as in Pylkkänen (2008). The external argument is still added by Voice_{tr} , which attaches on top of CAUS:

- (63) The water Jane was boiling was still doing so. . .



- a. $\llbracket \text{CAUS} \rrbracket = \lambda f_{(v,t)} \lambda e. \exists e'. \mathbf{f}(e') \ \& \ \text{CAUS}(e', e)$
 b. $\llbracket \overline{\text{Voice-a}} \rrbracket = \lambda x \lambda e. \exists e'. \mathbf{boil}(e', t_{\text{water}}) \ \& \ \text{CAUS}(e', e) \ \& \ \text{Init}(e, x)$
 c. $\llbracket \overline{\text{VoicePd}} \rrbracket = \lambda x \lambda e. \mathbf{f}(e, x)$
 d. Copy: $\llbracket \overline{\text{VoicePd}} \rrbracket = \lambda x \lambda e. \mathbf{boil}(e, x)$

Within the causative, there is still a function “ $\mathbf{boil}(e', t_{\text{water}})$ ” which is appropriate for copying into the denotation of *do so*. Again, the trace can be treated as a variable.

The addition of CAUS makes it impossible to go the other way, and have a causative *do so* with an inchoative antecedent, because *do so* cannot include CAUS. I assume that in English CAUS strictly selects transitive VPs, ones that include a direct object. *Do so* does not. It is therefore not possible to merge CAUS on top of *do so*. Back in (62), then, the structure and interpretation can only be that shown. However, the interpretation in (62c) is the wrong one for a causative. The semantics of a causative is that shown in (63b), with two events, one of which causes the other. This is what is wrong with (62): it does not result in the right semantics.

Thus, the current theory is able to explain another mismatch between *do so* and its antecedent. In this case, however, the mismatch only goes one way, and the missing relation follows from an independently proposed hypothesis about causatives.

3.7 Category Mismatches

Kehler and Ward (1999) and Ward and Kehler (2005) have documented other types of mismatches between *do so* and its antecedent. One type involves syntactic category. The antecedent of *do so* does not have to be a VP:

- (64) a. The *defection* of the seven moderates, who knew they were incurring the wrath of many colleagues in doing so, . . . (Kehler and Ward 1999, 247, (39))
 b. Even though an Israeli *response* is justified, I don't think it was in their best interests to do so right now. (Kehler and Ward 1999, 248, (41))
- (65) (Ward and Kehler 2005, 375, (35–36))
 a. One study suggests that almost half of young female *smokers* do so in order to lose weight.
 b. The majority of *horse riders* do so purely for leisure and pleasure.

This type of mismatch is expected on the current account. Here, we just need to find a function to replace *f* with in the denotation of *do so*. There is no reason that function has to come from a verb or verbal projection. For example, suppose that the denotation of an agentive nominalization like *smoker* involves some sort of generic quantification over events, so that it includes something like “GENe.smoke(e)” as part of its denotation. Then the function **smoke(e)** can be copied into the denotation of *do so*, as follows:

- (66)
-
- a. $\llbracket \overline{\text{Voice-d}} \rrbracket = \lambda x \lambda e. \mathbf{f(e)} \ \& \ \text{Init}(e, x)$
 b. Copy: $\llbracket \overline{\text{Voice-d}} \rrbracket = \lambda x \lambda e. \mathbf{\text{smoke}(e)} \ \& \ \text{Init}(e, x)$

As Ward and Kehler (2005) point out, not all nominals evoke a salient function that could replace *f* in *do so*. For instance, the nouns *computer* and *propeller* do not evoke “compute(e)” and “propel(e)” easily, and so they do not make good antecedents for *do so*:

- (67) (Ward and Kehler 2005, 375, (39–40))
 a. # My computer does so faster than yours. [=compute]
 b. # The boat's propeller failed to do so, and now we're stuck. [=propel]

In contrast, *defection*, *response*, *smoker*, and *rider* all saliently evoke an event function, and this can be copied into *do so*.

3.8 Split Antecedents

Do so also allows split antecedents, just like VP ellipsis (see, e.g., Hardt 1993, 1999; Fiengo and May 1994):

- (68) (Kehler and Ward 1999, 248, (42–43))
 a. Fortunately, the first person to [die in 1990] and the first couple to [file for divorce in 1990] were allowed to do so anonymously.
 b. What I am suggesting is that when we [delay], or when we [fail to act], we do so intentionally.

This can be captured quite easily in the current account. As stated above, *do so* is interpreted as *f(e)* in the active. The function *f* needs to be replaced with an appropriate function from the discourse. Nothing stops *f* being replaced by a function constructed from multiple functions in the discourse. In both of these cases, coordination naturally primes constructing a coordinated function:

- (69) a. $f = [\text{die}(e) \ \& \ \text{file-for}(e', \text{divorce})]$
 b. $f = [\text{delay}(e) \ \text{or} \ \text{fail}(e', \text{act})]$

The plural subject of *do so* can then distribute to the individual conjuncts in (68a).

3.9 Ellipsis-Containing Antecedents

Do so, like VP ellipsis, also allows ellipsis-containing antecedents (Hardt 1999, Schwarz 2000, Elbourne 2008, Tomioka 2008):

- (70) When it's Jim's turn to cook, he refuses to, and when it's his turn to clean, he does so too.

In this example, *does so* has to be interpreted as 'refuse to clean', but there is no antecedent with that form. The first *refuse to* is actually *refuse to [cook]*.

