The discourse potential of narrow scope indefinites in Samoan

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Abstract
This paper proposes a theory of bare noun phrases in Samoan (Polynesian). I show that these NPs are interpreted as indefinites obligatorily taking narrowest scope with respect to negation, modals, if-clauses, and universal quantification. The theory I propose for their compositional semantics shares much with Van Geenhoven’s (1998) theory of semantic incorporation. I extend this theory by considering the behaviour of these indefinites at a level of discourse, particularly with respect to the following properties. First, bare NPs in Samoan differ from the other kind of narrowest scope indefinite, marked by the determiner se, in that they are unable to introduce discourse referents and antecede cross-sentential anaphora. Next, sentences with bare NP indefinites are unable to license interrogative anaphora (sluicing ellipsis). The formal account is framed within Groenendijk and Stokhof’s (1991) Dynamic Predicate Logic.

1 Introduction

The semantics of obligatorily narrowest scope indefinites, or semantically incorporated indefinites in the terminology of Van Geenhoven (1998), is of central importance to those interested in the semantics of indefinites and their potential to license various kinds of discourse anaphora. This paper presents an attempt to link a pair of previously unlinked properties relating to the discourse potential of indefinites. Firstly, their potential to license cross-sentential pronominal anaphora, and secondly the potential of a sentence containing an unembedded indefinite to license interrogative anaphora (sluicing ellipsis).

This paper details the semantic properties of a particular breed of indefinites observed in the Polynesian language Samoan which have been frequently termed “incorporated objects” in the descriptive literature on the language. These indefinites are distinguished by not taking any determiner (being realised as bare noun phrases), and appearing adjacent to the main predicate. The example pair in (1) presents a minimal pair with roughly equal interpretation, (1a) contains a (bolded) indefinite argument marked by the indefinite determiner se, while (1b) is a rough paraphrase using the putative incorporation construction where the (again, bolded) indefinite is verb-adjacent and determinerless.1

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1Abbreviations used throughout: ABS absolutive, ACC accusative, AV actor-voice, CL clitic, COMP complementiser, CONN connective particle, DAT dative, EMPH emphatic particle, ERG ergative, FUT future tense, GEN genitive, HON honorific, NEG negation, NONSPEC non-specific determiner, Q question particle, PAST past tense, PERF perfect aspect, PL plural, PRES present tense, PROG progressive aspect, SG singular, SPEC specific determiner, SUBJUNCT subjunctive
Both sentences in (1) seem to signal an existentially quantified expression as in (2). Both sentences are true only if the set of songs intersects with the set of things which Susana wrote. Falsity arises only in cases where Susana writes no songs, that is, when the two sets do not intersect.

(2) \( \exists x : \text{song}(x) \land \text{wrote}(\text{Susana}, x) \)

As with many other determinerless indefinites cross-linguistically, the indefinite exemplified in (1b) obligatorily takes the narrowest scope with respect to any other sentential operators such as negation, if-clauses, universal quantification and modals, if any are present in the sentence. The semantics of narrow-scope indefinites is particularly interesting in Samoan due to the fact that Samoan indefinites marked by the determiner se (as in 1a) also have this property. Why then does Samoan maintain two means of expressing narrow scope indefinites? By what properties do they disassociate themselves?

I will show that the two varieties of indefinites begin to differentiate themselves at the level of discourse. In particular, I show that bare NPs are unable to introduce a discourse referent which can serve as the antecedent for pronominal anaphora in subsequent sentences, as in (3a). DPs headed by se are able to antecede cross-sentential anaphora, as in (3b).

(3) a. sā fa'apāgōtā foamea Ioane. ??ʻua ia ita ʻiata Ioane
   PAST arrest thief\(_i\) John. PERF he\(_i\) angry at John
   “John thief-arrested. He became angry at John.”

b. sā fa'apāgōtā se foamea e Ioane. ʻua ia ita ʻiata Ioane
   PAST arrest NONSPEC thief\(_i\) ERG John. PERF he\(_i\) angry at John
   “John arrested a thief. He became angry at John.”

I suggest that the property of being able to introduce a discourse referent is linked to the ability to license other kinds of anaphora, such as sluicing ellipsis. I show that bare NP indefinites may never serve as the correlate (or inner antecedent) for a sluice, as in (4a). se DPs on the other hand are not subject to this restriction (4b).

(4) a. #sā sasa maile le tamaloa ʻae ʻou te ʻē iloa pe ʻo lēfēa maile
   PAST beat dog the old.man but I PRES not know Q which dog
   “The old man dog-beat but I don’t know which dog.”

b. sā sasa se maile e le tamaloa ʻae ʻou te ʻē iloa pe
   PAST beat NONSPEC dog ERG the old.man but I PRES not know Q
   ʻo lēfēa maile
   which dog
   “The old man beat a dog but I don’t know which dog.”
I suggest that these two properties can be linked by making certain assumptions with the formalism in Groenendijk and Stokhof (1991), Dynamic Predicate Logic (DPL). DPL classifies existentially quantified sentences as externally dynamic. That is, existential quantifiers allow expressions within their scope to introduce potential antecedents for anaphora in subsequent sentences. DPL also defines formal machinery intended to close off this potential of existential quantifiers – making them externally static – but leaving the truth conditional content of the sentence unaltered. I suggest that this dichotomy between externally dynamic existential quantification and externally static existential quantification is instantiated within Samoan grammar by indefinites headed by se and bare NP indefinites respectively.

The rest of the paper is structured as follows: in Section 2, I detail the morphosyntax of Samoan, highlighting the grammatical properties most relevant to constructing sentences with bare NP indefinites. In Section 3, I introduce facts relating to the semantics of both se DPs and bare NPs, contrasting them with a third type of Samoan indefinite: le DPs. I propose that se DPs and bare NPs are both trapped in narrow scope, while le DPs obligatorily take wide scope. In Section 4, I outline some prominent approaches to treating the semantics of narrow scope indefinites, namely Van Geenhoven (1998) and Chung and Ladusaw (2004) and I give a first pass analysis of the compositional semantics of both kinds of indefinites. In Section 5, I outline the differing behaviour of these two kinds of indefinites at the level of discourse. In Section 6, I lay out the formal mechanisms in DPL (Groenendijk and Stokhof 1991) and show how they can account for the differing behaviour with respect to licensing cross-sentential use of pronominal anaphora. In Section 7, I propose how the formal machinery in DPL can account for the failure of bare NP indefinites in Samoan to license sluicing. Section 8 concludes.

2 The morphosyntax of Samoan bare NPs

This section describes the relevant morphosyntactic properties of bare NPs in Samoan. The summary conclusions are as follows. Firstly, only the less agentive argument of two-argument verbs may be expressed as a bare indefinite. Realising this argument as a bare indefinite causes the verb to behave morphosyntactically as an intransitive predicate. Bare NPs are obligatorily adjacent to the verb without any possibility of intervening material. As these bare NPs may be realised as multi-word NPs, there is little evidence that they are morphologically incorporated into the predicate.

The syntactic analysis briefly outlined at the end of this section is based on Massam’s (2001) analysis of a similar construction in Niuean. To preview, ordinary DP objects of transitive verbs are raised to a VP-external position (in an operation similar to Object Shift), after which the entire VP (containing the trace of the raised object) fronts to a position linearly preceding the subject. I assume bare NPs are unable to raise out of the VP, and thus front along with the VP accounting for their pre-subject position.

Mithun (1984) puts Samoan (and Tongan) bare NPs within her definition of incorporated objects cross-linguistically. She gives a set of diagnostics showing that bare NP objects de-transitivise their selecting verb. In Tongan, an ergative-absolutive aligned language, a bare indefinite transitive object prevents the transitive subject from taking the ergative case marker ‘é. It instead takes the absolutive case marker ‘a, associated with subjects of intransitives.
The same facts hold of Samoan. Samoan is also traditionally thought of as an ergative-absolutive aligned language, at least in its morphological case system. In transitive clauses, the subject takes the ergative case marking preposition *e* as in (6a). Objects of transitive verbs and subjects of intransitive predicates take no case marking preposition. Where the object is expressed as a bare indefinite, the subject is unable to take ergative case marking as in (6b).

(6) a. *Sā inu le ‘ava e Ioane*  
    PAST drink SPEC kava ERG John  
    ‘John drank the kava.’  

b. *Na’e inu kava ‘a Ioane.*  
    PAST drink kava ABS John  
    ‘John kava-drank.’

Where the subject of a transitive verb appears in the left periphery of the clause (for topicalisation, *wh*-movement, relativisation etc.), the verb must take a suffix variously realised as -*a* or -*ina* (glossed as A(GENT-)V(OICE)). With a bare indefinite object, the verb is unable to take the suffix, even where the subject appears in the left periphery.

(7) a. ‘*O pred le tama sā fufulu-ina le ipu*  
    PERF the child PAST wash-AV the dish  
    ‘It was the child that was washing the dish.’  

b. ‘*O pred le tama sā fufulu(*-ina) ipu*  
    PERF the child PAST wash-AV dish  
    ‘It was the child that was dish-washing.’

Similarly, where the subject of a transitive verb appears in the left periphery of the clause, a resumptive pronoun may appear cliticised to the subordinate-clause tense marking auxiliary as in (8a). When subjects of intransitive predicates appear in the left periphery, no resumptive pronoun may appear. With a bare indefinite object, resumptive pronouns are similarly impossible as in (8b).

(8) a. ‘*ua taunu’u le fafine sā ia fa’atau le lolē*  
    PERF arrive the woman PAST she sell the candy  
    ‘The woman who was selling the candy arrived.’  

b. ‘*ua taunu’u le fafine sā (*ia) fa’atau lolē*  
    PERF arrive the woman PAST she sell candy  
    ‘The woman who was candy-selling arrived.’

These data demonstrating the intransitive syntax of Samoan transitive verbs with a bare NP object point to a classification of bare NPs in Samoan as incorporated nominals.
Another property of bare NPs which gives rise to this classification is their obligatory adjacency to the verb. Bare indefinite objects are always directly adjacent to the verb in Samoan, without any possibility of intervening material. Mithun (1984) gives one piece of evidence for this generalisation. She notes that the locative clitic *ai attaches to the right of the Samoan verbal complex wherever a locative DP occupies the left periphery of the clause. In Mithun’s example, the locative wh-expression po *o 'afea, ‘when’, occupies the left periphery and the locative clitic *ai appears within the main clause, between the verb and its arguments.

(9) Po *o 'afea e tausi *ai e ia tama?
Q pred when pres care clitic erg he child
‘When does he care for the children?’

In the above example, the transitive object tama does not take a determiner. Where NPs are not verb adjacent and do not take a determiner, they are interpreted as obligatorily plural and specific. They are therefore traditionally placed into a separate semantic and morphosyntactic category from verb-adjacent bare NPs (Mosel and Hovdhaugen 1992: 259).

If any bare indefinite object is present, the locative clitic may only appear to the right of the bare indefinite.

(10) Po *o 'afea e tausi (*ai) tama ai ‘o ia?
Q pred when pres care clitic child clitic abs he
‘When does he baby-sit?’

Similar evidence for strict linear adjacency of the verb and bare indefinite comes from the placement of certain adverbs to the right of the verbal complex. Where a bare indefinite object is present, the adverb comes to the right of the bare indefinite.

(11) Sā fufulu (*pea) ipu pea Susana.
PAST wash continually dish continually Susana
‘Susana was continually washing dishes.’

Given the strict adjacency of the bare NP to its selecting verb, a question arises as to whether these NPs are morphologically incorporated into the verb. I suggest that this kind of analysis is problematic in light of the following data which demonstrate that bare NP objects in Samoan are able to be multi-word expressions, which may include modifiers. The following examples demonstrate that bare NPs may include adjectives (12a), conjoined noun phrases (12b) and purpose clauses (12c-d).

(12) (a) e /sasa ta‘ifau ula/ pea le teine
pres beat dog.HON mischievous continuously the girl
“The girl continuously beats mischievous dogs.”
(b) e /sasa ta‘ifau ma ta‘apaepae pea le teine
pres beat dog.HON and chicken.HON continuously the girl
“The girl continuously beats dogs and chickens.”
(c) e /su‘e ta‘apaepae ‘ia ‘a’ai pea le teine
pres search chicken.HON subjunct eat.pl continuously the girl
“The girl continuously searches for chickens to eat.”
These data suggest that the construction’s adjacency requirement holds between the V head and the maximal projection of the bare indefinite, the NP, rather than between the V head and N head.

2.1 Syntactic Analysis

Massam (2001) uses data relating to an analogous class of bare NPs in Niuean to argue for a particular view on the derivation of verb-initial word ordering. Her hypothesis, which I will refer to as the Predicate Fronting Hypothesis (PFH), derives verb-initial word order by raising a constituent containing the verb to a clause initial position. This analysis has proven popular in the derivation of word order in several Austronesian languages (e.g., Aldridge 2004 for Seediq; Rackowski and Travis 2000 for Tagalog). The syntactic portion of my analysis of bare NPs for Samoan assumes that the PFH is correct for Samoan.

The PFH states that verb initial ordering in a clause is derived by raising a constituent containing the verb to a specifier position which linearly precedes the subject. The category of the raised constituent may vary cross-linguistically, though Massam argues that the constituent is a VP in Niuean. I assume this is true in Samoan also. In order for the verbal complex to linearly follow the tense marking auxiliary (which I assume instantiates the functional category T), the landing site of the raised VP must be a functional projection above the position of the subject, but below tense. I tentatively suggest this head is Asp. The intransitive sentence in (13) is modelled in (14).

