Semantic variation and the grammar of property concepts*

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Abstract

This paper discusses the effects of semantic variation in the meaning of property concept (PC) terms (Dixon 1982) on the grammar of predicative and comparative constructions. We demonstrate that, in a range of unrelated and less well-studied languages in which PC terms are not adjectival, such constructions systematically surface with possessive morphology/syntax. This pattern, which we refer to as "possessive strategies of predication", is argued to reflect a semantics of "property possession", which is necessitated by the lexical semantics of the participating PC terms. A semantic theory for possessive strategies is developed, and a compositional analysis of the relevant constructions is presented for an example language (Ulwa, an endangered Misumalpan language of Nicaragua). This theory is then used to address an outstanding issue in the study of PC constructions, namely, the nature of the derivational relationships between the components of predicative and comparative constructions: the PC term, the positive form, and the comparative form. It is argued that the range of possible overt morphosyntactic derivational relations can and should be viewed as directly reflecting semantic composition, the possible directions of which in turn depend completely on lexicalization facts.

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1 Introduction

Dixon (1982) famously identified seven classes of *property concepts* (PCs), concepts consistently lexicalized across languages as adjectives in languages with this lexical category. English examples from each of Dixon's classes are given in (1).

(1) Dixon's seven classes of PCs

dimension	big, small, long, tall, short, wide, deep, etc.
age	new, young, old, etc.
value	good, bad, lovely, atrocious, perfect, proper, etc.
color	black, white, red, etc.
physical	hard, soft, heavy, wet, rough, strong, hot, sour, etc.
speed	fast, quick, slow, etc.
human propensity	jealous, happy, kind, clever, generous, cruel, proud, etc.

Lexemes encoding PCs (henceforth *PC lexemes*), such as adjectives in English, are the basis for constructions such as (2a) and (2b) (henceforth *PC constructions*), which can be said informally to express *predication* and *comparison* respectively.

(2) **PC constructions**

a. **Predication**: Hilary is tall.

b. **Comparison**: Hilary is taller than you.

The syntax and semantics of PC constructions have been well-studied in the formal literature (Kamp 1975; Cresswell 1977; Klein 1980; von Stechow 1984; Heim 1985; Bierwisch 1989; Kennedy 1999; Moltmann 2009; Husband 2010 *inter alia*). However, most of these studies are restricted to either a single language, or a few closely related and highly familiar ones (such as English and German), and few attempts have been made to understand systematic patterns of morphosyntactic variation in PC constructions in theoretical terms.[1] This paper argues that several crosslinguistic generalizations about the form of PC constructions can be explained in terms of semantic variation. In particular, the relevant generalizations follow from differences in the lexical semantics of the components of PC constructions, especially of PC lexemes, and the way they enter compositional semantics. Descriptively, the paper introduces and establishes a phenomenon which we refer to as *possessive strategies of predication*, and which serves as the paper's empirical core. This is a phenomenon found in different guises in a variety of unrelated languages, in which predicative PC constructions involve morphosyntactic material that is otherwise used to express possession. This is illustrated using data from Hausa (Chadic) in (3). Hausa has a large set of nouns, called "abstract nouns of sensory quality" in the literature (Parsons 1955), which express PCs. Predicative PC constructions with such nouns, (3a), are form identical to possessive sentences as shown by (3b).

(3) a. *Munà dà ƙarfi̱.*
we.CONT with strength
'We are strong.' (Newman 2000:224)

[1] Recent exceptions include work by Sigrid Beck and colleagues (Beck et al. 2004, 2010) and work by Chris Kennedy (Kennedy 2007a). These works are important precedents for the kind of study presented in this paper. However, our focus here is significantly different from theirs, in that they focus on variation in comparative constructions only, whereas we are concerned with the derivational relationship between PC constructions and the semantic consequences of it.

b. *Yārinyà tanà dà zōbè.*
girl she.CONT with ring
'The girl has a ring.' (Newman 2000:222)

Possessive strategies arise only in some languages. Furthermore, within a single language, they sometimes arise only with a subset of PC lexemes. For example, in Hausa, PCs expressed as nouns trigger the possessive strategy (3a), whereas PCs expressed as adjectives never do (4a), and predicate instead like regular predicate nominals (4b).

(4) a. *Audù dōgō nè.*
Audu tall COP
'Audu is tall.' (Jaggar 2001:457)
b. *Audù dàřaktà nē.*
Audu director COP
'Audu is/was the director.' (Jaggar 2001:457)

Thus, whether or not a PC lexeme predicates with a possessive strategy or not is a matter of intra- and interlinguistic variation. This raises the question whether the use of possession to express predication is regulated by some systematic principle. This paper argues that it is, and that what determines the presence and absence of possessive strategies is variation in the meaning of PC lexemes. We propose the simple, compositionally attractive, hypothesis that possessive strategies reflect possessive semantics, and more specifically a semantics of *property possession*. Possessive morphosyntax surfaces in predicative PC constructions only with PC lexemes that denote properties (in a precise sense to be defined). The first theoretical goal of this paper is to present a semantic theory of properties and property possession, as well as a compositional analysis of PC constructions in a language in which canonical PC constructions feature possessive strategies.

The second, more ambitious, theoretical goal is to suggest a preliminary restrictive hypothesis about the relation between the semantic components of PC constructions and the typology of morphosyntactic derivational relations between them. Throughout the literature, an analytic distinction is drawn, whether explicitly or implicitly, between three components of PC constructions: the PC lexeme itself, the *positive form*, and the *comparative form*. We illustrate the distinction with the bold-faced expressions in (5).

(5) a. **tall** PC lexeme
b. Felicia is **tall**. positive form
c. Felicia is **taller** than Felix. comparative form

Any fully adequate analysis of PC constructions must assign meanings to all three components. What exactly these meaning are, and how they relate to one another, is an open debate in the formal semantic literature on PC constructions, discussed in detail in §4. In most if not all analyses, some meanings are compositionally derived from others. For example, the meaning of the comparative form, henceforth COMP, might be derived from that of the positive form (henceforth POS), and some analyses posit a semantic derivational relation between the meaning of the PC lexeme (henceforth PC) and POS. A central aim of this paper is to show that theorizing about what the meanings of the various components are and how they are related can and should be constrained by typological considerations. The typological literature, particularly Ultan (1972), shows that languages differ in the way in which PC lexemes are morphosyntactically related to the positive and comparative forms. For example, in languages like English, the positive form is, at least superficially, simply the PC adjective, and the comparative expression

is derived from it. Given that meaning and form are generally very tightly linked, typological generalizations regarding the range of attested morphosnyntactic derivational relations between these components should be at least consistent with, if not derivable from, the range of possible semantic relations between them. Thus, a form which is consistently morphologically simple across a variety of unrelated languages should not be hypothesized to have a meaning that is semantically derived. This paper presents a preliminary theory about the typology of derivational relations between the components of PC constructions. As far as we are aware, ours is the first attempt at stating such a theory explicitly in the literature, and certainly the first that takes possessive strategies into consideration. According to this theory, the range of possible derivational relations is determined entirely by the lexical meaning of PC lexemes, and the morphosyntactic inventories of particular languages.

The structure of the rest of the paper is as follows. We begin in the next section by laying out the empirical landscape, exemplifying both the generality of possessive strategies of predication crosslinguistically and some of the morphosyntactic diversity with which they can be implemented. §3 discusses the hypothesis that possessive strategies encode property possession, presenting a semantic theory of properties and property possession and then exemplifying this proposed semantics in a compositional analysis of PC constructions in Ulwa (Misumalpan; Nicaragua), which has a particularly intriguing and typologically marked possessive strategy. §4 presents our theory of the typology of derivational relations between the components of PC constructions. In §5, we offer some concluding remarks.

2 Possessive strategies of predication

This section introduces possessive strategies of predication and demonstrates that they are attested across a range of unrelated languages. Possessive strategies can take a variety of morphosyntactic forms, depending on the devices for the expression of possession available in specific languages. The examples given here are far from exhaustive, but suffice for illustration of the generality of the phenomenon.