I suggest that with *do so*, the elided VP that serves as part of the antecedent for *do so* can be another *do so*:

- (71) When it's Jim's turn to cook, he refuses to [do so], and when it's his turn to clean, he does so too.

The elided *do so* is "f(e)," as above. The function f will be replaced with "cook(e)" in the semantic interpretation. However, I suggest that for purposes of the second *do so*, the first can be copied with simply the function f in it. So, the second *do so* can be replaced with [refuse to f], where "f" is the interpretation of the first (elided) *do so*. Within this, f must also be replaced, and it can be replaced with "clean(e)."

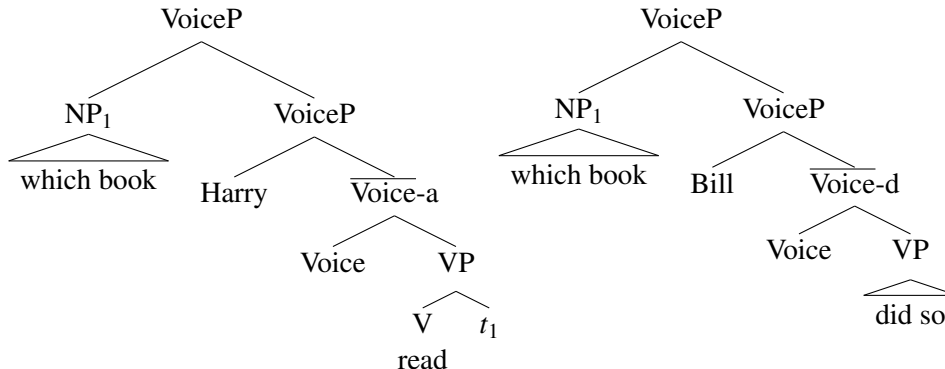
Note that the example in (71) is grammatical with the first *do so* pronounced. So we need this to work anyway, even without ellipsis. Once we have a way of interpreting (71), we just need to permit the first *do so* to elide.

3.10 Back to A-Bar Extraction

Now that we have a complete, worked-out analysis of *do so*, we should check that the account does not inadvertently admit the equivalent of A-bar extraction. In the analysis, A-movement appears to be allowed with *do so*, simply from the way lambda abstraction works in A-movement. The question is whether something similar could happen in A-bar movement, incorrectly permitting A-bar movement with *do so*.

The answer is that, if lambda abstraction for A-bar movement could be built into the denotation of Voice the way A-movement was, it would be permitted. Consider the hypothetical case below:

- (72) * I know which book Harry read and which book Bill did so.



If lambda abstraction could be part of the denotation of Voice, we would have the following:

- (73) a. $\llbracket \overline{\text{Voice-a}} \rrbracket = \lambda x \lambda y \lambda e. \text{read}(e, y) \ \& \ \text{Init}(e, x)$
 b. $\llbracket \overline{\text{Voice-d}} \rrbracket = \lambda x \lambda y \lambda e. f(e, y) \ \& \ \text{Init}(e, x)$
 c. Copy: $\llbracket \overline{\text{Voice-d}} \rrbracket = \lambda x \lambda y \lambda e. \text{read}(e, y) \ \& \ \text{Init}(e, x)$

This would be interpretable, incorrectly.

The difference between A-movement in passives and unaccusatives and A-bar movement generally is that Voice always requires movement in passives and unaccusatives, as explained above. No version of Voice ever requires A-bar movement. In fact, Voice is not related to A-bar movement at all. It therefore makes sense to keep A-bar lambda abstraction out of the denotation of Voice.

Furthermore, Sauerland (1998) and Ruys (2000) propose that A-bar movement involves quantification not over individuals, but over choice functions. If this is correct, there must always be a copy of the moved wh-phrase in an argument position. In the example of *which book Harry read*, in argument position there must be a copy interpreted as “f(book),” that is, as the output of the choice function applied to the set of books. The choice function *f* is then bound by the moved wh-phrase from its higher position (see also Reinhart 1998).

If this is correct, then A-bar movement will always be ill-formed with *do so*, because there is no argument position that could host “f(book).” As explained above, the *do* of *do so* is intransitive. There will be no way to interpret *which book Bill did so*.

On this account, A-movement and A-bar movement are very different. A-movement at the relevant level is effected by Voice, and Voice performs the abstraction as part of its denotation. A-bar movement is not effected by Voice but by something else, and the quantification involved is over choice functions, not individuals. This requires an argument position for interpretation to go through, which *do so* does not have.

4 Conclusion

I have shown here that *do so* is compatible with all kinds of A-movement, contrary to the received wisdom: it is compatible with verbal passives and with raising to subject, in addition to adjectival passives and unaccusatives. At the same time, expletives show us that A-movement is movement, but the subject of *do so* is always base-generated. I showed that these facts receive a natural explanation under a pro-form analysis of *do so*, if we adopt the hypothesis that lambda abstraction in A-movement is built into the denotation of the Voice head that effects the movement. A-bar movement works in a very different way, such that A-bar movement is never compatible with *do so*.

The analysis spelled out how *do so* and pro-predicate *so* work in a compositional semantics. An appropriate function must be copied into their denotation from the discourse. This analysis successfully accounts for all of the facts of these anaphors, including mismatches between *do so* and its antecedent in voice and category, split antecedents, and ellipsis-containing antecedents. It also explains why *do so* requires a linguistic antecedent.

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