(13) ‘Olo‘o siva le teine
    PROG dance SPEC girl
    ‘The girl is dancing’

(14) TP
    T
    AspP
    ‘olo‘o
    VPj
    V
    Asp
    vP
    siva
    v
    Dj
    D
    le
    N
    teine

This approach is able to model the word order variation with respect to the position of the object of a transitive verb. It is outside the verbal complex when realised as a full DP, and directly verb adjacent when realised as a bare indefinite. Where the transitive object is realised as a full DP,
Massam assumes that it raises to a functional projection below the subject which controls the case of the object (labelled AbsP). I model this raising of the object as movement to a second specifier of position of vP. The transitive clause in (15) is modelled in (16). I classify the ergative marking preposition e as a case marker (with the category label K).

\[
\text{(15) } Sā \text{ perf tipi e le } tama \text{ le } falaoa \\
\text{‘The child cut the bread’}
\]

\[
\text{(16) }
\begin{array}{c}
\text{TP} \\
\text{AspP} \\
\text{VP}_j \\
\text{V} \text{ tipi} \\
\text{Asp} \text{ vP} \\
\text{KP} \\
\text{e DP} \\
\text{DP}_i \text{ v} \text{ t}_j \\
\text{le NP} \\
\text{le N} \\
\text{tama} \\
\text{falaoa}
\end{array}
\]

Where the object is a bare indefinite, Massam’s analysis has the object remaining VP-internally, raising along with the VP to the position linearly preceding the subject. Under her analysis the bare indefinite is an NP-sized constituent. A paraphrase of (13) in (17), in which the object is realised as a bare indefinite, is modelled in (18).

\[
\text{(17) } Sā \text{ perf tipi falaoa le tama} \\
\text{‘The child bread-cut.’}
\]
The predicate fronting serves as a baseline assumption for the clause structure of Samoan. In particular, it supplies a neat account of why bare NP objects surface adjacent to the verb in a clause initial position. The following sections deal with the interpretation and discourse behaviour of Samoan indefinites, including these bare NP objects.

3 Quantificational force and narrow scope

This section lays out the semantic properties of Samoan bare NPs and contrasts them with the semantic properties of DPs headed by the determiners se and le. I argue that all sentences with se DPs, le DPs and bare NPs are existentially quantified. se DPs and bare NPs differ from le DPs in that both are obligatorily trapped in narrow scope with respect to any other sentential operator (e.g., negation, conditionals). Neither variety of narrow scope indefinite requires the presence of a wider scoping operator. I will propose in a following section that the two narrow scope indefinites differ with respect to their potential to update the discourse.

3.1 Introduction to Samoan Indefinites

To begin, the table in (19) presents the singular and plural forms of NPs (in the traditional sense) in Samoan, using the example noun fafine, ‘woman’. Before I lay out the semantic facts of these different NP-types, I will simply refer to se indefinites as “non-specific” and le indefinites as “specific”. The categories in (19) do not include a category of determiners referred to as “emotive determiners”. Emotive determiners demonstrate a distinction between non-specific and specific, and as such inherit the same semantics as their non-emotive counterparts but for the fact that they introduce expressive meaning, signalling that the speaker feels empathy or belittlement towards the referent. Beyond this paragraph, emotives will not figure in this paper.

(19)

<table>
<thead>
<tr>
<th></th>
<th>Bare</th>
<th>Non-Specific</th>
<th>Specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG</td>
<td>fafine</td>
<td>se fafine</td>
<td>le fafine</td>
</tr>
<tr>
<td>PL</td>
<td>fafine</td>
<td>ni fafine</td>
<td>fafine</td>
</tr>
</tbody>
</table>

From (19), it seems that Samoan does not mark plural on the head noun, but does make a singular-plural distinction by the choice of determiner. There are in fact a small class of nouns
which do demonstrate plural morphology. These are generally noun-stative verb compounds where the stative verb shows plural agreement morphology, in most cases signalled by partial reduplication as in (20). The following table gives the paradigm with the morphologically complex noun *tamaloa*, ‘old man’, composed of a nominal head *tama*, ‘man’, and the stative predicate *loa*, ‘long (of time)*.

<table>
<thead>
<tr>
<th></th>
<th>BARE</th>
<th>NON-SPECIFIC</th>
<th>SPECIFIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG</td>
<td><em>tamaloa</em></td>
<td><em>se tamaloa</em></td>
<td><em>le tamaloa</em></td>
</tr>
<tr>
<td>PL</td>
<td><em>tamaloloa</em></td>
<td><em>ni tamaloloa</em></td>
<td><em>tamaloloa</em></td>
</tr>
</tbody>
</table>

The following sections describe some semantic properties of singular bare NPs, non-specifics marked by *se* and specifics marked by *le*.

### 3.2 Scope

This subsection focuses on the scope-taking properties of the three kinds of indefinites in question. The summary point is that *le* DPs must take wide-scope with respect to a range of sentential operators, while both *se* indefinites and bare indefinites must take narrow scope with respect to the same set of operators. This is shown with reference to the behaviour of these indefinites in sentences with negation, modals, and universal quantification and in conditional sentences.

#### 3.2.1 Negation

*le* indefinites take wide scope with respect to negation, while *se* indefinites and bare indefinites take narrow scope. To demonstrate this, I present two contexts which were given to Samoan informants (in English). (21) is a context which should accommodate a sentence with an indefinite taking wide scope over negation. (22) is a context which accommodates a sentence with an indefinite taking narrow scope under negation.

(21) Indefinite scopes above negation:
I walked into a bookstore, and I want to buy a particular green notebook I saw advertised yesterday. I didn’t see the green notebook in the store, but I did buy a red notebook and a blue notebook instead.

(22) Indefinite scopes below negation:
I walked into a bookstore, and I want to buy a particular green notebook I saw advertised yesterday. I didn’t see the green notebook in the store, so I left without buying anything.

The following sentences were presented to the consultants, and they were asked whether the sentences were accepted as true or rejected as false in each context. Examples (23), (24), and (25) respectively contain a *le* DP, a *se* DP and a bare NP within a negated sentence.

(23) *Sā* past ‘ou lē fa’atau le api.
PAST I not buy SPEC notebook
‘I didn’t buy a/the notebook.’
True in both contexts.

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2 The view of Samoan indefinites drawn in this section claims that *se* DPs and bare NPs are obligatorily narrow, while *le* DPs are obligatorily wide. This leaves open the question of how intermediate scope readings of indefinites are formed, if they are allowed at all. I leave this discussion for a future revision of this work, subject to further data collection. Sentences with an indefinite co-occurring with two distinct sentential operators, such as negation and a modal for example, are key to determining which kind of indefinite (if any) may scope in between the two operators. The result will motivate a revision to the preliminary picture of compositional semantics sketched out in Section 4.
(24) *Sā* ‘ou lē fa’atau *se* api.

past I not buy nonspec notebook

‘I didn’t buy a notebook.’

Rejected in context (21), accepted in context (22)

(25) *Sā* ‘ou lē fa’atau-api.

past I not buy-notebook

‘I didn’t notebook-buy.’

Rejected in context (21), accepted in context (22)

The general pattern is what we would expect given the claim that *se* DPs and bare NPs are obligatory narrow scope. The data in (26) and (27) demonstrate that this effect is not restricted to *se* DPs in object position: even *se* DPs in subject position demonstrate narrow scope with respect to negation.

(26) *E* le‘i iloa ā e *se* isi lenā mea.

pres not.yet know emph erg nonspec one that thing

‘No one yet knows that.’ (Mosel and Hovdhaugen (1992): 765)

(27) e lē tagi se agelu

pres neg cry nonspec angel

‘Angels do not cry.’ (Mosel and Hovdhaugen (1992): 264)

3.2.2 Conditionals

The contexts in (28) and (29) were presented to consultants to test the same effects for conditional sentences. (28) is a context in which a sentence with an indefinite scoping out of a conditional clause should be felicitous, while (29) is a context where a sentence with an indefinite scoping within a conditional clause should be felicitous.

(28) Indefinite scopes out of conditional:

Our family keeps a pen of pigs. All of them are tiny, and wouldn’t make a good meal, except one, which would make a good meal.

(29) Indefinite scopes within conditional:

Our family keeps a pen of pigs. All of them would make a good meal.

The following sentences were presented to the consultants. As expected, the *le* DPs were interpreted as scoping out of the conditional clauses, while the *se* DPs and bare NPs were interpreted as taking narrow scope inside the conditional clause.
If my brother kills a (particular) pig, we can eat a big meal.

Rejected in context (28), accepted in context (29)

If my brother kills a(ny old) pig, we can eat a big meal.

Rejected in context (28), accepted in context (29)

If my brother pig-kills, we can eat a big meal.

Rejected in context (28), accepted in context (29)

The following quote from the Samoan Bible demonstrates a similar effect: a se DP subject scopes within a conditional clause. In the same example we see another se DP (sana fānau, 'a child (of his)') scoping under the negative adverbial le‘i, as well as a se DP (sona iso, 'a brother (of his)') scoping under a deontic modal tatau.

If a man dies without having any children, it must be that a brother of his stays with that wife.  
(Matthew 22:24)

3.2.3 Modals

Turning to sentences with modals, the sentences in (34) and (35) were presented to consultants to tests the scopal behaviour of indefinites with respect to a deontic modal. (34) is a context in which we expect a felicitous utterance of a sentence with an indefinite scoping over a deontic modal, and (35) is a context in which we expect a felicitous utterance of an indefinite scoping under a modal.

(34) Indefinite scopes above modal:
The woman is not allowed to touch any of the village’s coconuts, because they belong to her evil aunt; however, her aunt has given her one coconut in particular that she must scoop out.

(35) Indefinite scopes below modal:
The woman’s evil aunt needs some copra, so she tells the woman to scoop out some coconut; however, there are no coconuts anywhere in the area.
(36) e tatau ‘ona sali e le fafine le popo  
  PRES must COMP scoop ERG SPEC woman SPEC ripe.coconut  
  ‘The woman must scoop a coconut.’  
  Accepted in context (34), rejected in context (35)

(37) e tatau ‘ona sali e le fafine se popo  
  PRES must COMP scoop ERG SPEC woman NONSPEC ripe.coconut  
  ‘The woman must scoop a coconut.’  
  Rejected in context (34), accepted in context (35)

(38) e tatau ‘ona sali-popo le fafine  
  PRES must COMP scoop-ripe.coconut the woman  
  ‘The woman must scoop a coconut.’  
  Rejected in context (34), accepted in context (35)

The following example demonstrates a similar effect for ability modals: a subject se DP (se tagata, ‘a man, somebody’) obligatorily scopes under the ability modal mafai.

(39) e mafai fo’i ‘ona manavatā se tagata e fa’apena  
  PRES possible still COMP have.diarrhea NONSPEC person PRES like.that  
  OK: any person can get diarrhea  
  #: there is a particular person that can get diarrhea  (Mosel and Hovdhaugen 1992: 261)

3.2.4 Distributivity

The obligatory narrow scope of both se DPs and bare NPs is similarly clear when looking at the possibility of distributive readings in sentences with a second argument which has the potential for scopal relations with the indefinite. We find that sentences with se DPs and bare NPs only allow distributive readings for the indefinite, while sentences with le DPs never allow distributive readings. The simplest way to see this is with the following triplet, following a paradigm in Matthewson (1998). In a scenario where the non-distributive reading is implausible (that is, a reading where the indefinite cannot plausibly scope under the second quantified argument), the use of a le DP to express the indefinite results in infelicity.

(40) #sā ‘ai e lo’u tuafafine e tolu le pī  
  PAST eat ERG my sister PRES three SPEC bean  
  ‘My three sisters ate a (particular) bean.’

(40) is only acceptable with a kind reading, for example, the three sisters were eating a particular species of bean. On a non-kind reading, the only acceptable interpretation is that the sisters are eating one (giant) bean. The sentence is incompatible with a reading that each of the three sisters is eating a different bean.

No such infelicity arises with the use of a se DP or a bare NP. Both sentences are compatible with the interpretation that each sister is eating a different bean.

(41) sā ‘ai e lo’u tuafafine e tolu se pī  
  PAST eat ERG my sister PRES three NONSPEC bean  
  ‘My three sisters ate a bean.’

(42) sā ‘ai pī lo’u tuafafine e tolu  
  PAST eat bean my sister PRES three  
  ‘My three sisters bean-ate.’
3.3 Indefiniteness

In this section I present evidence that all three of bare NPs, se DPs and le DPs are interpreted as indefinites. The restriction of bare NPs and se DPs to narrow scope with respect to other sentential operators (data laid out in the previous subsection) is in itself enough evidence that these two types of phrases are interpreted as indefinites, as definites by nature take wide scope with respect to such operators. However, le DPs are obligatorily wide-scoping, leaving their status as either definites (entailing the uniqueness and familiarity of the referent) or wide-scoping indefinites (in the sense of Fodor and Sag (1982)) a priori uncertain. The evidence presented in this section leads towards an analysis of le DPs as something like wide-scoping indefinites rather than definites. That is, le DPs do not force a uniqueness entailment nor familiarity of the referent.