As mentioned in the introduction, the descriptive literature on Hausa (Newman 2000; Jaggar 2001) recognizes a large class of PC words lexicalized as nouns. These are traditionally called in the literature, following Parsons (1955), "abstract nouns of sensory quality", or ANSQs (Newman 2000:Chapter 2; Jaggar 2001:103), and number about sixty PC words, some of which are listed in (6).

(6) Some ANSQs in Hausa (Newman 2000:13; Jaggar 2001:103ff.)
dā̀dì̄'pleasantness, niceness'; *nauyī̀*'heaviness'; *tsāmī̀*'sourness, acidity'; *wārī̀*'stench'; *zā̀kī̀*'sweetness'; *zurfī̀*'depth; *dā̀cī̀*'bitterness'; *dā̀rī̀*'cold'; *danshī̀*'dampness, moistness'; *fā̀dì̄*'breadth, width'; *gautsī̀*'brittleness'; *kaifī̀*'sharpness'; *ƙarfī̀*'strength'; *lāmī̀* 'tastelessness'; *laushī̀*'softness'; *nauyī̀*'heaviness' ...

As shown in (4) and (3) above, regular nominal predication and PC predication with ANSQs do not pattern together. The former is expressed as a copular construction, whereas the latter is expressed as a possessive construction, as already observed by Newman: "HAVE sentences with complements consisting of abstract nouns indicate predicative qualities" (Newman 2000:224).

The data in (7) exemplify a similar pattern found in Huitoto, a Huitotoan language of Colombia. While Huitoto, according to Minor et al. (1982), has a class of adjectival PC words (Minor et al. 1982:42), it also has a class of PC nouns. While the former predicate directly (7a), the latter require the suffix *–re* (7b), which is also the suffix that expresses possessive 'have' in

the language, as shown in (7c).

(7) Huitoto (Huitotoan; Colombia)

a. *jofo áillue*
house big
'The house is big.' (Minor et al. 1982:42)

b. *Rozilli naimé-re-de.*
pineapple sweet-HAVE-3SING
'The pineapple is sweet.' (Minor et al. 1982:49)

c. *jofó-***re**-*di-cai*
house-HAVE-NONFUT-1PL
'We have a house.' (Minor et al. 1982:101 in Stassen 2009:183)

As far as we have been able to tell, in Huitoto, as in Hausa, no possessive strategies are used in predication that does not involve PC lexemes. (8) exemplifies regular nominal predication in Huitoto, which is expressed by simple juxtaposition of subject and predicate.

(8) *Cue moo cai illaima.*
1SING.PRONOUN father 1PL.PRONOUN captain
'My father is our captain.' (Minor et al. 1982:62) (Glossed with aid of Minor and Minor 1987)

The data from Huitoto and Hausa are in fact very similar to the familiar patterns from Germanic and Romance, exemplified by the Spanish data below. The data in (9) show that there is a class of PC words, exemplified by *alto* 'tall' in (9a), that in PC predication pattern identically to nominal predication (9b), both requiring the copula.

(9) a. *Kim es alto.*
Kim is tall
'Kim is tall'

b. *Kim es un professor.*
Kim is a professor
'Kim is a professor.'

By contrast, there is a small class of PC words, exemplified by *sueño* 'tiredness' in (10a), that make use of a possessive construction, of the kind found in nominal possessive predication (10b), to express predication.

(10) a. *Kim tiene sueño.*
Kim has tiredness
'Kim is tired.'

b. *Kim tiene un carro.*
Kim has a car
'Kim has a car.'

In Spanish, and Germanic and Romance more generally, only few PC words behave in this way. These tend to be nouns describing experiences such as hunger or fear, i.e. concepts belonging to what Dixon (1982) called the *human propensity* class. In the languages we are interested in here, the use of possession to express PC predication is more extensive. Nevertheless, the basic pattern and generalization is the same—there is a class of PC words in these languages which require possessive morphosyntax in order to be attributed to an entity, i.e., that make use of the

possessive strategy of predication.

A somewhat more exotic pattern is found in Bisa, a Mande language spoken in northern Ghana and southern Burkhina Faso. In Bisa, as in many other languages, possession is expressed by the existential construction, exemplified in (11).

(11) *Wusu ta-w.*
God exist-in
'God exists.' (Naden 1982:212)

In Bisa, a possessive sentence is an existential in which the NP argument of the existential predicate is a possessive NP. Nominal possession is expressed by juxtaposition of possessor and possessed, as shown in (12). The way in which nominal possession and the existential come together to express possession is illustrated by the data in (13), which might be literally translated into English as 'My wife exists'.

(12) **Mɔɔ lu** *bor naa-w*
I wife came this-at
'My wife came here.' (Naden 1982:212)

(13) **Mɔɔ lu** *ta-w.*
I wife exist-in
'I have a wife.' (Naden 1982:212)

As shown in (14), PC predication, at least with some PC lexemes, is expressed as a possessive construction in which the PC noun is possessed.

(14) a. **A** **gwili** *ta-w.*
3SING weight exists-in.
'It is heavy.' (Naden 1982:212)

b. **A** **gweli** *ta-w.*
3SING beauty exists-in
'She is pretty. (Naden 1982:213)

In Bisa, as in Hausa, Huitoto, Romance and Germanic, regular nominal predication not involving PCs is not expressed using a possessive strategy, but by a copular construction, as shown in (15).

(15) *Tiikya awo n.*
teacher he cop
He is a teacher. (Naden 1982:213)

This shows that it is not the case that in the relevant languages, possessive marking is the general strategy for expressing predication. Rather, it is only PC predication that is so expressed.

The data considered so far show that in several unrelated languages, PC predication with at least some PC lexemes is expressed using whatever means the language uses to express what Stassen (2009) calls "predicative possession", i.e. the structure used to express 'have' sentences. We next turn to Ulwa (Misumalpan; Nicaragua), which shows an interestingly different possessive strategy of predication, built not on predicative possession but instead on nominal possession. The crucial properties of Ulwa are that:

(i) PCs are encoded by morphologically bound pre-categorial roots.

(ii) The words that translate English adjectives are nouns, derived from such roots by affixing the morpheme *–ka*.

(iii) The same morpheme marks the possessed noun in a possessive noun phrase.

The feature in (i) is a robust fact of Ulwa grammar, made clear from the discussions and data in Green (1999), Hale and Salamanca (2002), and Koontz-Garboden (2007:Chapter 6, 2009c). The features in (ii) and (iii) are discussed in Koontz-Garboden and Francez (2010) and illustrated in turn. In Ulwa possessive NPs, possession is marked on the possessed noun. The possessive marker agrees with the possessor, according to the paradigm in (16), illustrated in (17).

(16) Nominal possessive paradigm (Green 1999:78)

1SING	*–ki*	1PL.EXCL	*–ki-na*
2SING	*–ma*	2PL	*–ma-na*
3SING	*–ka*	3PL	*–ka-na*
		1PL.INCL	*–ni*

(17) a. *Yang pan-ki*
1SING stick-1SING
'My stick'

b. *Man pan-ma*
2SING stick-2SING
'Your stick'

c. *Alas pan-ka*
3SING stick-3SING
'His/her stick'
etc.

The third person possessive suffix, *–ka*, illustrated in (17c), also occurs on PC words in predicative (and adnominal) position, as illustrated in (18).