The diagnostics for indefiniteness listed below are taken from Matthewson (1998). Note that Matthewson lists a fifth diagnostic: definites may not correlate with wh-remnants of sluices. This property is discussed in much further detail in a following subsection.

i. Indefinites may serve as pivots of existential sentences

ii. Multiple uses of identical definites across a conjoined sentence force consistent reference across uses.

iii. Definites carry a uniqueness entailment or presupposition

v. Definites are used for familiar discourse referents

3.3.1 Existentials

(43) and (44) show that, respectively, le DPs and se DPs may serve as the pivot of an existential. In Samoan, the pivot of an existential is placed after the existential predicate iai, which is possibly compositionally derived from the locative marker i plus the locative pro-form ai, to mean something like ‘(is) at that place/there’. As the existential predicate is by nature intransitive, we do not find bare NPs as the pivot of an existential, as bare NPs are only licensed as the object of a transitive verb.

(43) Sā iai le agelu sīsīlisi a le Atua sā iga a‘ia Lusifer
PAST exist SPEC angel highest GEN SPEC God PAST name DAT Lucifer
‘There was a highest angel of God who was named Lucifer.’

(44) Sā iai se ali’i malosi ma se tamaitai aulelei lava.
PAST exist NONSPEC chief strong and NONSPEC lady beautiful very
‘There was a strong chief and a very beautiful lady.’
(Gagana Sāmoa—NZ Curriculum Online, nzcurriculum.tki.org.nz/content/download/464/3653/file/gagana.pdf)

Universal quantifiers (introduced by le DPs with an adjoined particle) are unable to serve as the pivots of existentials.

(45) ??Sā iai le tagata taitāsi i le fala
PAST exist SPEC person all at the house
‘There were all the people at the house.’
3.3.2 Non-consistent reference across multiple uses

Next, we find that none of the DPs, se DPs nor bare NPs force their referent to be interpreted as unique. This is clearly observed in conjoined sentences where both conjunct sentences contain an indefinite of the same type and descriptive content. In these cases, none of the DPs, se DPs nor bare NPs force an anaphoric type reading, that is, a reading where both indefinites refer to the same individual. Compare these to the English example in (49), in which the use of the definite article forces a consistent reference across uses.

(46) Sā pu’e e Ioane le faomea ma sā pu’e fo’i e Susana le
PAST catch ERG Ioane SPEC thief and PAST catch also ERG Susana SPEC
faomea
thief
‘Ioane caught a thief and Susana also caught a (different) thief.’

(47) Sā pu’e e Ioane se faomea ma sā pu’e fo’i e Susana se faomea
PAST catch ERG Ioane NONSPEC thief and PAST catch also ERG Susana
se NONSPEC thief
‘Ioane caught a thief and Susana also caught a (different) thief.’

(48) Sā pu’e faomea Ioane ma sā pu’e faomea fo’i Susana
PAST catch thief Ioane and PAST catch thief also Susana
‘Ioane caught a thief and Susana also caught a (different) thief.’

(49) ‘Ioane caught the thief and Susana also caught the thief.’

In all three sentences (46-48), it is acceptable to interpret Susana and Ioane as catching two distinct thieves.

3.3.3 Uniqueness

The following set of examples further expands on the point that none of the DPs, se DPs nor bare NPs force a uniqueness entailment on their referent, unlike definites in languages like English which do entail uniqueness. In the context (50), there are multiple pigs and thus the pig being fed by Ioane is non-unique. Still, sentences (51-53) are acceptable in this context.

(50) There are four pigs waiting for their meal. Ioane leans down but only feeds one of them.

(51) Sā fafaga e Ioane le pua’a
PERF feed ERG Ioane SPEC pig
‘Ioane was feeding a pig.’

(52) Sā fafaga e Ioane se pua’a
PERF feed ERG Ioane NONSPEC pig
‘Ioane was feeding a pig.’

(53) Sā fafaga pua’a Ioane
PERF feed pig Ioane
‘Ioane was pig-feeding.’

All three sentences are consistent with the interpretation that there exist multiple pigs, and the referent of the indefinite is not unique.
3.3.4 Familiarity

Crosslinguistically, definites are used in discourse contexts where their referent is already given. That is, it is unusual or pragmatically odd to use a definite to introduce a new discourse referent. Examples (54-56) all demonstrate that se DPs and le DPs are felicitously used to introduce a discourse referent. In each case the sentences contain the first mention of the referents of the indefinites. In fact, these sentences are taken from the first sentences of stories.

(54) ‘O le ulugāli‘i, fānau la lā tama ‘o le teine ‘o Sina.

‘A couple, they gave birth to a child, the girl was (named) Sina.’

(Mosel and Hovdhaugen (1992): 259)

(55) Sā iai le ulugali‘i ‘o Papa le tane ‘a ‘o Eleele le fafine

‘There was a couple, Papa the husband and Eleele the woman.’

(Mosel and Hovdhaugen (1992): 262)

(56) Sā iai se matua moa ma sana toloai.

‘There was a hen and its brood.’

(Mosel and Hovdhaugen (1992): 262)

Bare NPs similarly lack the requirement that the referent be already given within the discourse context.

(57) Na alu se tamāloa ‘i le vao ma tātā fafie

‘A man went into the forest and chopped firewood.’

The diagnostics presented in the previous two sections point to the conclusion that both DPs headed by se and bare NPs are interpreted as obligatorily narrow scope indefinites. Their quantificational force is clearly demonstrated to be existential. In the following section, I will briefly lay out two analyses of the compositional semantics of obligatorily narrow scope indefinites, namely the theories proposed by Van Geenhoven (1998) and Chung and Ladusaw (2004) and then give a rudimentary analysis of the compositional semantics of Samoan indefinites and how it ensures that the indefinite always takes scope under any other scope-taking operator.

4 Compositional analyses

The analyses of both Van Geenhoven (1998) and Chung and Ladusaw (2004) focus primarily on the problem of how to derive the meanings of transitive verbs and their incorporated objects compositionally. We start from the assumption that a bare noun phrase denotes a property (a set of individuals or a characteristic function mapping individuals to truth values), and a transitive verb denotes a relation between two individuals. We run into a technical problem – relations do not have a suitable type to compose with a property.
To illustrate, consider the example in (58).

(58) sā pu’e pua’a le tagata
    PAST  catch pig SPEC man

“The man was pig-catchng.”

We start with the assumption that the transitive verb *pu’e* is interpreted as a 2-place relation mapping a pair of individuals \( \langle y, x \rangle \) to true just in case \( y \) catches \( x \). We interpret the noun *pua’a* as a 1-place relation mapping an individual \( x \) to true just in case \( x \) is a pig.

\[
\begin{align*}
&\text{(59)} & \text{a. } [\text{catch}] &= \lambda x.\lambda y.\text{catch}(y, x) \\
& & \text{b. } [\text{pig}] &= \lambda x.\text{pig}(x)
\end{align*}
\]

On trying to compose these two functions, we encounter a type mismatch: neither serves as a suitable argument for the other. We have the additional problem that it is unclear how the argument of *pua’a* and the object argument of *pu’e* come to be existentially quantified.

\[
\begin{array}{c}
\lambda x.\lambda y.\text{catch}(y, x) \\
\lambda x.\text{pig}(x)
\end{array}
\]

Both Van Geenhoven (1998) and Chung and Ladusaw (2004) propose solutions to this problem which both overcome the compositional difficulties, and ensure the introduction of the existential quantifier.

### 4.1 Van Geenhoven’s semantic incorporation

Van Geenhoven’s analysis of narrow scope indefinites starts from the point of assuming that the basic type of obligatory narrow scope indefinites, like Samoan *se* DPs and bare NPs, are properties, that is functions mapping individuals to truth values. In order to allow these property type indefinites to compose with a verb meaning, she introduces a productive type shifting operation which she terms “Semantic Incorporation” illustrated below. I represent the type shifting operation as a function \([\text{si}]\) which takes 2-place relations as its domain and returns 2-place relations between properties and individuals. I’m assuming an extentionalised version of all these terms for simplicity.

\[
\begin{align*}
&\text{(61) Semantic Incorporation (Van Geenhoven 1998)} \\
&\text{a. } [\text{catch}] &= \lambda x.\lambda y.\text{catch}(y, x) \\
&\text{b. } [\text{si}(\text{catch})] &= \lambda f.\lambda y.\exists x : \text{catch}(y, x) \land f(x)
\end{align*}
\]

The intuition is that a type-shifted transitive verb \([\text{si}(\text{catch})]\) denotes a relation between a property \( f \) and an individual \( y \), asserting that there is an individual \( x \) such that \( y \) catches \( x \) and property \( f \) is true of \( x \). This type-shifted predicate composes naturally with a property type such as the denotation of bare NP object.

\[
\begin{array}{c}
\lambda y.\exists x : \text{catch}(y, x) \land \text{pig}(x) \\
\lambda f.\lambda y.\exists x : \text{catch}(y, x) \land f(x) \\
\lambda x.\text{pig}(x)
\end{array}
\]
The result of this composition is another property type, denoting the set of individuals \( y \) such that there is a pig that \( y \) caught.

As the existential quantifier is introduced within the denotation of the verb itself, it is forced to scope below any operators which are introduced elsewhere in the sentence. (63) is a simple illustration demonstrating how the existential quantification introduced by the use of a bare NP must scope below negation. Note that the structure below ignores the semantic contribution and composition of aspectual and voice heads which I assume in my syntax, in order to focus on the relation between the existential quantifier and negation.

\[
(63) \quad \neg \exists x : \text{catch}(\text{John}, x) \land \text{pig}(x)
\]

Van Geenhoven’s semantic incorporation renders the variable bound by the existential quantifier inaccessible to any additional content in the sentence which predicates of that variable. For example, a language may allow transitive verbs to incorporate a noun, and then additionally take a full object (something like “John pig-caught Porky the Pig”). In such a language, Van Geenhoven’s system has to appeal to an operation which somehow cancels the original existential binding of that variable. In Samoan, such sentences are impossible. The appearance of a bare NP object entails that the internal argument slot of the transitive verb is fully saturated.

### 4.2 Chung and Ladusaw’s Restrict

Chung and Ladusaw (2004) propose a different approach to composing a property type with a transitive verb. Under their system, the transitive verb composes with a property but leaves the variable in the object slot of the transitive verb unsaturated. This allows transitive verbs to naturally compose with additional arguments after incorporating a bare NP.

Their system appeals to a particular rule of composition, which occurs where a 2-place relation between individuals (like a transitive verb) and a property type are syntactic sisters. In this scenario, a rule termed “Restrict” may apply, which adds the property type as a conjunct to the transitive verb and causes the variable introduced by the property to be rebound as the object argument of the transitive verb.

\[
(64) \quad \text{Restrict (Chung and Ladusaw 2004)}
\]

- a. \[\text{pu’e} = \lambda x \lambda y. \text{catch}(y, x)\]
- b. \[\text{pua’a} = \lambda x. \text{pig}(x)\]
- c. \[\text{RESTRICT}(R)(f) = \lambda x \lambda y. R(y, x) \land f(x)\]
- d. \[\text{RESTRICT}(\text{[pu’e]})(\text{[pua’a]}) = \lambda x \lambda y. \text{catch}(y, x) \land \text{pig}(x)\]
The result of applying Restrict to a transitive verb and a property is another transitive verb, and therefore it may compose with an individual as in the derivation below. This is the kind of derivation Chung and Ladusaw assume for languages which allow V+N compounds to take objects.

(65) \[
\lambda y \lambda x. \text{catch}(x, y) \land \text{pig}(y) \quad \text{(via Restrict)}
\]

\[
\lambda y \lambda x. \text{catch}(x, y) \land \text{pig}(y) \quad \text{Porky}
\]

\[
\lambda x. \text{catch}(x, \text{Porky}) \land \text{pig}(\text{Porky}) \quad \text{John}
\]

\[
\lambda y. \text{catch}(x, y) \land \text{pig}(z)
\]

For languages such as Samoan, we need existential quantification to be introduced somehow, and at a sufficiently low level so as not to scope over other operators such as negation. Chung and Ladusaw appeal to two notions in order to capture such languages.

The first is a theory of Existential Closure (of the type described by Diesing (1992)). Chung and Ladusaw’s theory states that any argument which is left unsaturated must be bound by an existential quantifier. The “timing” of the existential closure operation is forced at the end of the composition of the predicate with its arguments. In Davidsonian terms, Existential Closure occurs before the event argument is itself existentially bound.

Any property-denoting argument which is left vP-internal (where vP represents the syntactic constituent in which the verb is composed with its arguments) is therefore subject to being existentially quantified. A sample derivation follows below, demonstrating the interaction between Restrict and Existential Closure. As with the derivation illustrating the Van Geenhoven theory, I introduce sentential negation. As Existential Closure is obligatorily operational at the vP level, operators like negation which enter the derivation outside this level necessarily outscope the existential quantifier.

The second mechanism required is a reshuffling of the lambda terms before the subject composes with the verb. This is required as their theory stipulates that Restrict leaves the object argument unsaturated. There is therefore a risk that the subject will be composed with the verb in the object slot and be interpreted as the object. The object argument must therefore be “demoted” if it is not immediately saturated by composing with a DP.
4.3 A compositional model for Samoan

In this section I present a compositional model of Samoan indefinites which ensures the narrow scope of both *se* indefinites and bare NPs. The compositional semantics relies on the syntactic analysis laid out in Section 2. Recall that predicate-initial word ordering in Samoan is derived in this system by movement of the verb phrase to a specifier position higher than the subject. I tentatively labelled this landing site for the VP as AspP, though nothing crucially relies on this position being associated with sentential aspect. In cases where the transitive object is realised as a bare noun phrase, it remains within the verb phrase, moving along with the verb to the position above the subject, thus generating the observed VOS word order.

With this syntactic analysis in place, we are not required to stipulate any additional mechanism to handle the compositional semantics of a verb-initial language. Instead, we are able to interpret the verb phrase in its in-situ position under reconstruction. The structure in (67) is therefore interpreted as in (68), with the verb phrase in a lower position.
The compositional semantics laid out in this section therefore treats the clause structure like a familiar SVO language. Reformattting the analysis to handle a base-generated VSO clause structure is a topic for future research, but beyond the scope of this paper. Also note that the analysis abstracts away from the semantics of tense and aspect.

Beginning with se DPs, we find they have the potential to appear in either the subject or object position. We see a se DP in the subject position of a transitive clause, taking ergative case in (69) and a se DP in the object position of a transitive clause in both (69) and (70).

(69) A fai /e se tagata e toatasi/ₜₜ se mea leaga e na’o
FUT make ERG NONSPEC person PRES single NONSPEC thing bad PRES only
“A single man only causes problems”
(Faamatua i se Aganuu Fou, Spectrum Migrant Resource Centre, 2008)

(70) ‘Ua ‘ou fia inu /se fagu vai]/₀.
PERF 1SG want drink NONSPEC bottle water
“I want to drink a bottle of water”
(http://village.1samoana.com/group/samoamalananahagana/forum)

We start with the assumption that a se DPs is interpreted as a standard, Montagovian generalised quantifier, that is, they denote sets of properties. It follows that se is a quantificational determiner which expresses a relation between two sets, namely that the intersection of the two sets is non empty. We can represent the lexical entry for se as below:

\[
[\text{se}] = \lambda f \lambda g. \exists x : f(x) \land g(x)
\]

Composing this determiner with a property (denoted by the descriptive content of the se DP) such as doctor, we get a generalised quantifier or a set of properties. The set of properties are all properties which share a member with the set denoted by doctor:

\[
[\text{se}]([\text{doctor}]) = \lambda g. \exists x : \text{doctor}(x) \land g(x)
\]

As with any generalised quantifier type, the difficulties are (i) ensuring correct composition in non-subject positions, and (ii) ensuring the scope facts come out right, in this case ensuring the obligatorily narrow scope. In particular, we want se DPs in subject position to be the narrowest scoping element. This includes scoping below a generalised quantifier object. These kinds of sentences are composed straightforwardly by following the kinds of mechanisms illustrated in Heim and Kratzer (1998). We allow the universal generalised quantifier to quantifier raise and adjoin to the highest scoping position, and insert an operator co-indexed with the trace of the raised quantifier. The result is compositionally well-formed and gets the (inverse) scoping facts right.
Implicit in the derivation in (73) is the claim that the obligatory narrow scope of se DPs is derived via disallowing them from quantifier raising. If this were allowed, we would expect se DPs to take wide scope over sentential operators like negation, which they cannot. In fact, I suggest that quantifier raising is precisely the property which distinguishes le DPs from se DPs: le DPs must always quantifier raise, while se DPs never quantifier raise. The choice between le and se corresponds simply to the choice between a wide scope and narrow scope indefinite. The analysis spells out this intuition by linking the choice between le and se to a choice between interpretation in a raised position or interpretation in-situ, respectively.

A simple question arises: how do we interpret se DPs in object position. Under our assumptions, se DPs denote sets of properties (the set of properties which share members with the property denoted by the descriptive content of the se DP). If this is correct, a se DP in object position should lead to a type-mismatch. As quantifier raising is disallowed, by what mechanism can the generalised quantifier object compose with its selecting verb?

We resolve this by appealing to a theory of argument raising (Hendriks 1993). Under this theory, we can manipulate the type of the transitive verb to allow it to take generalised quantifiers as arguments. I define a type-shifting operator RAISE which takes transitive verbs (denoting relations between pairs of individuals) and outputs relations between individuals and generalised quantifiers.

With this piece of machinery in hand, we can interpret se DPs in object position, without forcing them to quantifier raise and thereby get their scoping behaviour wrong. A sentence with a se DP in object position follows in (76) and its derivation in (77).

(76) sā tapē e Ioane se puaʻa
past kill erg John nonspec pig
“John killed a pig.”
Interpreting a se DP in subject position doesn’t require any special machinery, the transitive verb composing with its object should result in a property type, which can compose naturally with the se DP. If the object is an individual type (like a proper name in the derivation below), the object simply composes with the verb. If the object is a wide scoping generalised quantifier, the transitive verb can compose with its trace as in (73). The following sentence has a se DP in subject position, and (79) shows its semantic derivation.

(78) sā tapē e se pua’a Ioane
PAST kill ERG NONSPEC pig John
“A pig killed John.”

(79) \[ \exists y : \text{pig}(y) \land \text{kill}(y, \text{John}) \]

As far as bare NP objects go, the Van Geenhoven type shifting analysis serves well. To reiterate, the Van Geenhoven analysis posits a type shifting operation on transitive verbs. Instead of denoting relations between pairs of individuals, transitive verbs denote relations between individuals and properties. The existential quantificational force of bare NP indefinites is handled by introducing the existential quantifier directly into the meaning of the transitive verb. The operation is in (80).

(80) \[ [\text{inc}] = \lambda R \lambda P \lambda x : R(x) \land P(x) \]

The type shifting operation in (80) ensures that transitive verbs may combine directly with property types, such as those denoted by bare NPs. The operation is limited to the object position of transitive verbs thereby ruling out the possibility of any verbs composing with their subjects. The example in (81) is a paraphrase of (76) using a bare NP object. Its derivation follows in (82).

(81) sā tapē pua’a Ioane
PAST kill pig John
“John pig-killed.”
The suggested paradigm for Samoan indefinites stemming from this elementary discussion follows in (83). I suggest that both DPs headed by le and DPs headed by se are generalised quantifiers (type $\langle \langle e, t \rangle, t \rangle$). They share their truth-conditional content, both introducing existential quantification. Their higher type requires additional machinery to compose with their selecting verb. I suggest that their mechanisms of composition are the root of their scoping properties with respect to sentential operators such as negation. le DPs quantifier raise and adjoin to the root node and as such take wide scope with respect to sentential operators. se DPs compose with the verb in-situ, object se DPs require the verb to type-raise in order for it to accept a generalised quantifier object.

I suggest that a bare NP object is interpreted as a property (type $\langle e, t \rangle$), and as such does not introduce an existential quantifier per se. Rather the Van Geenhoven type-shifting operation on transitive verbs termed semantic incorporation entails that the transitive verb takes a property-type object and in doing so introduces the existential quantifier within its denotation. As the existential quantifier is part of the verb’s meaning, it necessarily scopes below sentential operators. As the type-shifting operation is restricted to the object argument of the verb, we expect that bare NP subjects are ruled out via a type-mismatch.

This section gives a sketch of an analysis of how the obligatory narrow scope effects of the two kinds of Samoan indefinites under focus in this paper are derived compositionally. A more complete analysis incorporating the scoping properties of more complex sentences with the full range of Samoan quantificational expressions is a topic for future study. In particular need of closer examination is the claim that wide scope effects are derived via quantifier raising. Crucially, quantifier raising must be enforced for quantificational expressions besides se DPs (such as le DPs) in object position, to prevent the possibility of composing the expression with a transitive verb raised by the raise operation. Failing to quantifier raise in this scenario will incorrectly give the expression narrow scope. A fully fleshed out analysis of the intricacies of wide scope expression in Samoan is beyond the scope of this paper. However, the analysis presented in this section fully accounts for the narrow scope effects of both se DPs and bare NPs and ensures that bare NPs introduce existential quantification.

However, what should be clear from the derivations throughout this subsection and the previous subsection is that sentences with either kind of narrow scope indefinites receive the same kind of semantic representation. I have ended up saying that both bare NP objects and se DPs introduce
existential quantification. The existential quantifier surfaces as the default widest scoping operator (in the absence of any other kind of operator) regardless of the indefinite responsible for the introduction of the existential.

When we expand our empirical coverage to the behaviour of these indefinites with respect to various discourse phenomena, we find that bare NPs and se DPs have clearly divergent behaviour. The following section presents data showing that se DPs are able to antecede cross-sentential pronominal anaphora and serve as the inner antecedent to sluicing ellipsis, while bare NPs are not able to. These data suggest that the two kinds of narrow scope indefinites should not receive equivalent representations. The formal account presented in Sections 6 and 7 extends the analysis of Samoan narrow scope indefinites to incorporate their discourse behaviour described in the next section. The central claim is that Samoan bare NPs, but not se DPs, introduce an operator which removes the dynamic potential of any existential quantifier in its scope.

5 Discourse behaviour

The discourse transparency of an incorporated indefinite refers to its ability to participate in anaphoric phenomena across sentences, that is, an discourse transparent incorporated indefinite is able to introduce a discourse referent. Mithun (1984) points out that this property appears to vary cross linguistically, she cites Mohawk as an example of a language whose incorporated indefinites may introduce discourse referents and therefore license pronominal anaphora in subsequent sentences. Massam (2001) states that the discourse transparency of incorporated objects varies by construction in Niuean. Objects incorporated by transitive verbs are discourse opaque (they do not introduce discourse referents and thus do not serve as the antecedent to a subsequent pronoun), while objects incorporated into the existential predicate are discourse transparent. Dayal (2011) notes that incorporated plurals are discourse transparent, but singulars are discourse opaque. Farkas and De Swart (2003) observe similar facts for Hungarian narrow scope indefinites.

5.1 Pronominal Anaphora

We see divergent behaviour between se DPs and incorporated indefinites with respect to their discourse transparency, that is, their ability to license pronominal anaphora in subsequent sentences. We find that unembedded se DPs do license pronominal anaphora.

(84) sā fa’apāgotā se foamea e Ioane. ‘ua ia ita ‘iate Ioane
PAST arrest NONSPEC thiefi ERG John. PERF hei angry at John
“John arrested a thief. He became angry at the chief.”

The same does not appear to be true of bare NP indefinites. The following two sentence discourse in which a bare NP indefinite antecedes a pronominal anaphor is odd or marked.

(85) sā fa’apāgotā-foamea Ioane. ??’ua ia ita ‘iate Ioane
PAST arrest-thiefi John. PERF hei angry at John
“John thief-arrested. He became angry at the chief.”

Samoan narrow scope indefinites therefore clearly diverge with respect to their discourse transparency: se DPs are discourse transparent while bare NPs are discourse opaque.

Interestingly, although bare NPs are unable to bind anaphora across sentence boundaries, example (12d), repeated below, demonstrates that they are able to bind anaphora within the NP
itself. In the following example, the bare NP contains a dative clitic which refers anaphorically to the referent of the NP itself (the rock searched for by the girl).

(86) e /su’e ma’a ‘ia togi ‘iai le atigipūū/ pea le teine
    PRES search rocki SUBLNCT throw DAT.CL3 the seashell continuously the girl
    “The girl continuously searches for a rock in order to throw the seashell against it.”

5.2 Sluicing

By sluicing, I mean the ellipsis of the sentential component of an embedded interrogative, stranding the wh-item (Ross 1969). Most characterisations of sluicing in the literature classify it as an example of surface anaphora (Hankamer and Sag 1976, Merchant 2001) requiring that there exist a linguistic antecedent in the discourse licensing its occurrence, though see Ginzburg and Sag (2000), Culicover and Jackendoff (2005) for a different view.

In cases where the elided interrogative clause links to the previous linguistic context, the stranded wh-item often links with an indefinite in a preceding clause. The sentence interpreted within the ellipsis site can be characterised as containing a variable bound by the stranded wh-item. Following Chung et al. (1995), I refer to the indefinite in the preceding clause which links to the wh-item in this way as the ‘inner antecedent’.

In Samoan, we find that se DPs are valid inner antecedents for wh-items in a subsequent clause which have been stranded by a sluice.

(87) sā sasa se maile e le tamaloa ‘ae ‘ou te lē iloa pe
    PAST beat nonspec dog ERG the old.man but I PRES not know Q
    ‘o lēfeqa maile
    which dog
    “The old man beat a dog but I don’t know which dog.”

We also find that bare NP indefinites are not valid inner antecedents for a sluice.

(88) #sā sasa-maile le tamaloa ‘ae ‘ou te lē iloa pe ‘o lēfeqa maile
    PAST beat-dog the old.man but I PRES not know Q which dog
    “The old man dog-beat but I don’t know which.”

In a related paradigm, we find a similar distribution of fragment wh-items exemplified in (89) and (90). The sentential content of a fragment wh-question is able to be reconstructed from a sentence containing a se DP (89), but not a sentence with a bare NP indefinite (90).

(89) A: sā fa’apāgotā se foamea e le ta’ita’i.
    PAST arrest nonspec thief ERG the leader
    “The chief arrested a thief.”

B: ‘o ai?
    Who?
    “Who?”

25
5.3 Towards finer grained distinctions

As discussed in the previous section, incorporated indefinites are standardly thought of as being interpreted as narrow scope existential quantification. Samoan is an interesting case to explore this kind of analysis as se indefinites share all the scopal properties of incorporated indefinites, but differ in their discourse behaviour. To treat both of these kind of indefinites as simply narrow scope existential quantification misses the distinctions between the two indefinites illustrated in this section.