(18) *Yang as-ki-na minisih*-**ka**.
1SING shirt-1SING dirty-KA
'My shirt is dirty.' (Green 2004:asna)

Koontz-Garboden and Francez (2010) argue, based on Misumalpan diachrony, that the morpheme *–ka* which appears on PC words is the same morpheme as that which appears in possessive NPs, rather than an accidental homophone. In brief, the observation is that in the history of Misumalpan, when the third singular possessive suffix underwent a shift in its phonological shape, the PC suffix also underwent precisely the same shift, showing that, at least at the time of the shift, the two suffixes were actually one and the same. Thus, Ulwa PC predication involves a possessive strategy of predication built on nominal possession. Ulwa predicative possession is formed with the non-verbal predicate *watah*, illustrated in (19).[2]

(19) *Muih luih ya pâpangh watah ka.*
person all the father have SENT-KA
'Everyone has a father.' (Green 2004:pâpangh)

To summarize, possessive strategies occur in a variety of unrelated languages, and take a

[2]The "sentential ka" illustrated in (19) is, best we can tell, a direct evidence evidential. It is unrelated to the nominal possessive *–ka* under discussion here. See Koontz-Garboden (2009b) for details.

variety of morphosyntactic shapes. They can be constructed with both nominal and sentential possession. In the latter case, they can involve existential constructions as well as transitive "have"-type predicates (see Francez and Koontz-Garboden 2010 for a fuller discussion). It also appears to be the case that in all of the languages discussed, other than Ulwa, the relevant PC lexemes are nouns; in Ulwa, they are roots. In fact, we know of no language in which a possessive strategy is used with a lexeme belonging to a major lexical category other than nouns. This would seem to lead to the generalization that possessive strategies are found with all and only PC nouns, at least if we concern ourselves only with the major lexical categories (ignoring Ulwa's categoryless roots). Such a generalization opens up an interesting set of questions about the nature of lexical categories. While this is an interesting issue, exploring it further here would take as too far afield. In the next section we explore a semantic motivation for the existence of possessive strategies.

3 Possessive strategies and property possession

The hypothesis explored here (building on Koontz-Garboden and Francez 2010 and Francez and Koontz-Garboden 2010) is that possessive strategies are semantically motivated. In particular, they are motivated by the denotation of the PC lexemes that participate in them. We suggest that possessive strategies encode possessive semantics, and specifically a semantics of *property possession*. What is meant by "properties" is made precise below. Intuitively, properties are abstract mass substances, and property denoting expressions denote the set of all "portions" of the relevant substance. Therefore, the content of PC predication cannot be expressed by directly predicating a property denoting term of an individual. For example, suppose for the sake of illustration that the PC encoded by the English adjective *strong* were instead encoded only by the noun *strength*, and suppose this noun denotes a property in our sense, i.e. a mass substance called "strength". Just like the mass noun *water* denotes the set of all portions of water, so *strength* denotes the set of all portions of strength. Consequently, directly predicating *strength* of an individual a would yield the content that a is a portion of strength, which is not the intended content of a predicative PC construction with this PC (cf. *Felicia is strong*). Thus, in order to express this content with a property-denoting lexeme, some other means must be found. Our suggestion is that a semantics of property possession, and consequently possessive morphosyntax, is that means.

In philosophical jargon, predication is standardly talked about in terms of property possession. Thus, we talk of things *having* properties, and take sentences such as those in (20) to be roughly equivalent.

(20) a. Krishna is wise $\approx$
b. Krishna has wisdom

The job of a theory of possessive strategies is to provide a model-theoretic account of properties and property possession that can be used in assigning a compositional semantics to predicative and comparative PC constructions. Such a semantics must capture the crosslinguistically invariable aspects of the semantics of PC constructions, in particular the well known context dependence of predicative PC sentences.

3.1 Properties as mass substances

How to model properties is a theoretical question. Various theories of properties have been developed in the logico-philosophical as well as the linguistic literature, with various purposes in mind (see for example Cocchiarella 1972; Chierchia 1985; Bealer and Mönnich 1989; Chierchia and Turner 1988; Fox 2000). A common feature of these theories is that properties are viewed as simple individuals. Koontz-Garboden and Francez (2010) use one such theory, that of Chierchia and Turner (1988), to analyze Ulwa predicative PC constructions. However, below we argue that modeling properties as simple individuals becomes problematic when gradability and comparison is taken into account, since simple individuals are not gradable. We therefore propose instead to model properties as mass substances. Modeling properties as abstract mass substances is clearly advantageous in the current context because mass substances are generally gradable (cf. *more salt, less oil*). When PC notions are nouns, as with English PC notions such as *strength*, *hunger* etc., the Romance and Germanic notions, or the Hausa ANSQs, these are mass nouns, making this approach particularly natural and motivated. The semantics of abstract mass nouns has remained completely unexplored until very recently (see Nicolas 2010), and there is consequently no standard model-theoretic treatment of abstract mass substances. For current purposes, we can simply carry, with very little modification, Link's (2002) mereological approach to concrete substances over to abstract ones.

Intuitively, substance mass nouns like *water* are predicates over a domain that is mereologically ordered. If something is water, then any part of it is also water, and any two portions of water can be "fused" into a single portion of which they are both parts. Similarly, a property is a predicate over a domain that is mereologically ordered. If something is a portion of, say, strength, then any part of it is also a portion of strength, and any two portions of strength can be "fused" into a portion of which they are both parts.

The crucial assumptions are as follows. Let $\mathcal{A}$ be a non-empty set of portions of abstract substance. $\mathcal{A}$ has the structure of a join semilattice (with no bottom element) with the join operation $\sqcup$ (i.e. $\sqcup$ is commutative, indempotent, and associative). $\sqcup$ induces an ordering relation $\preceq$ on $\mathcal{A}$, which can be thought of as a 'part-of' relation:

(21) For any $p, q \in \mathcal{A}$, $p \preceq q \Leftrightarrow p \sqcup q = q$

Properties are subsets of $\mathcal{A}$ that are closed under $\sqcup$. Thus, two portions of any property have a "fusion" that is also a portion of the property. Gradability is modeled as an ordering on the portions of properties with the following two postulates:

P1 Any property $P \subseteq \mathcal{A}$ is ordered by a total preorder $\leq$, intuitively thought of as 'smaller or equal to'.

P2 The preorder $\leq$ preserves the mereological part-of relation, so that given a property P, and two portions $p, q \in P:\ p \preceq q \rightarrow p \leq q$

P1 states that any two portions of abstract matter are comparable in "size". Two distinct portions can be of the same size, or else one is bigger than the other. P2 states that a portion that is a part of another portion is smaller than the portion it is part of.

An interesting semantic issue which we cannot discuss here is that of the relation between mass substances and scales. In particular, there are well known differences between adjectives encoding PCs that relate to scale structure (Kennedy and McNally 1999; Rotstein and Winter 2004; Kennedy and McNally 2005). Certain English adjectives, such as *pure*, are taken to have closed scales. Closed-scale adjectives are associated with a scale that has an upper limit, a maximal degree. Completely pure cocaine cannot become any purer than it is. The question arises

whether and how such differences in scale structure translate into differences in the structure of properties. We leave this issue for future research, and turn now to describing the semantics of property possession and its relation to predication.

3.2 Property possession

A key element of our proposal is that PC predication with properties takes the form of property possession, because property-denoting expressions cannot be directly predicated of individuals with the intended meaning. To illustrate this, we need some notation. For convenience, we use boldfaced English nominalizations as constants over properties. For example, $\mathbf{strength}$ is the constant naming whatever property is denoted by property-denoting expressions equivalent to the English adjective *strong*. Let P, Q be variables over properties, i.e. subsets of $\mathcal{A}$, and let p, q be variables over portions. Suppose that α is a property-denoting expression expressing the property $\mathbf{strength}$. The denotation of α is the function characterizing all and only the portions of this property, as in (22).

(22) $\quad [\![\alpha]\!] = \lambda p.\mathbf{strength}(p)$

Clearly, combining α with an individual denoting expression a yields the proposition $\mathbf{strength}(a)$, which says that a is a portion of strength, not that a is strong (viz., *Kim is strength* versus *Kim is strong*). We propose that a natural semantic alternative to direct predication is relating the individual a to the denotation of α, by a binary relation, and that the most natural binary relation is the possessive relation. As mentioned above, viewing individuals as "having" properties is common in philosophical jargon. While we do not wish to make in any metaphysical or epistemological claims about the nature of properties, it seems intuitively clear why possession should be a privileged relation between individuals and properties. While properties can be construed as universals, which particular individuals *exemplify*, they might also be considered as the things that *make up* individuals, i.e. integral parts of individuals. Integral (or inalienable) parthood is very prototypically expressed as possession in natural languages. This is easily seen for English in examples like (23):

(23) a. A square has four corners.
b. John has a nose.