The following section proposes a formal account of the two indefinites based within the formalism of Dynamic Predicate Logic (Groenendijk and Stokhof 1991). Dynamic Predicate Logic is a dynamic system designed to deal with the kinds of discourse phenomena exemplified in Section 5.1, the ability of certain sentences to antecede cross-sentential anaphora. The logic is sensitive enough to create a finer grained distinction between narrow scope indefinites which I argue successfully accounts for both the scopal properties and discourse behaviour of both kinds of narrow scope indefinites in Samoan.

6 Pronominal anaphora in Dynamic Predicate Logic

The formal component of this paper is based within Dynamic Predicate Logic (or DPL) (Groenendijk and Stokhof 1991). In particular, I draw attention to the distinction made within DPL between externally dynamic sentences, and externally static (or test) sentences. By externally dynamic sentences, I refer to sentences which are able to raise potential antecedents for pronominal anaphora in subsequent sentences. Externally static sentences are precisely the opposite, they block any antecedents which are potentially raised by the sentence from anteceding any anaphora in subsequent sentences. We might consider the first sentence in an example like (91) as externally dynamic as the indefinite in the first sentence is able to antecede a pronominal anaphor in the second sentence.

(91) I saw a₀ man enter. He₀ whistled.

In contrast, the first sentence in (92) could be considered externally static as the indefinite is prevented from anteceding the pronominal anaphora in the second sentence

(92) It’s not the case that I didn’t see a₀ man enter. #He₀ whistled.

Central to this analysis is the Closure operator which I notate as \( \Diamond \) which scopes over sentences, blocking their potential to raise any antecedents for pronominal anaphora in subsequent sentences. Rephrased, the operator shifts externally dynamic sentences into externally static ones.

\( ^3 \)The Closure operator is notated in Groenendijk and Stokhof (1991) as \( \Diamond \)
### 6.1 Introduction to Dynamic Predicate Logic

The central concern of DPL is the way a sentence brings its interpreter from one information state to a new information state. In particular, DPL focusses on updating information about the discourse itself, how interpreters resolve anaphoric links between sentences and how they keep track of various discourse referents. The system as I present it is entirely extensional. Sentences are always interpreted relative to the actual world assuming for simplicity that information about the world is fixed between the interlocutors.

A DPL model $M$ is a pair $\langle D, \text{Ext} \rangle$ consisting of $D$ is a domain of individuals, and $\text{Ext}$ is an interpretation function. $\text{Ext}$ maps $n$-ary relations (like man, enter, whistle, arrest,...) to subsets of $D^n$, and maps individual constants (like John, Mary, Sue,...) to members of $D$. The syntax of DPL is identical to ordinary first order logic. The vocabulary consists of non-logical constants, variables (notated with 0, 1, 2,...), and logical constants including negation $\neg$, conjunction $\land$, disjunction $\lor$, implication $\rightarrow$, existential quantification $\exists$, universal quantification $\forall$, and identity $\equiv$. A full enumeration of the syntax of DPL is laid out in the appendix.

The syntax allows for both bound and free variables. A formula with free variables must be interpreted relative to an assignment function which can map the variable to an individual in $D$. The formula $\text{walks}(0)$ interpreted relative to an assignment function which maps 0 to John will be interpreted as $\text{walks}(\text{John})$ and as such take a truth value. I assume assignment functions are a total mapping of variables to individuals. I represent assignment functions as in (93), where each cell pairs a variable with an individual value.

\begin{align*}
(93) & \\
& 0 & \text{John} & 1 & \text{Mary} & 2 & \text{Sue} & \ldots & n & \ldots
\end{align*}

The information state of an interlocutor is always represented as a set of assignments, i.e., the assignments “still in the running” as possible candidates for interpreting any subsequent sentences in the discourse which contain free variables. (94) is an example information state for an interpreter at some point in a conversation. Each row in the matrix represents a possible assignment of variables to individuals.

\begin{align*}
(94) & \\
& 0 & \text{John} & 1 & \text{Mary} & 2 & \text{Sue} & \ldots & n & \ldots \\
& 0 & \text{Mary} & 1 & \text{John} & 2 & \text{Sue} & \ldots & n & \ldots \\
& 0 & \text{John} & 1 & \text{Sue} & 2 & \text{Mary} & \ldots & n & \ldots \\
& 0 & \text{Sue} & 1 & \text{Mary} & 2 & \text{Mary} & \ldots & n & \ldots
\end{align*}

As the conversation progresses, the interpreter has a more refined sense of how to assign variables to particular individuals. It is in this way that knowledge states and updates bringing interpreters to new knowledge states are presented in this system. Conceptualising assignments as total sequences of individuals, we can think of this refinement process as being strictly eliminative. If interlocutors somehow acquire the knowledge that the individual John is to be interpreted as the the individual mapped to the index 0, any possible sequence which does not put John in position 0 is eliminated, updating (94) to (95).

\begin{align*}
(95) & \\
& 0 & \text{John} & 1 & \text{Mary} & 2 & \text{Sue} & \ldots & n & \ldots \\
& 0 & \text{John} & 1 & \text{Sue} & 2 & \text{Mary} & \ldots & n & \ldots
\end{align*}

Following Groenendijk and Stokhof (1991), the denotations for sentences are kept static. A sentence is interpreted relative to a pair of assignments $\langle g, h \rangle$. I talk about the pair as having an
input member \( g \) and an output member \( h \). \( g \) and \( h \) are possible input-output pairs if they meet the conditions defined by Groenendijk and Stokhof (1991) in (96). A sentence in DPL therefore denotes the set of pairs of assignments which are possible input-output pairs. The most relevant definitions will be unpacked below. Note that the expression \( h[x]g \) means that the assignment \( h \) and the assignment \( g \) agree on the value for every variable except \( x \), which they may agree or disagree about.

\[ \text{(96)} \]

a. \[ [R t_1, \ldots, t_n]^{(g,h)} \text{ is true iff } g = h \text{ and } \langle g(1) \ldots g(n) \rangle \in \text{Ext}(R) \]
b. \[ [t_1 = t_2]^{(g,h)} \text{ is true iff } g = h \text{ and } g(1) = g(2) \]
c. \[ \lnot \phi \] \( [g,h] \) \text{ is true iff } \( g = h \) and there is no } k \text{ s.t. } \phi^{(g,k)} \text{ is true}
d. \[ \phi \lor \psi \] \( [g,h] \) \text{ is true iff } \( g = h \) and there is a } k \text{ s.t. } \phi^{(g,k)} \text{ is true or } \psi^{(g,k)} \text{ is true}
e. \[ \phi \rightarrow \psi \] \( [g,h] \) \text{ is true iff } \( g = h \) and for all } k, \text{ if } \phi^{(g,k)} \text{ is true, then there is a } j \text{ such that } \psi^{(k,j)} \text{ is true}
f. \[ \forall x \phi \] \( [g,h] \) \text{ is true iff } \( g = h \) and for all } k, \text{ if } k[x]g \text{ then there is a } j \text{ s.t. } \phi^{(k,j)} \text{ is true}
g. \[ \phi \land \psi \] \( [g,h] \) \text{ is true iff there is a } k \text{ s.t. } \phi^{(g,k)} \text{ is true and } \psi^{(k,h)} \text{ is true}
h. \[ \exists x \phi \] \( [g,h] \) \text{ is true iff there is a } k \text{ s.t. } k[x]g \text{ and } \phi^{(k,h)} \text{ is true}

In order to see how sentences in DPL bring us from one information state (as in 94) to a smaller information state (as in 95), we need to define an update function. \( G \) represents the initial information state and \( G' \) is the information state updated with the sentence \( \phi \). \( G' \) is the union of the possible outputs of \( \phi \) for each input in \( G \).

\[ \text{(97)} \ G \ + \ [\phi] = \bigcup_{g \in G} \{ h \mid \phi^{(g,h)} \text{ is true } \} = G' \]

This definition is useful to think about updates intuitively and how the interpreters information states shift between sentences. Groenendijk and Stokhof (1991), on the other hand, treat multi-sentence discourses statically by representing them as the conjunction of sentences using the rule in (96g). I will continue with this convention.

### 6.2 se DPs in DPL

In the previous sections, I argued that se DPs are indefinites and introduce existential quantification. It therefore comes as no surprise that in the absence of any higher scoping operator, se DPs may antecede anaphora in subsequent sentences. In (98), the se DP se foamea antecedes the pronominal anaphora in the second sentence.

\[ \text{(98)} \ s\ a\ \text{past\ fa’apagot\ se}_0\ \text{nonspec\ foamea\ e\ Ioane}_1. \ ‘ua\ iaq\ ita\ ‘i\text{ate} \text{Ioane}_1\ \text{ PERF\ he\ angry\ at\ John\ “John\ arrested\ a\ thief.\ He\ became\ angry\ at\ John.”} \]

Before I illustrate the DPL treatment of this example, I will introduce how DPL handles a simpler example of cross-sentential anaphora. In (99), the proper name Ioane binds a pronoun cross-sententially.

\[ \text{(99)} \ s\ a\ \text{taunu’u\ Ioane}_0. \ s\ iaq\ \text{fiafia} \ \text{PERF\ he\ happy\ “John\ arrived.\ He\ was\ happy.”} \]
The two sentences impose the following conditions on pairs of assignments. I assume proper names set their indexed variable to their referent (outside the scope of any sentential operators).

\[ \text{a. } \text{arrive}(\text{John}_0) = \text{true iff } g = h \text{ and } g(0) = \text{John} \text{ and } g(0) \in \text{Ext(arrive)} \]

\[ \text{b. } \text{happy}(0) = \text{true iff } g = h \text{ and } g(0) \in \text{Ext(happy)} \]

Conjoining the sentences in discourse, we see that a single assignment consistently values each occurrence of the variable 0 in the discourse. As 0 is mapped to John within the first sentence, subsequent sentences which contain the free variable 0 will be evaluated as if they instead contained the individual constant John. Throughout the paper I will just give the final line of the logical derivation, fuller derivations may be found in the Appendix.

\[ \text{arrive}(\text{John}_0) \land \text{happy}(0) = \text{true iff } g = h \text{ and } g(0) = \text{John} \text{ and } g(0) \in \text{Ext(arrive)} \land g(0) \in \text{Ext(happy)} \]

Going back to the more complex example in (98), the two sentences impose the following conditions on pairs of assignments.

\[ \exists x : \text{arrest}(\text{John}_1, x) \land \text{thief}(1) \]

\[ \text{true iff } h[0]g \text{ and } h(1) = \text{John} \text{ and } (h(1), h(0)) \in \text{Ext(arrest)} \land h(0) \in \text{Ext(thief)} \]

\[ \text{angry-at}(0, \text{John}_1) \]

\[ \text{true iff } g = h \text{ and } g(1) = \text{John} \text{ and } (g(0), g(1)) \in \text{Ext(angry-at)} \]

Again, under conjunction, the variables throughout the discourse are consistently valued by a single assignment. The output assignment of the first sentence ensures that the individual assigned to 0 is within the extension of thief. Subsequent free occurrences of 0 (for example, the pronoun in the second sentence) therefore behave as if they are dynamically bound by the existential quantifier outside of its nuclear scope.

\[ \exists x : \text{arrest}(\text{John}_1, x) \land \text{thief}(1) \land [\text{angry-at}(0, \text{John}_1)] \]

\[ \text{true iff } h[0]g \text{ and } h(1) = \text{John} \text{ and } (h(1), h(0)) \in \text{Ext(arrest)} \land (h(1), h(0)) \in \text{Ext(thief)} \]

We are able to conjoin a sentence containing an unbound occurrence of the variable 1 due the discourse properties of existential quantification. We can even conjoin more sentences with further occurrences of 1, and the variable will always be interpreted as if bound by the existential. It is in this way that DPL represents the notion of ‘discourse referent’. The variable bound by the existential is able to be reused throughout the discourse. For this reason, we classify an existentially quantified sentence as externally dynamic. They are able to pass on variables as antecedents for subsequent anaphora.

Externally dynamic sentences stand in opposition to externally static ones. Negated sentences are externally static. This means that they do not pass on antecedents for subsequent anaphora. Any discourse referents which are potentially introduced under the scope of negation are blocked. Let’s consider the ill formed discourse in (104).

\[ \text{sā lē taunu’u sē}_0 \text{ isi. } ??sā \text{ ia}_0 \text{ fiafia} \]

\[ \text{PAST NEG arrive NONSPEC one PAST 3SG happy} \]

“No one arrived. He was happy”

Conjoining the two sentences imposes the following conditions on pairs of assignments.
Where this differs from previous examples is that the assignment function which values the free occurrence of 0 in the second sentence is not assignment updated by the existential quantifier in the first sentence. There is nothing ensuring that the assignment will consistently map 0 to individuals who are happy and who did not arrive, i.e., the existential quantifier cannot dynamically bind outside its nuclear scope. This capability of existential quantifiers is blocked by negation.

I have argued that se DPs introduce existential quantification. Within a DPL system, their introduction of an existential quantifier accounts for their ability to license cross-sentential anaphora, so long as they are not embedded under externally static operators like negation. The following subsection explores how the closure operator in DPL blocks the anaphoric potential of existential quantification, shifting externally dynamic sentences to externally static sentences. I will go on to say that Samoan incorporated indefinites conventionally introduce such an operator.

6.3 The Closure Operator

Within DPL, some formulas, depending on their widest scoping operator, have the property of blocking any discourse referents raised by expressions within them from anteceding any anaphora in subsequent sentences – they do not ‘pass on’ variables. We have seen that formulas scoping under negation are a clear example. We can see this reflected in Samoan, where se DPs scoping under negation are unable to dynamically bind a pronoun in a subsequent sentence.

DPL classifies sentences which block the potential of variables to antecede subsequent anaphora as ‘tests’. They examine input assignment and determine whether they fit a certain condition. If the input meets the condition, the formula simply returns the input as the output and rejects the input otherwise. Therefore, test sentences always denote sets of pairs of assignments where the first member is identical to the second.

(106) Tests (quoted from Groenendijk and Stokhof (1991))
\[ \phi \text{ is a test iff } \forall M \forall g \forall h : \text{if } \langle g, h \rangle \in [\phi]^M, \text{ then } g = h \]

Sentences with widest scoping negation, implication, disjunction and universal quantification are tests, as well as simple atomic formulas, conjunctions of tests and contradictions.

DPL defines an operator ! which shifts dynamic sentences into tests. Any potential bindings raised by the expressions in a dynamic sentence under the scope of ! will be unable to pass on those bindings to subsequent sentences. Just like any test, a sentence !\phi gives a condition on the input, returning the input as the output if the condition is met, and rejects the input otherwise. The condition is simply whether the input can be successfully processed by \phi.

(107) Closure Operator (quoted from Groenendijk and Stokhof (1991))
\[ [!]\phi](g,h) \text{ is true iff } g = h \text{ and there is a } k \text{ s.t. } [\phi](h,k) \text{ is true} \]

The ! operator is derivable as double negation, such that !\phi is equivalent to \neg \neg \phi. We find that scoping \phi under negation blocks any anaphoric potential of \phi, and then embedding \neg \phi under a second negation does not reverse this effect. Although !\phi and \phi are non-equivalent in terms of their anaphoric potential, they are equivalent in terms of their truth conditions. They will satisfy the same set of input assignments, but generate a different set of output assignments. In DPL terms they are s-equivalent, but not (simply) equivalent.
6.4 Bare NPs in DPL

I propose that Samoan *se* DPs and bare NPs instantiate the key DPL distinction between externally dynamic sentences (allowing dynamic binding of cross-sentential anaphora) and externally static sentences (disallowing dynamic binding). We are able to embed a sentence \( \phi \) under the ! operator, blocking its anaphoric potential but not altering its truth conditions. I propose that Samoan sentences with bare NPs introduce the ! operator, such that the discourse in (108) is interpreted as (109).

(108) sā fa‘apūgotā-foamea\(_0\) Ioane\(_1\). ??‘ua ia\(_0\) ita ‘iate Ioane\(_1\)

PAST arrest-thief John. PERF he angry at John

“John thief-arrested. He became angry at John.”

(109) \([!\exists x_0 : \text{thief}(x_0) \land \text{arrest}(\text{John}_1, x_0)] \land [\text{angry}(x_0, \text{John}_1)]\)

The two sentences impose the following conditions on pairs of assignments.

(110) a. \([![\exists 0 : \text{arrest}(\text{John}_1, 0) \land \text{thief}(1)]^{(g,h)} \text{ is true iff}\)

\( h = g \) and there is a \( k \) s.t. \( k[0]h \) and \( k(1) = \text{John} \) and \( \langle k(1), k(0) \rangle \in \text{Ext(\text{arrest})} \)

and \( k(0) \in \text{Ext(\text{thief})} \)

b. \([![\text{angry-at}(0, \text{John}_1)]^{(g,h)} \text{ is true iff}\)

\( h = g \) and \( h(1) = \text{John} \) and \( \langle h(0), h(1) \rangle \in \text{Ext(\text{angry-at})} \)

The first sentence in (110) is truth conditionally equivalent to the existentially quantified version without the closure operator. With or without the operator, the sentence will denote the empty set (leading to an absurd information state) in all models where John arrested no thieves. Where the sentence differs from the version without the operator is that here it does not set the existentially quantified variable 0 to an individual who is a thief arrested by John.

The consequences of that are clear when we look at the conditions on pairs of input-output assignments imposed by the conjunction of the two sentences in our small discourse. See the appendix for the full derivation.

(111) \([![\exists 0 : \text{arrest}(\text{John}_1, 0) \land \text{thief}(1)] \land [\text{angry-at}(0, \text{John}_1)]^{(g,h)} \text{ is true iff}\)

\( h = g \) and \( h(1) = \text{John} \) and there is a \( k \) s.t. \( k[0]h \) and \( k(0) \in \text{Ext(\text{thief})} \)

and \( \langle k(1), k(0) \rangle \in \text{Ext(\text{arrest})} \) and \( \langle h(0), h(1) \rangle \in \text{Ext(\text{angry-at})} \)

As with the negated sentence in (105), the free variable in the second sentence is not interpreted relative to the assignment that is updated by the existential sentence. The existential updates an assignment \( k \) in order to test its input assignment, but after the test is complete, the update is discarded. As such, free variables in subsequent sentences are unable to be dynamically bound by the existential.

With the DPL closure operator in our semantic inventory, a simple alteration of Van Geenhoven’s semantic incorporation follows in (112). The operation does not only existentially close the first argument of the transitive verb, it also embeds the existential quantifier under the DPL closure operator, thereby restricting its anaphoric potential.
Semantic Incorporation with Anaphoric Closure

a. \([\text{catch}] = \lambda x \lambda y. \text{catch}(y, x)\)

b. \([\text{si}'(\text{catch})] = \lambda f \lambda y. !\exists x : \text{catch}(y, x) \land f(x)\)

This analysis accounts for the curious earlier case in which a bound anaphora appears within the bare NP constituent.

(113) e [su'e ma'a 'ia togi 'iai le atigipū'ū] pea le teine
    PRES search rocki SUBJUNCT throw DAT.CLi the seashell continuously the girl
    “The girl continuously searches for rocks to throw the seashell against it.”

The denotation of the bare NP does not contain any ! operator and therefore allows co-indexation of variables across conjunction. I take the denotation of the bare NP in (113) to be as follows:

(114) \([\text{ma'a 'ia togi le atigipū'ū}] = \lambda x. \exists y : \text{rock}(x) \land \text{seashell}(y) \land \text{for-throwing-against}(y, x)\)

Composing with the shifted transitive verb su'e, ‘search’, we derive the following logical form. As the 0 variable is existentially bound under the scope of the ! operator, it may not antecede cross-sentential anaphora.

(115) \(\exists 2 : \exists 1 : \text{girl}(2) \land \text{seashell}(1) \land !\exists 0 : \text{rock}(0) \land \text{for-throwing-against}(1, 0)\)

I intend the definition in (112) to build towards a formal typology of indefinites, where the ability to license cross-sentential anaphora is a delineating factor in classifying varieties of indefinites, above and beyond their quantificational and scopal properties. I do not intend the claim that narrow scope indefinites realised as bare NPs (or morphologically incorporated nouns) cross-linguistically should be interpreted as trapped under the scope of the closure operator. While this seems true in Samoan, the generalisation does not hold cross linguistically. Mithun (1984) shows that Mohawk incorporated nouns may antecede pronominal anaphora, while Massam (2001) shows that bare NPs in Niuean may antecede pronominal anaphora so long as they are adjacent to the existential predicate.

Although the semantics for Samoan se DPs and bare NPs are non-identical, the analysis retains the central insight that these two kinds of indefinites are truth-conditionally equivalent, both expressing narrow scope existential quantification. The analysis in this section captures their differing behaviour with respect to they ability to antecede cross-sentential anaphora. The following section links the failure of bare NPs to antecede cross-sentential anaphora to their failure to license a sluice. I will argue both can be formulated to stem from the hypothesis that bare NPs are interpreted as introducing a non-dynamic existential quantifier.

7 Sluicing

This section proposes an account of the paradigm below, repeated from earlier examples, which show that se DPs are valid inner antecedents for a sluice, while bare NPs are unable to serve as inner antecedents for a sluice.
The treatment I give for this paradigm follows on from the DPL treatment of dynamic binding of pronouns. I propose a condition on the elision of an interrogative clause based on semantic identity with a salient antecedent clause in the preceding linguistic context, in the spirit of Merchant (2001). The precise formulation of this semantic identity condition is spelled out with reference to the types of denotations assigned to sentences within the DPL system.

In short, an antecedent clause with a se indefinite shares with the wh-interrogative clause the potential to dynamically bind anaphora in subsequent sentences. I assert that this equivalence with respect to dynamic potential is necessary for the sluice to be licensed. An antecedent clause with a bare indefinite does not have the same dynamic potential of the wh-interrogative clause, and the sluice is not licensed. A parallel can be drawn to the analysis in AnderBois (2011), who frames the identity condition between of the antecedent clause and an elided interrogative clause in terms of their dynamic potential.

### 7.1 Some desiderata for a theory of sluicing

In this section I lay out some previous analyses of sluicing with some discussion of Samoan data, building a list of data points which any theory of sluicing should handle. By sluicing I refer to an ellipsis process where the sentential component of an embedded interrogative is left silent (Ross 1969). A sluicing construction involves an elided clause (labelled E below) and a linguistic antecedent clause (labelled A below). Within the A clause, there is typically an indefinite expression which I refer to as the inner antecedent following Chung et al. (1995).

\[
(118) \text{[Someone left]}_A \text{ but I don’t know [who left]}_E
\]

A particularly influential theory of sluicing is Merchant’s (2001), which accounts for the phenomena as a deletion at PF. The full interrogative clause is built with a complete syntactic structure including the wh-movement of the stranded wh-item. A feature on the TP constituent of the interrogative clause instructs the phonetic component of the grammar to not pronounce the constituent. The theory is advantageous as it captures the famous paradigm in (119) from Ross (1969), in which the morphological case of the wh-word must match the morphological case of its inner antecedent. This paradigm is expected as the wh-word enters the derivation case licensed in the same manner as its inner antecedent.

\[
(119) \text{a. Er will jemandem schmeicheln, aber sie wissen nicht,}
\]

\[
\text{he wants someone.DAT flatter but they know not}
\]

\[
\{ *wen/wem \}
\]

\[
\text{who.ACC/who.DAT}
\]

\[
\text{“He wants to flatter someone but they don’t know who.”}
\]
b. Er will jemandem loben, aber sie wissen nicht, \{wen/*wem\}
   he wants someone.ACC praise but they know not who.ACC/who.DAT
   “He wants to praise someone but they don’t know who.”

The Samoan examples of sluicing do not bear on this question due to the language-specific facts about *wh*-interrogative clause formation. In Samoan, the syntactic schema for a *wh*-interrogative clause is [pe + ‘o + *wh*-item + clause]. The particle pe signals the embedding of an interrogative. The *wh*-item is always preceded by the particle ‘o and never by any other kind of case marker. This includes cases where the *wh*-item is a transitive subject (and therefore ordinarily marked by the ergative marker e), a dative (ordinarily marked by ‘i) or a locative (ordinarily marked by i).

(120) a. ‘o/*e ai e inumia le vai
   TOP/ERG who PRES drink.AV the water
   ‘Who drinks the water?’

b. ‘o/*i ai e va’ai ‘iai le fafine
   TOP/DAT who PRES see DAT.CL the woman
   ‘Who does the woman see?’

c. ‘o/*i ai e galo ai le fafine
   TOP/LOC who PRES forgotten LOC.CL the woman
   ‘Who has forgotten the woman?’

The requirement that the *wh*-remnant stranded by a sluice must match the case marker of the inner antecedent is blocked by this feature of Samoan grammar.

(121) ‘ua inu e se isi ‘ae ‘ou te lē iloa pe ‘o/*e ai
   PERF drink ERG someone but 1SG PRES not know Q TOP/ERG who
   ‘Someone drank the water but I don’t know who.’

The PF deletion approach relies on the notion that the *wh*-word in the interrogative undergoes ordinary *wh*-movement binding a trace within the ellipsis site. It is therefore unexpected that sluicing seems to ignore syntactic islands. Ross (1969) and Merchant (2001) point out examples in which reconstructing a syntactic structure matching the antecedent clause within the ellipsis site leads to an island violation.

(122) a. They want to hire someone who speaks a Balkan language, but I don’t remember which one (*they want to hire someone who speaks).

b. They want to hire Mary and someone else, but I don’t know who (*they want to hire Mary and).

Also problematic for this approach is the behaviour of speaker-oriented indexicals within the ellipsis site. If we are to assume that there is a condition matching the elided clause with the antecedent clause on syntactic grounds, the following examples show a distinct tolerance for lexical mismatches between the two clauses. A semantic account which compares the two clauses semantically (though potentially before the value of the indexical is set by the context) has no such trouble.

(123) a. A: Someone ate my banana!
   B: Who (ate your banana)?
b. A: Something flew by my face at this very second!
    B: What (flew by your face at that very second)?

The PF deletion approach is often compared to the LF copying approach, pursued by Chung et al. (1995, 2011), and Chung (2006, 2013). In this approach the A clause is copied onto the ellipsis gap site. The inner antecedent is replaced by an unbound variable which is bound by the stranded \textit{wh}-item. In cases where the A clause does not contain an inner antecedent, the copying process may ‘sprout’ a variable for the \textit{wh}-item to bind. This is employed in cases where the \textit{wh}-item does not correspond to any linguistic expression within the antecedent clause.

(124) Mary danced but I don’t know why (she danced).