Possessive strategies are thus a reflection of the semantics of property possession required to express PC predication with property-denoting PC lexemes.

Since properties are here conceived as sets of portions, a natural definition of property possession is the one in (24). An individual a has a property P if and only if a has some portion of P. The possessive relation is written as π.

(24) **Property possession**:
For any individual a and property P, a has P iff
$\exists p[P(p)\ \&\ \pi(a,p)]$

A crucial aspect of PC predication that any theory must capture is its well known context sensitivity (see e.g., Kennedy 2007b for a summary). Thus, a sentence like (25) can vary in truth value, depending on what standard one is using to evaluate tallness.

(25) Felicia is tall.

The sentence can be true in some contexts, false in others, and in yet other contexts its truth value may be indeterminable. For example, is (25) true when Felicia is five feet tall? In some contexts yes, in other contexts no, and in other contexts we simply are not certain. This context dependence is presumably universal and holds also for languages in which PC predication is expressed as property possession, as demonstrated for Ulwa by the data in (26), which show that the extent to which *yuhka* can be truly attributed to Sherwell depends on the context in which he is considered.

(26) *Sherwell ya bikiska balna karak laih yuhka katka muih almuk balna karak laih*
Sherwell the child PL with TOP tall-KA but person old.man PL with TOP
yuhka sa.
tall-KA NEG
'Sherwell is tall compared to children, but compared to old men he is not tall.' (Jan11-2)

In the literature on adjectives discussed in §4, context-sensitivity is dealt with in various ways, e.g. by invoking contextually salient degrees on a scale, or partial functions and supervaluations. So far, our theory of properties and of property possession does not accommodate context dependence in any way. Any individual either does or does not bear the relation π to (a portion of) the property P. Of course, it is possible to insist that the relation π is in fact gradable, and that an individual can bear π to a property to a certain degree. But such a move seems counterintuitive and empirically unmotivated. The oddity of the examples in (27), for example, indicates that the possessive relation, at least as holds between two simple individuals, is not gradable.

(27) #John has a nose more than Mary (does).

However, it is precisely to deal with context dependence, and with the concomitant issue of comparison, that we introduced the order $\leq$ on portions of abstract substance in the previous section. This order can be used to replicate in the domain of properties the effect of contextual standards. Since the semantics of property possession is constructed as involving existential quantification over portions, context sensitivity can naturally be introduced as contextual domain restriction.

It is widely known that quantification in natural language is very often, if not always, restricted, and that the restriction is often contextually determined (Westerståhl 1984; von Fintel 1994; Roberts 1995; Cooper 1996; Gawron 1996 *inter alia*). For example, in most utterance contexts, (28) would not be understood to make a statement about everything in the domain of quantification, but rather about everything in a contextually salient subset of this domain.

(28) Everything is in the car.

We propose to incorporate context sensitivity as a contextual domain restriction on the existential quantifier over portions in the semantics of property possession.

Informally, the idea is that only portions that are, in a sense, "big enough" count as relevant in evaluating whether an individual has a property or not (cf. what Kennedy 2007b calls the "stand out" relation). That is, in asserting that there is a portion of a property P that an individual has, quantification is restricted to those portions that are ranked high enough by the preorder $\preceq$. This kind of restriction seems to be a general property of sentences involving quantification over mass terms. For example, in many contexts, an utterance of (29a) would be considered false if uttered by someone who has two pennies in her pocket and no other

monetary possessions. Similarly, (29b), discussed in Travis (1989:18–19), would in many contexts be considered false if there is in fact no milk in the refrigirator save for two drops on the bottom of a drawer. In both cases, the relevant substance (money, milk) must exceed a certain contextually determined amount in order to "count" as verifying the sentence.

(29) a. I have money.
b. There is milk in the refrigirator.

A similar kind of contextually sensitive domain restriction is found with other cases of quantification over ordered domains. An example is modality. Following advances in modal logic made in the early 20th century, it is common since Kratzer's work (Kratzer 1977, 1991) to view epistemic possibility modals such as *might* in (30) as quantifiers over possibilia (usually modeled in terms of possible worlds).

(30) Felicia might be dead.

(30) might be analyzed as asserting that a possibility (e.g. a possible world) exists in which Felicia is dead. As Kratzer has emphasized, however, only reasonably non-remote possibilities count. For example, a hearer who has seen Felicia sitting in the next room a minute ago, is likely to consider an utterance of (30) false, even though a very remote possibility that, by some extremely unlikely accident, she has in fact died in the minute that has passed cannot be ruled out.[3] What this suggests is that, when ordered domains are involved, it is very common to find exactly the kind of contextual restriction to elements "high enough" in the order which we posit for quantification of possessed portions of properties.

To illustrate how domain restriction can be utilized to model context dependence, we turn now to presenting a compositional analysis of PC constructions in Ulwa.[4] The same mechanism of domain restriction at work in modeling the context sensitivity of predicative PC constructions is also used to model comparison and comparative PC constructions.

3.3 Predicative constructions in Ulwa

Ulwa predicative PC constructions have the form in (18), repeated in (31).

(31) *Yang as-ki-na minisih*-**ka**.
1SING shirt-1SING dirty-3SING.POSS
'My shirt is dirty.'

As discussed in §2, Ulwa PC words are constructed from a root and the possessive suffix *–ka*, which also marks the possessed noun in a possessive NP. We take PC roots in Ulwa to denote properties in the sense elaborated above. Consistent with our usage so far, P, Q are used as variables over such properties, and English nominalizations in boldface as property constants. For example, the property denoted by the Ulwa root *minisih* 'dirty' is written as **dirtiness**, as in (32).[5]

(32) $[\![\text{minisih}]\!] = \mathbf{dirtiness} \subseteq \mathcal{A}$

[3] In Kratzer's and much subsequent work, this kind of domain restriction is done by means of a contextually determined "ordering source".

[4] Ulwa was chosen simply because it is the language the possessive strategy of which we understand best. Extension to other languages must be left for future research.

[5] As above, this is purely a notational convention, not a theoretical claim about nominalization in English.

The denotation we propose for the suffix *–ka* is in (33).

(33) $[\![\text{ka}]\!] = \lambda P \lambda x \lambda D . \exists^D z [P(z) \ \& \ \pi(x, z)]$

In (33), D is a variable over sets of portions.[6] The notation $\exists^D$ is used to express restriction of the existential quantifier only to elements of D. (33) says that *–ka* takes a property P and an individual x and returns a context-dependent proposition (technically, a function from sets of portions to truth values). Given some set of portions, call it $\mathbf{d}$, the proposition expressed is that there is a portion of P that x has, and that portion belongs to $\mathbf{d}$.

The denotation of an Ulwa word like *minisihka* 'dirty' is straightforwardly derived from the meaning of *–ka* and the meaning of the root by function application, as in (34).

(34) $[\![\text{minisihka}]\!] = \lambda x \lambda D . \exists z^D [\mathbf{dirtiness}(z) \ \& \ \pi(x, z)]$

The denotation of a PC word with *–ka* might be called a context sensitive predicate – a function from individuals and sets of portions to propositions. Combining such a PC word with an individual-denoting term such as a proper name does not itself determine a proposition. Rather, in order to do so, the context must supply a domain restriction for the existential quantifier over portions.[7]

One final note is due regarding the nature of the contextually supplied sets that form the restriction for the existential quantification over portions in the meaning of *–ka*. In order to ensure that this semantics is coherent, the range of possible values for D must be constrained. In particular, we want our contextual sets to represent the notions of "big enough", i.e. to include all and only portions that are either at or exceed a certain cut off point in the preorder induced by $\leq$. To achieve this, we restrict the possible values of D to sets of portions that form a left-bounded interval, in the special sense defined in (35).

(35) **Interval**: A set of portions P forms a left-bounded interval if and only if
$\exists p \in \mathcal{A} : P = \{q : p \leq q\}$

Having determined a possessive semantics for Ulwa predicative constructions, we now turn to comparatives.

[6] We take portions of abstract substance to be a sort of individual, i.e. a subtype of type e, the type of simple individuals.

[7] Since our motivation for assuming a possessive strategy for Ulwa is the fact that *–ka* is used in nominal possession, the question arises how the denotation of *–ka* in (33) relates to that of *–ka* in nominal possession. Koontz-Garboden and Francez (2010) discuss this issue in detail, within an LF-style analysis of the syntax semantics interface (inspired by Barker 1995). For various reasons, we do not endorse this style of analysis here, and prefer an analysis of possessive NPs as generalized quantifiers (see, e.g., Barker 2002; Peters and Westerståhl 2006; Francez 2009 for discussion). The details of such an analysis are too complex to present here, and are largely irrelevant to our concerns. In (i) we therefore simply give the two denotations we propose for the two uses of *–ka*. The two differ combinatorically, as necessitated by their different syntactic distribution. The crucial point is that the lexical semantic core of *–ka*, the contribution it makes to truth conditions, is identical in both uses. The relevant part of the denotation is underlined in (i).

(i) a. $[\![\text{ka}]\!]$ (in possesive NPs) $= \lambda P \lambda x \lambda Q . \{z : \underline{\pi(x, z) \wedge P(z)}\} \subseteq Q$
b. $[\![\text{ka}]\!]$ (in PC constructions) $= \lambda P \lambda x \lambda D . \exists^D z [\underline{\pi(x, z) \ \& \ P(z)}]$

3.4 Comparatives in Ulwa

The comparative construction in Ulwa also involves the use of possessive *–ka*, in addition to the comparative lexeme is *kanas* 'more'. An example is given in (36).

(36) *Âka kahkalu âka kanas pau-ka wak yâ-rak.*
this shirt this more red-3SING.POSS other there-with
'This shirt is more red than that one.' (Oct09-100)

The core idea of our analysis is simply that an Ulwa comparative like (36) expresses the proposition that some individual has a portion of a property that is 'bigger' than some explicitly specified size. The role of *kanas*, together with its complement (the 'target phrase', in (36), *wak yârak* 'that one (=shirt)'), is to determine this size. This is achieved by determining the contextual domain restriction of the existential quantifier in the meaning of the PC word. Informally, the target phrase provides a portion of the relevant property, and *kanas* restricts the domain of portions quantified over to those portions that are equivalent to, or bigger than, this portion. For example, in (36), the phrase *kanas pau-ka wak yâ-rak* 'more than that (shirt)' restricts the set of portions within which the referent of *Âka kahkalu âka* 'this shirt' has a portion of redness.

The first thing required is a way to get from the target phrase to a portion. For simplicity, we consider here only phrasal comparatives, where the target phrase is individual denoting. To achieve this, we make use of contextual $\langle e, e\rangle$ functions of the kind employed in the analysis of "donkey" and "paycheck" pronouns (Geach 1980; Evans 1977; Cooper 1979; Evans 1980; Lappin 1989; Neal 1990; Jacobson 2000 *inter alia*). Generally, an $\langle e, e\rangle$ function is a function f that maps individuals into other individuals, so that for any individual a, $f(a)$ is also an individual. Which individual $f(a)$ is is determined by the preceding linguistic context. For example, consider the sentence in (37).

(37) Every woman who has a hat wears it to church.

What does the pronoun *it* in this example refer to? Clearly, it does not refer to any particular entity. Rather, for every woman who has a hat, the thing she is said to wear to church is her hat. Thus, the pronoun *it* can here be analyzed as denoting an $\langle e, e\rangle$ function mapping every woman to her hat. The pronoun comes to denote this particular function somehow by virtue of the immediately preceding linguistic context, which mentions explicitly women and their hats.

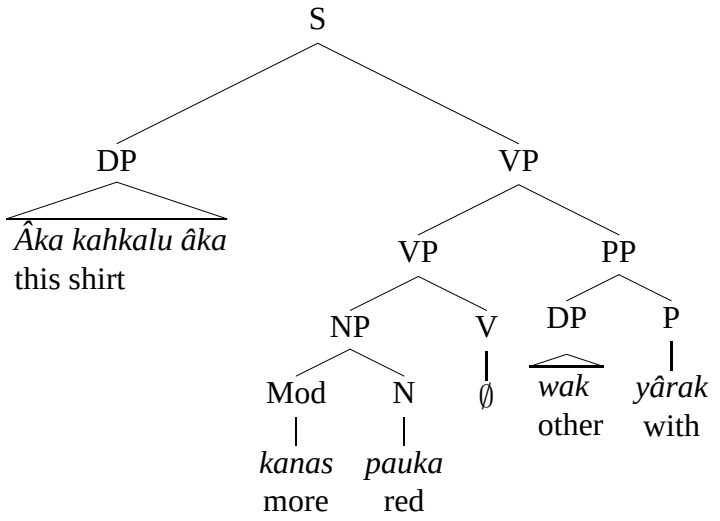
Coming back to comparatives, the denotation we propose for *kanas* 'more' is given in (38), where α is a variable over meanings of PC words in *–ka* (such as *pau-ka* 'red'), and f an $\langle e, e\rangle$ function.

(38) $[\![\text{kanas}]\!] = \lambda\alpha\lambda y\lambda u.\alpha(u)(\{v : v > f(y)\})$

kanas combines first with a PC word, then with an individual denoting term, resulting in a predicate. The resulting predicate is not context sensitive in the way that the predicate in a predicative PC sentence is. It does not depend on a contextually determined set of portions. Instead, it is true of any individual u if and only if u has a portion of the property expressed by the PC word that is bigger than the target individual's portion of that property, the portion determined by f. This can be seen best by considering the full derivation in (40) of the comparative sentence in (36), for which we assume the syntactic structure in (39).[8]

[8]The focus of this paper is not the syntactic structure of comparatives. We have included a null V in (39), since the copula is null in the third person but not in other persons (see, e.g., the discussion and data in Koontz-

(39)



(40) Full derivation of (36)

a. $[\![$Âka kahkalu âka$]\!] = s_1$

b. $[\![$wak yâ-rak$]\!] = s_2$[9]

c. $[\![$pau-ka$]\!] = \lambda x \lambda D.\exists^D z[\mathbf{redness}(z)\ \&\ \pi(x,z)]$

d. $[\![$kanas$]\!] = \lambda\alpha\lambda y\lambda u.\alpha(u)(\{v : v > f(y)\})$

e. $[\![$kanas pau-ka$]\!] = [\![$kanas$]\!]([\![$pau-ka$]\!]) =$
$\lambda\alpha\lambda y\lambda u.\alpha(u)(\{v : v > f(y)\})(\lambda x\lambda D.\exists^D z[\mathbf{redness}(z)\ \&\ \pi(x,z)]) =$
$\lambda y\lambda u.(\lambda x\lambda D.\exists^D z[\mathbf{redness}(z)\ \&\ \pi(x,z)])(u)(\{v : v > f(y)\}) =$
$\lambda y\lambda u.(\lambda D.\exists^D z[\mathbf{redness}(z)\ \&\ \pi(u,z)])(\{v : v > f(y)\}) =$
$\lambda y\lambda u.\exists^{\{v:v>f(y)\}} z[\mathbf{redness}(z)\ \&\ \pi(u,z)]$

f. $[\![$kanas pau-ka wak yâ-rak$]\!] = [\![$kanas pau-ka$]\!](s_2) =$
$\lambda u.\exists^{\{v:v>f(s_2)\}} z[\mathbf{redness}(z)\ \&\ \pi(u,z)]$

g. $[\![$Âka kahkalu âka kanas pau-ka wak yâ-rak$]\!] = [\![$kanas pau-ka wak yâ-rak$]\!](s_1) =$
$\exists^{\{v:v>f(s_2)\}} z[\mathbf{redness}(z)\ \&\ \pi(s_1,z)]$

s_1 and s_2 in the derivation are the denotations of the subject and the target phrase, respectively, the two shirts compared in (36). The most important point in the derivation is (40e), which shows the result of combining *kanas* with the PC word *pauka* 'red'. The result is a function that requires an individual, y, to feed as the argument of the function f, which maps individuals to individuals. The function f at this point is determined to be a function from individuals to portions of redness, since that function is made salient by the immediate linguistic environment, specifically by *pauka*, the sister node of *kanas*. Thus, the expression at the end of (40e) is a relation between two individuals y and u, which holds if and only if u has a portion of redness that is bigger than y's portion of redness. The values of y and u are straightforwardly determined by the target and the subject, respectively.