Yet another approach to sluicing treats the ellipsis site as a linguistic expression which is anaphoric to a salient antecedent. This approach is pursued by Jäger (2001) and Barker (2013) who claim that the ellipsis site must be anaphoric to a linguistic expression in the previous discourse. Contrast this to Ginzburg and Sag (2000) who similarly claim that the sluicing ellipsis site is anaphoric to a salient antecedent, though this antecedent may be supplied by either the linguistic or non-linguistic context. Ginzburg and Sag (2000) make a series of arguments based on data like (125) for allowing a sluicing anaphor to take extra-linguistic context as its antecedent.

(125) a. (to someone entering an elevator) What floor?
    b. What the fuck!
    c. (Milling around on first day of conference, participants ignorant of location of talks go up to harried organiser:) Hey, could you tell us which room so we can go in and wait for things to start?

These examples are problematic for a strictly linguistic definition of sluicing antecedents. However, I shy away from allowing a theory of sluicing to take non-linguistic antecedents due to its excessive power in allowing interpreters to accommodate appropriate semantics within sluicing ellipsis sites. For example, the examples in (125) sound acceptable (to me at least), though Hankamer and Sag’s (1976) famous example sounds unacceptable.

(126) (Hankamer produces a gun, points it offstage and fires, whereupon a scream is heard)
    Sag: *Jesus, I wonder who.

The question remains why the ellipsis site in (126) can’t be pragmatically reconstructed if sluicing anaphor may take its interpretation from the extra-linguistic context. More concerning for this kind of approach are the case matching facts in (119) as well as voice matching facts pointed out in Merchant (2013) and Chung (2013). By voice matching I mean a requirement that sluiced clauses must match their antecedents in terms of voice.

(127) a. The cake was eaten but I don’t know who *(ate the cake).
    b. Someone ate the cake but I don’t know by whom *(the cake was eaten).

Based on these data and the data throughout this section, Chung (2013) argues that sluicing requires some kind of hybrid approach combining some requirement matching the antecedent clause and elided clause in terms of syntactic structure and semantics. The list in (128) gives some types of data that a theory of sluicing should be able to handle based on the discussion in this section.
Some desiderata for a theory of sluicing

1. Morphological case matching between the inner antecedent (if any) and the stranded wh-item (possibly cross linguistically parametrized and suspended for Samoan).
2. Reconstructing the embedded interrogative allows island violations.
3. Allows speaker-oriented indexicals to switch reference between speakers.
4. Sprouting cases allowed: where the (adjunct category) wh-item does not correspond to an inner antecedent.
5. Voice mismatches disallowed.
6. Linguistic antecedent necessary except in pragmatically controlled cases like (125)

7.2 Conditions on matching antecedent and interrogative clauses

Central to the discussion of all theories of sluicing is how to characterise the right conditions under which a clause may serve as a possible antecedent for an elided clause later in discourse. What is it about the antecedent clause (labelled $A$) in (129) which licenses the elision of the sentential component of the elided clause (labelled $E$), and how does it differ from the would-be antecedent clause in (130).

(129) [Someone left]$_A$ but I don’t know [who left]$_E$

(130) *[Noone left]$_A$ but I don’t know [who left]$_E$

I start from the assumption that the conditions under which a clause may serve as an antecedent for sluicing are fundamentally semantic, following Ginzburg and Sag (2000), Merchant (2001), Culicover and Jackendoff (2005), AnderBois (2011) and others, based on the desiderata in the previous section: specifically the flexibility of indexicals between the $A$ and $E$ clauses, the amnesty from island constraints, the cases of tense and aspect mismatches, and variability in indexical reference. This approach of course leaves open the questions of how to pin down the case and voice matching constraints cross-linguistically\(^4\). I suggest that the data from the previous section shows that Samoan does not seem to observe the case matching constraint (due to its cleft-like wh-question forming strategy), and that data which convincingly bear on the voice matching constraint are hard to come by due to the lack of a passive in Samoan.

Following Merchant (2001), I characterise the condition on eliding an interrogative clause as a mutual entailment condition. That is, the interrogative clause and the antecedent clause must mutually entail each other in order for the interrogative clause to be realised as elided. AnderBois (2011) extends this mutual entailment condition to be mutual entailment over both truth conditional content and issues raised into the discourse context. In that spirit, I extend Merchant’s mutual entailment condition to be mutual entailment over both truth conditional content and discourse update potential (spelled out in terms of DPL).

(131) **Condition on Licensing Sluicing** (first pass)

An antecedent clause $A$ licenses the elision of the sentential constituent of an interrogative clause $E$ iff $A$ and $E$ entail each other in terms of both truth-conditional content, and in terms of satisfying the same input-output pairs of assignments given a fixed context set $G$.

---

\(^4\)See Barker (2013) for a persuasive semantic analysis of sluicing which incorporates case and voice matching requirements.
The relation defined by DPL which I use to capture this particular kind of entailment is *meaning inclusion*. If a sentence $\phi$ meaning-includes $\psi$, it simply means that the set of input-output pairs of assignments which satisfy $\phi$ also satisfy $\psi$.

\[
\text{(132) Meaning Inclusion (≥): } \phi \succeq \psi \iff \forall M : [\phi]_M \subseteq [\psi]_M
\]

A proposition $\phi$ meaning-includes a proposition $\psi$ iff all the possible input-output pairs of assignments which satisfy $\phi$ also satisfy $\psi$.

Applying (132) to (131), we arrive at a model of sluicing where an antecedent clause may trigger the elision of an interrogative clause only if the update potential of the antecedent clause is equivalent to the update potential of the interrogative clause, where update potential are defined as the set of potential input-output pairs of assignments. Construing this condition in terms of updates on a set of assignment or a matrix, updating a matrix $G$ with the antecedent clause must have the same effect as updating $G$ with the interrogative clause.

With a few assumptions in place, this definition should be enough to handle our original paradigm in (116) and (117) with one addendum. For simplicity, I will begin by treating cases where the correlate is the sole indefinite in the discourse. The original paradigm in (116) and (117) contains a second indefinite (*le tamaloa*, ‘an old man’). The following examples replace *le tamaloa* with a proper name to avoid this complexity. We will need a couple of modifications to handle the more complex examples.

\[
\text{(133)} \quad \text{[sā sasa se maile e Ioane]A ae ou te lē iioa /pe ‘o lēfe}\ 
\text{past beat nonspec dog erg John but I pres not know Q which}
\text{maile John beat/E dog}
\]

“John beat a dog but I don’t know which dog.”

Following the analysis in Section 6, our first order logic representation for the antecedent clause follows in (134a). Following much previous work (Hamblin 1973, Karttunen 1977, Haida 2008, AnderBois 2011) which represents the meanings of *wh*-items as existential quantification. The result is an identical representation of the antecedent clause and the interrogative clause. Given their identity, they clearly satisfy the first condition in (131) for a successful sluice, namely that the antecedent clause and interrogative clause must symmetrically entail one another in terms of truth conditional content.

\[
\text{(134) a. } [(133)]_A = \exists i : \text{dog}(i) \land \text{beat}(John, i)\ 
\text{b. } [(133)]_E = \exists i : \text{dog}(i) \land \text{beat}(John, i)
\]

For illustration of the equivalence between the two clauses in terms of their update potential, I assume a model $M$ with two dogs beaten by John are *Fido* and *Rex*. We also have a third dog *Benji*, not beaten by John. I also assume our initial context set of assignments $G$ consists of assignments of one variable $0$.

\[
\text{(135) } G = \begin{array}{c}
0 \quad \text{Rex} \\
0 \quad \text{Fido} \\
0 \quad \text{Benji}
\end{array}
\]
Interpreting either the $A$-clause or $E$-clause relative to this model $M$ and set of assignments $G$ yields the same set of input-output pairs. This is represented in (136). The input-output pairs validating the antecedent clause (determined by our DPL rules for existential quantification) are placed side-by-side with the input-output pairs validating the $wh$-interrogative clause. They turn out to be identical. This result is entirely expected, our characterisation of $se$ indefinites as introducing dynamic existential quantification means that the two clauses are denotationally equivalent.

(136)

<table>
<thead>
<tr>
<th>Antecedent Clause:</th>
<th>Sluiced Clause:</th>
</tr>
</thead>
<tbody>
<tr>
<td>$[[\exists i : \text{dog}(i) \land \text{beat}(\text{John}, i)]^M]$</td>
<td>$[[\exists i : \text{dog}(i) \land \text{beat}(\text{John}, i)]^M]$</td>
</tr>
<tr>
<td>$\begin{cases}</td>
<td></td>
</tr>
<tr>
<td>0 \text{ Rex}, 0 \text{ Rex}                                      &amp; 0 \text{ Rex}, 0 \text{ Fido}</td>
<td></td>
</tr>
<tr>
<td>0 \text{ Fido}, 0 \text{ Rex}                                     &amp; 0 \text{ Fido}, 0 \text{ Fido}</td>
<td></td>
</tr>
<tr>
<td>0 \text{ Benji}, 0 \text{ Rex}                                    &amp; 0 \text{ Benji}, 0 \text{ Fido}</td>
<td></td>
</tr>
<tr>
<td>\end{cases}$</td>
<td>\end{cases}$</td>
</tr>
</tbody>
</table>

The update potential of the antecedent clause matches the update potential of the sluiced clause, satisfying identical sets of input-output pairs of assignments if evaluated with respect to the same model.

Given that the two clauses symmetrically entail one another in terms of both truth conditional content and update potential, they satisfy the condition for a successful sluice in (131) and ellipsis is licensed. Under these assumptions, the failure of the bare NP to license a sluice (as in 137) is similarly easy to see.

(137) $\#[s\tilde{a} \text{ sasa-maile Ioane}]_A \text{ 'ae 'ou te lē iloa } [pe 'o lēfe'a maile } \text{ John } \text{ beat}]_E$

“John dog-beat but I don’t know which dog.”

Under the analysis in Section 6, the representation for the antecedent clause follows in (138a) with the inclusion of a closure operator making the existential quantifier introduced by the bare indefinite non-dynamic. No such operator is introduced by the $wh$-word, which I take to be represented by a dynamic existential. The interpretations of both the antecedent and interrogative clauses follow below.

(138) a. $[[137)_A] = !\exists i : \text{dog}(i) \land \text{beat}(\text{John}, i)$

b. $[[137)_E] = \exists i : \text{dog}(i) \land \text{beat}(\text{John}, i)$

It is clear that the two clauses symmetrically entail one another in terms of their truth conditional content. However, appealing to the same model as earlier where the two dogs beaten by John are $\text{Fido}$ and $\text{Rex}$, the differing update potential of the antecedent and interrogative clauses is clear. The antecedent clause is treated like an atomic update, forcing the output assignments to match their input. In our current model, neither sentence entails the other in terms of its update potential. They are satisfied by a distinct set of input-output pairs. By the rule in (131), the sluice is predicted to be unsuccessful.
With certain assumptions in place, it is possible to link the inability of bare NPs to license cross-sentential pronominal anaphora to their inability to serve as the inner antecedent to a sluice. In this section I outlined a system which posits that the two failures to license these discourse phenomena stem from one semantic property – their embedding under a closure operator resulting in their interpretation as non-dynamic.

To handle our original example, we must make sure the system handles complex examples. For example, we want the system to handle examples with multiple indefinites. Recall that our original example contained a wide scope indefinite le tamaloa.

The obvious question is what to reconstruct within the ellipsis site, that is, what do we take to have been deleted under semantic identity with the antecedent clause? If we take the logical form of the antecedent clause (a (particular) old man beat a dog) to be as in (141), a distinct problem arises in the interpretation of the elided clause.

Under our semantic identity condition, the logical forms of the elided clause must also be interpreted as in (141). If this is the case, we are forced into the position where we reconstruct a fresh existential quantifier into the ellipsis site. In doing so, we have no way of ensuring that the new existential quantifier in the elided clause does not introduce a new discourse referent, thus giving us the wrong interpretation (a0 (particular) old man beat a dog but I don’t know which dog).

We could instead presume that the clause reconstructed in the ellipsis site includes a variable bound by the wide scope indefinite le tamaloa. The logical form of the antecedent clause is still interpreted as in (141), but the elided clause is instead interpreted as (142).

This approach seems like the truth conditions of the full reconstructed discourse are correct (a (particular) old man beat a dog, but I don’t know which dog he beat). But of course this analysis causes the antecedent clause and interrogative clause in (140) to be non-identical: the descriptive
content of the DP *le tamaloa* is missing from the elided clause, and the elided clause has a free variable in the place of an existentially bound variable in the antecedent clause. This falsely predicts the sluice to be invalid.

I resolve this problem by firstly assuming the following logical form for the discourse in (140). The indefinite *le tamaloa* scopes wide enough to bind variables in both the antecedent clause and the elided clause. I posit that wide scope indefinites like *le* DPs scope at the text level, taking scope over multiple sentences, much like Heim’s (1982) analysis of unembedded indefinites. Note the LF in (143) abstracts away from analysing *but I don’t know* and treats it like a simple connective.

\[
\exists 0 : \text{old.man}(0) \land [\exists 1 : \text{dog}(1) \land \text{beat}(0,1)] \land \text{but.I.don’t.know} \land [\exists 1 : \text{dog}(1) \land \text{beat}(0,1)]
\]

We can therefore take the matching requirement to hold between the bracketed clauses in (143). Next, we need to introduce an additional condition on the matching requirement between \(A\) and \(E\) clauses, to handle the comparison of sentences with free variables.