Modeling property possession in terms of existential quantification over (possessed) portions thus allows us to handle both predicative and comparative PC constructions in Ulwa, capturing the fact that the former are context sensitive in a way that the latter are not. An important and, we believe, highly desirable feature of this analysis is that the meaning of the

Garboden 2009a). We treat the target phrase syntactically as a modifier. This choice is motivated by its free order with respect to the other constituents; it can appear sentence initially, after the subject DP, or finally, as it does in (36). The prosodically unmarked position for it is sentence final, as in (36) and in the structure in (39).

[9] Our treatment of the target preposition phrase as entity-denoting, essentially denying that there is any semantic contribution by the "than" (in this case *wak*) particle, is consistent with general practice in the literature (see, e.g., Kennedy 2007b).

comparative form is built compositionally on the meaning of the positive form, exactly as one would expect, given that the former is syntactically built from the latter by addition of *kanas*. We elaborate on this point further in the next section, which addresses the second main theoretical topic of the paper: the relations between PC lexemes, positive forms, and comparative forms and their meanings across languages.

4 PC lexemes, the positive form, and the comparative

Any theory of PC predication and comparison inevitably articulates what the derivational relationship, both semantic and morphosyntactic, is between the three different items exemplified by the expressions in bold in (41) (repeated from (5)).

(41) a. **tall** PC lexeme
b. Andy is **tall**. positive form
c. Andy is **taller** than Shane. comparative form

The PC lexeme is simply the basic lexical item that encodes a PC. The positive form is whatever form denotes the *positive predicate* (POS), i.e. the context sensitive predicate that features in predicative PC constructions. In English, the positive form is surface identical to the PC lexeme. However, in Ulwa it is not – the PC lexeme is a bound root, whereas the positive form is derived from it by *–ka* suffixation. The comparative form is whatever form expresses the *comparative relation* (COMP), the relation between individuals that is expressed in a comparative sentence. In English, the productive ways of forming the comparative form derive it, morphologically or syntactically, from the adjective.

This section is concerned with the interaction between the forms of these three components and their meanings. Languages differ in how they encode the components, and in particular in whether and how they derive the positive and comparative forms from the basic PC lexeme. For example, while POS is expressed in English by an adjective that takes the same morphological form as the PC lexeme, in Ulwa it is expressed by a form derived from the PC lexeme with a possessive suffix, and in Hausa by a PC noun that composes with the possessive meaning of a Hausa comitative preposition. At the same time, semantic theory offers hypotheses about the semantics of the components, and about how POS and COMP relate to one another and to the lexical meaning of the PC lexeme, PC. Such hypotheses make predictions about form. When the semantic theory posits that the meaning of one form is compositionally derived from another, we expect the forms themselves to reflect the composition. While this correspondence between semantic and morphosyntactic composition might be obscured by language specific facts, it should nevertheless be observable in the form of crosslinguistic generalizations.

One possibility is that the meanings of the different components is invariable across languages. In this case, any overt morphosyntactic derivational relations between the components should uniformly reflect the direction of semantic composition. Alternatively, it is possible that in different languages, the components have somewhat different meanings. In this case, the overt derivational relations between the components that are observed across languages should reflect this semantic variation. Clearly, the analysis of possessive strategies proposed in this paper commits us to this second position. On that analysis, whether a PC lexeme denotes a property or not determines whether the positive/POS are morphosyntactically/semantically derived by means of possessive material or not.

In the remainder of the paper, we discuss two prominent and articulated approaches to the semantics of PC constructions, the *vague predicate* approach and the *pos* approach and the

predictions they make about the relation between semantic and morphosynactic derivation in these constructions. We argue that neither correctly captures the derivational relationship observed in possessive strategies of predication, whereas the theory we have articulated above does, and then go on to propose a hypothesis about the typology of derivational relations found across languages. The core of our hypothesis is, unsurprisingly, that morphosyntactic derivational relations between forms always reflect the direction of semantic composition, and that the variation in such relations is determined entirely by variation in lexical inventory.

4.1 The vague predicate approach

What we call the vague predicate approach is represented by the theories of Kamp (1975) and Klein (1980). Though their theories differ in some important respects, they share the property that they model adjectives as denoting vague predicates, in a sense clarified below, and it is this property which is our focus here. For the sake of keeping the exposition simple, we take Kamp's theory to be representative, and represent its main relevant features informally.[10]

On the vague predicate approach, there is no difference, in English, between the PC lexeme and the positive form. Lexical adjectives simply encode what we have been calling the *positive predicate* (POS), and so are themselves also the positive forms. The positive predicate is a partial function that delineates an ordered domain into a positive extension, a negative extension, and an extension gap. Take for example an adjective like *tall*. Intuitively, the positive extension is the set of things which, in the context, are definitely tall. The negative extension is the set of things which, in the context, are definitely not tall. The extension gap is the set of things for which the context does not determine whether they are tall or not. Where the line is drawn between the classes depends on the context.

Any context in which we are unsure about whether some individual is tall or not, however, can be made more precise, ultimately to a degree where the standard for tallness is made completely precise, so that there are no cases of uncertainty, no extension gap. Each successive precisification of a context creates a new context. The comparative relation, on this theory, is derived from the positive predicate. Intuitively, the idea is that x *is taller than* y is true if and only if all of the contexts in which it is true that y is tall, it is also true that x is tall, but not vice versa. More precisely, for a vague predicate P, *x is Per than y* is true in a context *c* iff the set of contexts in which $P(y)$ is true is a subset of the set of contexts in which $P(x)$ is true.

On this theory, then, the PC lexeme encodes the positive predicate, and is thus the same as the positive form. The comparative relation is derived from the positive predicate by a semantic operation, and is derived from the PC lexeme. This is depicted schematically in Figure 1, where we use $+comp$ for the semantic operation that derives COMP from POS on vague predicate approaches.

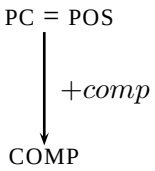


Figure 1: Semantic derivational relations, vague predicate approach

[10]We follow Klein (1980) in restating Kamp's partial models as "contexts".

4.2 The *pos* approach

The *pos* approach was first proposed by Cresswell (1977), developed, elaborated and integrated into modern generative grammar in the work of Kennedy (1999; 2007b *inter alia*), and assumed by many others following him. We take Kennedy's theory to be representative. On this approach, in contrast with the vague predicate approach, lexical adjectives do not denote the positive predicate, but instead denote measure functions. Measure functions map individuals to degrees on a scale (type $\langle e, d\rangle$, where d is the type of degrees), as exemplified informally in (42) for *tall*.

(42) $[\![\text{tall}]\!] = \lambda x.x$'s height

Thus, PC lexemes in English have non-predicative meanings. Their meanings are also not context sensitive in any way – any individual is mapped to the same degree in all contexts.

Since the positive predicate is of course both predicative and context sensitive, it must be derived from the meaning of the PC lexeme somehow, and this is done by a posited degree operator *pos*, which is presumed to be the denotation of degree morphology, or else a type shifting rule. The role of *pos* is to map measure functions to context-sensitive predicates. This is illustrated for the PC predicate *tall* in (43).

(43) $pos([\![tall]\!]) = \lambda x.[\![\text{tall}]\!](x) \geq s([\![\text{tall}]\!])$

In (43), *s* is a context-sensitive function that takes a measure function, in this case that denoted by *tall*, as an argument and returns a contextual standard. The contextual standard is a degree – the minimal degree required for something to count as *tall* in the context. A sentence like (44) will then be true on this theory if and only if the (maximal) degree to which Felicia is tall is greater than or equal to the contextual standard for tallness.

(44) Felicia is tall.

The comparative relation on this theory is also derived from the meaning of the PC lexeme by means of a degree operator. In this case too, the degree operator is contributed by degree morphology, e.g. by *–er* in English. This is shown in (45) and (46) for *tall* (where *g* ranges over the type of measure functions, *x*, *y* over ordinary individuals).[11]

(45) $[\![\text{-er}]\!] = \lambda g\lambda y\lambda x.g(x) > g(y)$ (Kennedy 2007b:5)

(46) $[\![\text{taller}]\!] = \lambda y\lambda x.[\![\text{tall}]\!](x) > [\![\text{tall}]\!](y)$

On this kind of analysis, then, PC lexemes have non-predicative meanings, and both POS and COMP are semantically derived from them. This is depicted schematically in Figure 2, where here $+comp$ is the operation deriving COMP from PC and $+pos$ the operation deriving POS from PC

The main motivation for the *pos* analysis is that it introduces degrees on a scale into the semantics, a move that has various advantages, especially in accounting for scalar typology (see e.g., Kennedy and McNally 2005; Kennedy 2007b; Kennedy and Levin 2008). However, one of its drawbacks, pointed out by Klein (1980) against Creswell's theory, is that the putative semantic operation *pos* is not realized overtly in any known language. Indeed, the *pos* morpheme is generally taken to be the denotation of a null degree morpheme. Positing morphosyntactic

[11] As is generally the case in the literature, *than* is taken to be semantically vacuous in this analysis.

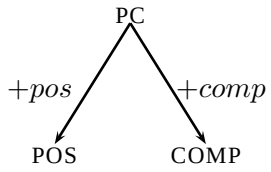


Figure 2: Semantic derivational relations, *pos* approach

structure that is phonologically null, however, should be justified by structural evidence. As far as we are aware, the motivation for the null degree morpheme is entirely semantic in nature.

Given this drawback, the question arises whether it is possible to maintain the degree-based semantics of the *pos* approach (along with its positive results for scalar typology discussed by Kennedy 2007b), while avoiding the predictions of Figure 2. We believe that it probably is. Interestingly, one way of doing this is to assimilate English to the analysis of Ulwa we proposed above. In other words, to view English adjectives as involving possessive semantics. Thus, suppose the lexical meaning of *tall* were as in (47), where D is a set of degrees, d a variable over degrees, and $\mathbf{height}$ a scale of height.

(47) $\quad [\![\text{tall}]\!] = \lambda x \lambda D.\exists^D d[\mathbf{height}(d)\ \&\ \pi(x,d)]$

The only difference between this and the denotation we have proposed for Ulwa PC words such as *yuhka* 'tall' is that quantification is over degrees on a scale rather than portions of a property. Inherent in the denotation in (47) is the idea that just like individuals can have properties, they can have degrees on a scale. In fact, as far as we can tell, degrees on a scale differ from portions of properties only in being totally ordered rather than totally preordered. This possibility is made particularly intriguing by the fact that the lexical entry in (47) is essentially identical to the one proposed on independent grounds by Heim (2006) (see also Schwarzschild and Wilkinson 2002):

(48) $\quad \lambda D \lambda x.x$'s height $\in D$

Whether this is ultimately a desirable analysis of English or not depends on whether contextual domain restriction is the correct approach to the context-sensitivity of English adjectives (as opposed, e.g., to the types of analyses discussed above). Further examination of this issue would take us far beyond the scope of this paper, and we leave it for future research.

4.3 The typology of derivational relations

Having laid out the vague predicate and the *pos* approaches, we now return to the issue of the relation between semantic and morphosyntactic derivation in PC constructions across languages. First, it seems clear that neither the vague predicate approach nor the *pos* approach can be taken to articulate the universal semantic components of PC constructions, on the assumption that morphosyntactic derivation reflects semantic composition. Figure 1 and Figure 2 both make predictions about the relation between PC lexemes and the positive and comparative form. According to Figure 1, the positive form is identical to the PC lexeme. We have already seen that this is not the case for Ulwa, or any other language showing a possessive strategy. According to Figure 2, both the comparative form and the positive form are derived, in different ways, directly from the PC lexeme. This too has already been shown to be false for Ulwa. In

this language, the basic PC lexeme is the root, but the comparative form is not directly derived from the root. Instead, it is derived from the word derived from the root by *–ka* suffixation. In other words, the comparative form in Ulwa is derived from the positive form, the form encoding POS. Such a situation is explicitly ruled out by the *pos* analysis, which requires the degree morphology deriving POS to be in complementary distribution with the degree morphology deriving COMP.

Thus, it seems that possessive strategies suggest a different derivational relationship between PC, POS and COMP. The theory of possessive strategies developed in this paper models exactly this kind of derivational relationship. On this theory, in PC constructions based on possessive strategies, the PC lexeme denotes a property. The positive predicate POS is derived from this property by means of possessive semantics. The comparative relation COMP in turn may be derived from the positive predicate POS, as it is in Ulwa, but this is not the only option. Nothing in the theory rules out that for some languages COMP will be derived directly from the property denoted by the PC lexeme, and below we show that this is in fact exactly what is found in Hausa.

The conclusion we draw from this discussion is that there does not seem to be a universal semantics for the components of PC constructions, one which would yield a universal set of semantic and morphosyntactic derivational relations. The generalization we propose is that it is precisely the variation in the denotational semantics of PC lexemes across languages (and within languages) that determines a range of possible derivational relations between PC, POS and COMP, and between the forms expressing them. In particular, we argue that the distinction between PC lexemes that encode properties and ones that encode context dependent predicates is what underlies the range of derivational relations observed in English, Ulwa, and Hausa.

Our proposal is that there are (at least) two different kinds of meanings that a PC lexeme can have. They can denote properties, or they can denote context dependent predicates, whether the latter are modeled in terms of partial functions or in a degree-based semantics (the difference is not important for current purposes). Thus, the range of possible PC lexemes is at least the following:

- Lexemes that lexicalize PC predicates (*Predicate lexemes*).
- Lexemes that lexicalize properties (*Property lexemes*).

Predicate lexemes do not require any semantic operations in order to be used in predicative PC constructions, and so languages with this lexicalization do not show any morphosyntactic derivation between PC and POS. The comparative relation in turn is derived from the PC predicate. English adjectives are predicate lexemes, and English PC constructions exemplify exactly this pattern of derivational relations. In contrast, property lexemes cannot in and of themselves act as predicates (for the reasons discussed in §3 above). With such lexemes, POS must be compositionally derived, and so must COMP. However, COMP need not necessarily be derived from POS; it might be derived from the meaning of the PC lexeme itself. We hypothesize, then, three possible derivational relationships between PC lexeme, positive predicate, and comparative relation, depending largely on the semantic type of the lexicalization of the PC lexeme. These three possibilities are schematized in Figure 3.

The morphosyntactic predictions of Figure 3 are borne out exactly by English, Ulwa and Hausa. As already noted, pattern (i) is reflected morphosyntactically in English (and many other languages in which PCs are adjectives), where the positive form is identical to the adjective, and the comparative form is either syntactically or morphologically derived. Patterns (ii) and (iii) are both reflected in languages with possessive strategies of predication. Pattern (ii) is the

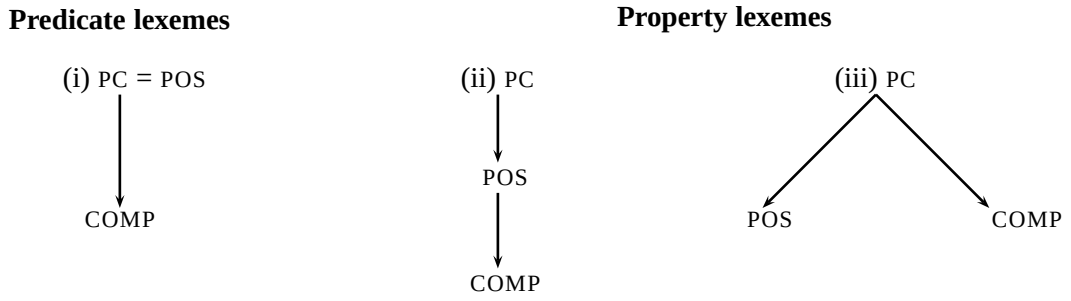


Figure 3: Predicted semantic derivational relations

one reflected in Ulwa, where the positive form is derived from the PC root by means of *–ka* suffixation, and the comparative form is syntactically derived from the positive form by means of *kanas* 'more'. Pattern (iii) is reflected in Hausa. In this language, the positive form is derived from the PC lexeme, a noun, by a possessive strategy, as illustrated in (3). The comparative form is also derived from the PC noun, with a verb usually glossed as *exceed*, as shown in (49).