(144) **Condition on Licensing Sluicing** (second pass)

In a discourse context \(G\), an antecedent clause \(A\) licenses the elision of an interrogative clause \(E\) iff \(\text{ec}(A)\) and \(\text{ec}(E)\) validate the same input-output pairs of assignments relative to \(G\), where \(\text{ec}(A)\) and \(\text{ec}(E)\) are identical to \(A\) and \(E\) but for the fact that all free variables in \(A\) and \(E\) are existentially bound.

The existential closure of both the antecedent and the interrogative clause in (140) is as follows.

(145) \(\exists 0 : \exists 1 : \text{old.man}(0) \land \text{dog}(1) \land \text{beat}(0,1)\)

Existentially binding all free variables in the bracketed sentences in the logical form (143) results in the matching condition being satisfied and the sluice being licensed.

### 7.3 Mismatches in descriptive content

Some recent papers tackling sluicing phenomena (Dayal and Schwarzschild 2010; Barker 2013; Barros 2013) have highlighted the varying acceptability of sluicing constructions in which the inner antecedent and the *wh*-expression stranded by the elided clause (the remnant) are mismatched in terms of descriptive content. A particular case of this (rather complex) empirical puzzle is exemplified in (146a), where animate inner antecedents are able to contain descriptive content and antecede a *wh*-remnant which lacks descriptive content. (146b) demonstrates that the reverse is not true.

\[
\text{(146) a. Some woman just arrived, but I don’t know who.}
\]

\[
\text{b. *Someone just arrived, but I don’t know which woman.}
\]

We find that a translation of (146a) into Samoan is also grammatical.

\[
\text{‘ua taunu’u se}_0 \text{ fafine}_A \ ‘ae ‘ou te lē iioa [pe ‘o ai}_0 \ \text{perf.arrive \ nonspec \ woman \ but \ I \ pres \ not \ know \ Q \ who} \]
\]

“Some woman just arrived, but I don’t know who.”

This seems like a problem for the account of sluicing so far. The \(A\) clause and the \(E\) clause in (147) are not denotationally equivalent, due to the presence of descriptive content in the *se* phrase within the \(A\) clause, but no descriptive content in the \(E\) clause. At first glance, we interpret the \(A\) and \(E\) clause in (147) as in (148).

(147) \[‘ua taunu’u se}_0 \text{ fafine}_A \ ‘ae ‘ou te lē iioa [pe ‘o ai}_0 \ \text{perf.arrive \ nonspec \ woman \ but \ I \ pres \ not \ know \ Q \ who} \]

This seems like a problem for the account of sluicing so far. The \(A\) clause and the \(E\) clause in (147) are not denotationally equivalent, due to the presence of descriptive content in the *se* phrase within the \(A\) clause, but no descriptive content in the \(E\) clause. At first glance, we interpret the \(A\) and \(E\) clause in (147) as in (148).
Let’s take a model $M$ where the woman are Dasha and Lelia, and the only man is Phil, and the arrivers are Dasha and Phil. The assignments in $G$ map the variable 0 to any of Dasha, Lelia, and Phil. Clearly the two sentences are not denotationally equivalent, evidenced by their distinct updates when interpreted relative to this model. The interrogative clause (lacking descriptive content) maps $x$ to individuals who are both men and women, so long as they arrive.

This result tells us that the sluice in (147) should fail – the antecedent and interrogative clauses are not denotationally equivalent. I suggest this issue can be resolved by appealing to a theory of quantifier domain restriction, for example the theory of Westerstahl (1985).

We take quantificational determiners and pro-forms to introduce in their denotation a free variable, which I label $F$. The value of $F$ is determined in context and is set to a property type with a non-empty intersection with the model $M$. In calculating the meaning of a quantified sentence, we intersect $F$ with the property serving as the first argument of the quantifier. This process allows us to interpret a sentence like every girl left to only take the set of contextually relevant girls as the domain of quantification (rather than every girl in the model).

The wh-word in (147) is a quantificational pro form. As such we expect it to introduce a free variable property $F$. As the wh-word does not take an NP complement in the syntax, we can still take its first argument to be restricted by the free variable $F$.

In deriving the semantics of this question, we can employ the quantifier domain restriction by intersecting the immediate scope of the wh-word with a contextually set property $F$. In the right context the question-asker can be interpreted to be quantifying over only the contextually relevant set of people.
It is no longer difficult then to suggest that the problematic sentence in (147) can be interpreted by contextually setting the free variable $F$ to the set of *women*, as the property of being a woman has been made salient by the immediately preceding sentence. The interrogative clause in (147) is therefore interpreted as in (152), where $F$ takes the value of $[\text{woman}]$.

This valuation of $F$ is a pragmatic inference triggered by the use of a *wh*-expression. The free variable $F$ crucially does not get dynamically bound by any quantifier in the previous discourse. In this respect it is distinct from the free variables introduced by pronouns dealt with in the discussion of wide-scoping indefinites in the previous subsection. We therefore do not expect $F$ to be existentially closed when evaluating the matching condition between the sluiced clause and antecedent clause. Rather, we expect $F$ to be contextually determined before the matching condition is tested. The result is that the antecedent and interrogative clauses in (147) now match in terms of their denotational content and we correctly predict the sluice to be valid.

Research within sluicing converges on the idea that some kind of semantic equivalence between the antecedent clause and interrogative is a necessary (though probably not sufficient) condition for a sluice to be successful. Recent proposals have varied as to what kind of semantic equivalence is tested. AnderBois (2011) proposes equivalence of both truth conditional content and issues raised into the discourse context. The present approach is influenced somewhat by AnderBois as the equivalence is spelled out in terms of potential to update the discourse context. The formalisation described in this section attempts to link this sluicing condition to the anaphoric potential of indefinites, in particular their ability to antecede cross-sentential pronominal anaphora.

8 Conclusion

This paper has investigated the differing discourse properties of two kinds of narrow scope indefinites in Samoan. In particular I highlighted the inability of Samoan bare NPs to license cross-sentential pronominal anaphora and to serve as the inner antecedent to a sluiced clause.

I suggest a way of capturing these two anaphoric properties under a single system: by proposing that both these properties follow from the assumption that bare NPs in Samoan introduce a non-dynamic existential quantifier. This is formalised within Dynamic Predicate Logic and its closure operator which has the capability of blocking the anaphoric potential of dynamic sentences. The compositional semantics is set up in such a way that the existential quantifier introduced by the
indefinite is permanently blocked by this closure operator. The operator has the additional property of leaving the truth conditional content of the sentence unaltered, accounting for the truth conditional equivalence of the two varieties of Samoan indefinites.

I intend this research to build towards a finer-grained comparative typology of indefinites cross-linguistically. Towards this I formalise a particular property by which indefinites often differ cross-linguistically, namely their potential to enter into anaphoric relations.

References


Appendix

8.1 Assumptions within DPL

The formal system assumes:

1. A model \( M = \langle D, Ext \rangle \), where \( D \) is a domain of individuals, and \( Ext \) is an interpretation function assigning subsets of \( D^n \) to \( n \)-ary relations, and members of \( D \) to individual constants.

2. Variables over individuals: 0, 1, 2, ...

3. A lexicon of non-logical constants:
   - Individual constants: Ioane, Susana, ...
   - Properties: thief, chief, ...
   - 2-place relations: arrest, angry-at, ...

4. The interpretation function \( J_{\phi}^{g,h} \), which maps a sentence to true iff the assignment \( g \) is a possible input and \( h \) is a possible output for the formula \( \phi \) (by the conditions stipulated in the next item), i.e. \( \phi \) denotes a set of pairs of assignments or a relation between two assignments.

5. Externally static formulas:
   a. \( [Rt_1, \ldots, t_n]^{g,h} = \) true iff \( g = h \) and \( \langle g(1) \ldots g(n) \rangle \in Ext(R) \)
   b. \( [t_1 = t_2]^{g,h} = \) true iff \( g = h \) and \( g(1) = g(2) \)
   c. \( [\neg \phi]^{g,h} = \) true iff \( g = h \) and \( \phi^{g,h} \neq \) true
   d. \( [\phi \lor \psi]^{g,h} = \) true iff \( g = h \) and there is a \( k \) s.t. \( \phi^{g,k} \) is true or \( \psi^{g,k} \) is true
   e. \( [\phi \rightarrow \psi]^{g,h} = \) true iff \( g = h \) and for all \( k \), if \( \phi^{g,k} \) is true, then there is a \( j \) such that \( \phi^{k,j} \) is true
   f. \( [\forall x \phi]^{g,h} = \) true iff \( g = h \) and for all \( k \), if \( k[x]h \) then there is a \( j \) s.t. \( \phi^{k,j} \) is true

6. Externally dynamic conjunction
   \( [\phi \land \psi]^{g,h} = \) true iff there is a \( k \) s.t. \( \phi^{g,k} \) is true and \( \psi^{k,h} \) is true

7. Externally dynamic existential
   \( [\exists x \phi]^{g,h} = \) true iff there is a \( k \) s.t. \( k[x]g \) and \( \phi^{k,h} \) is true

8. Closure operator (externally dynamic \( \rightarrow \) externally static)
   \( [\top \phi]^{g,h} = \) true iff \( g = h \) and there is a \( k \) s.t. \( \phi^{g,k} \) is true.
8.2 Full Derivations

1. \([\text{arrive}(\text{John}_0) \land \text{happy}(0)]^{(g,h)}\) is true iff
   there is a \(k\) : \([\text{arrive}(\text{John}_0)]^{(g,k)}\) is true and \([\text{happy}(0)]^{(k,h)}\) is true, =
   there is a \(k\) : \(g = k\) and \(g(0) = \text{John}\) and \(g(0) \in \text{Ext(arrive)}\) is true and \(k = h\) and
   \(k(0) \in \text{Ext(happy)}\), =
   \(g = h\) and \(g(0) = \text{John}\) and \(g(0) \in \text{Ext(arrive)}\) and \(g(0) \in \text{Ext(happy)}\)

2. \([\exists 0 : \text{arrest}(\text{John}_1, 0) \land \text{thief}(1)] \land [\text{angry-at}(0, \text{John}_1)]^{(g,h)}\) is true iff
   there is a \(k\) : \([\exists 0 : \text{arrest}(\text{John}_1, 0)]^{(g,k)}\) is true and \([\text{angry-at}(0, \text{John}_1)]^{(k,h)}\) is true, =
   there is a \(k\) : \([\exists 0 : \text{arrest}(\text{John}_1, 0)]^{(g,k)}\) is true and \(h = k\) and \(k(1) = \text{John}\) and \(\langle k(0), k(1) \rangle \in \text{Ext(angry-at)}\), =
   \([\exists 0 : \text{arrest}(\text{John}_1, 0)]^{(g,h)}\) is true and \(h(1) = \text{John}\) and \(\langle h(0), h(1) \rangle \in \text{Ext(angry-at)}\), =
   \(h[0]g\) and \(h(1) = \text{John}\) and \(h(0) \in \text{Ext(thief)}\) and \(\langle h(1), h(0) \rangle \in \text{Ext(arrest)}\)
   and \(\langle h(0), h(1) \rangle \in \text{Ext(angry-at)}\)

3. \([\neg \exists 0 : \text{arrive}(0)] \land [\text{happy}(0)]^{(g,h)}\) is true iff
   there is a \(k\) s.t. \([\neg \exists 0 : \text{arrive}(0)]^{(g,k)}\) is true and \([\text{happy}(0)]^{(k,h)}\) is true, =
   there is a \(k\) s.t. \([\neg \exists 0 : \text{arrive}(0)]^{(g,k)}\) is true and \(k = h\) and \(h(0) \in \text{Ext(happy)}\)
   \([\neg \exists 0 : \text{arrive}(0)]^{(g,h)}\) is true and \(h(0) \in \text{Ext(happy)}\)
   \(h = g\) and there is no \(k\) s.t. \([\exists 0 : \text{arrive}(0)]^{(g,k)}\) is true and \(h(0) \in \text{Ext(happy)}\)
   \(h = g\) and there is no \(k\) s.t. \(k[0]g\) and \(k(0) \in \text{Ext(arrive)}\) and \(h(0) \in \text{Ext(happy)}\)

4. \([\exists! 0 : \text{arrest}(\text{John}_1, 0) \land \text{thief}(1)] \land [\text{angry-at}(0, \text{John}_1)]^{(g,h)}\) is true iff
   there is a \(k\) : \([\exists! 0 : \text{arrest}(\text{John}_1, 0)]^{(g,k)}\) is true and \([\text{angry-at}(0, \text{John}_1)]^{(k,h)}\) is true, =
   there is a \(k\) : \([\exists! 0 : \text{arrest}(\text{John}_1, 0)]^{(g,k)}\) is true and \(h = k\) and \(k(1) = \text{John}\) and \(\langle k(0), k(1) \rangle \in \text{Ext(angry-at)}\), =
   \([\exists! 0 : \text{arrest}(\text{John}_1, 0)]^{(g,h)}\) is true and \(h(1) = \text{John}\) and \(\langle h(0), h(1) \rangle \in \text{Ext(angry-at)}\), =
   \(h = g\) and \(h(1) = \text{John}\) and there is a \(k\) s.t. \(k[0]h\) and \(k(0) \in \text{Ext(thief)}\) and \(\langle k(1), k(0) \rangle \in \text{Ext(arrest)}\)
   and \(\langle h(0), h(1) \rangle \in \text{Ext(angry-at)}\)