(49) *Bàlā yā fi Muusā ƙarfī.*
Bala he exceeds Musa strength
'Bala is stronger than Musa.' (Newman 2000:93)

Whether a given language with property lexemes realizes strategy (ii) or (iii) is, we believe, purely a matter of lexical inventory. The difference between the two patterns is in the availability of a form deriving the comparative form from the PC lexeme. Presumably, such a form would be a lexeme with a meaning paraphrasable as "has more than". Hausa has such a form, whereas Ulwa does not. A possible denotation for such a form, and the one we propose tentatively for the Hausa verb *fi* 'exceed' above, is in (50), where δ is a variable over properties, and $\Pi_{\delta,x}$ is x's maximal portion of δ.

(50) $\lambda\delta\lambda y\lambda x.\Pi_{\delta,x} \geq \Pi_{\delta,y}$

(50) says that a verb like *fi* takes a property and two individuals *x,y* and returns the proposition that x's maximal portion of the property is larger than y's maximal portion of the property.

Figure 4 summarizes the semantic derivational relations we predict, and the languages that exhibit them. The type of semantic operation used in the derivation is listed along the arrows, with its morphosyntactic reflection in parentheses.

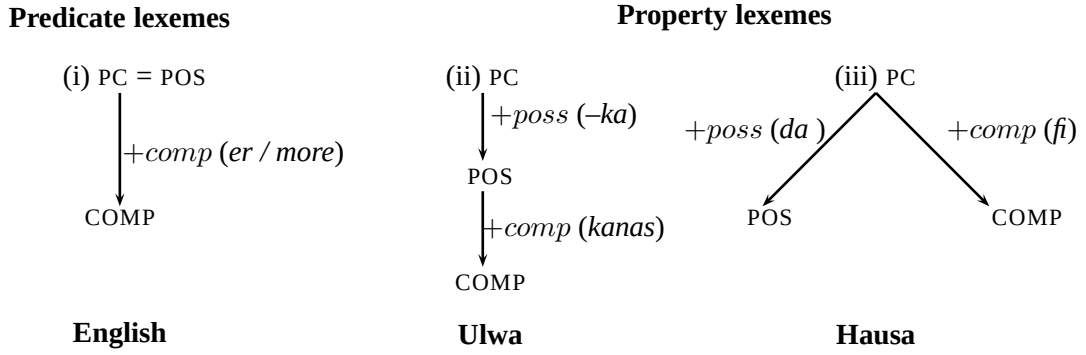


Figure 4: Semantic derivational relations predicted, and the languages that show them overtly

5 Concluding remarks

This paper began by introducing and describing possessive strategies of predication – the empirical observation that in some languages, PC predication is systematically encoded by means of possessive morphosyntax. The range of possessive structures used to express PC predication is wide, including 'have' verbs, comitative prepositions, nominal possessive marking, and existential constructions.

The first question we aimed to answer was why possessive strategies are invoked in those cases where they are and not invoked in those cases where they are not. We pursued the hypothesis that the explanation is rooted in the lexical semantics of PC lexemes, namely that they denote properties, conceived of as abstract mass substances. We argued that, due to their property denotation, such lexemes cannot act as PC predicates, and instead participate in a semantics of property possession. It is this semantics that is reflected in the possessive strategies. We developed a formal theory of property possession, which accounts for the main semantic properties of predicative PC constructions, and showed how this semantics can be used to provide a compositional analysis of predicative and comparative constructions in Ulwa. We argued that the compositional semantics we propose captures the context-sensitivity of gradable PC predication in a very natural way, as contextual domain restriction.

We then used this analysis as the point of departure for development of a restrictive theory of the relation between semantic composition and morphosyntactic derivation in PC constructions. On this theory, lexical facts about the denotational semantics of PC lexemes, together with facts about language specific lexical inventory, determine whether and how the different semantic components of PC constructions are compositionally related. These semantic relations in turn determine the morphosyntactic derivational patterns found between the forms encoding the different components across languages. We showed that this kind of approach does a much better job at capturing crosslinguistic variation in overt derivational relations between the elements of PC constructions than existing accounts.

Finally, our observations regarding possessive strategies and the relations between the components of PC constructions provide further evidence for the idea that languages vary crosslinguistically in their semantics. Research has only recently begun to inquire into the nature of semantic variation, and the scope of such variation is still largely unknown (see von Fintel and Matthewson 2008 for an overview of the state of the art). We hope to have shown in this paper that, in semantics as in other areas of grammar, the lexicon is an important locus of variation, and that analyzing lexical semantic variation precisely can go a long way towards explaining patterns of variation in form.

References

Barker, Chris. 1995. *Possessive descriptions*. Stanford, CA: CSLI Publications.

Barker, Chris. 2002. The dynamics of vagueness. *Linguistics and Philosophy* 25:1–36.

Bealer, George, and Uwe Mönnich. 1989. Property theories. *Handbook of Philosophical Logic* 4:133–251.

Beck, S., T. Oda, and K. Sugisaki. 2004. Parametric variation in the semantics of comparison: Japanese vs. english. *Journal of East Asian Linguistics* 13:289–344.

Beck, Sigrid, Sveta Krasikova, Daniel Fleischer, Remus Gergel, Stefan Hofstetter, Christiane Savelsberg, John Vandereist, and Elisabeth Villalta. 2010. Crosslinguistic variation in comparison constructions. *Linguistic Variation Yearbook* 9:1–66.

Bierwisch, Manfred. 1989. The semantics of gradation. In *Dimensional adjectives*, ed. Manfred Bierwish and Ewald Lang, 71–261. Berlin: Springer-Verlag.

Chierchia, Gennaro. 1985. Formal semantics and the grammar of predication. *Linguistic Inquiry* 16:417–443.

Chierchia, Gennaro, and Raymond. Turner. 1988. Semantics and property theory. *Linguistics and Philosophy* 11:261–302.

Cocchiarella, Nino. 1972. Properties as individuals in formal ontology. *Nous* 6:165–187.

Cooper, Robin. 1979. The interpretation of pronouns. In *Selections from the third Groningen Round Table*, ed. F. Heny and H. Schnelle, volume 10 of *Syntax and Semantics*, 61–92. New York: Academic Press.

Cooper, Robin. 1996. The role of situations in generalized quantifiers. In *The handbook of contemporary semantic theory*, ed. Shalom Lappin, 65–86. Oxford: Blackwell.

Cresswell, Max. 1977. The semantics of degree. In *Montague grammar*, ed. Barbara Partee, 261–292. Academic Press.

Dixon, R.M.W. 1982. *Where have all the adjectives gone?: And other essays in semantics and syntax*. The Hague: Mouton.

Evans, Gareth. 1977. Pronouns, quantifiers, and relative clauses. *The Canadian Journal of Philosophy* 467–536.

Evans, Gareth. 1980. Pronouns. *Linguistic Inquiry* 11:337–362.

von Fintel, Kai. 1994. Restrictions on quantifier domains. Doctoral Dissertation, University of Massachussets.

von Fintel, Kai, and Lisa Matthewson. 2008. Universals in semantics. *The Linguistic Review* 25:139–201.

Fox, Chris. 2000. *The ontology of language: properties, individuals and discourse*. Lecture Notes of The Center for the Study of Language and Information (CSLI). The Center for the Study of Language and Information (CSLI). URL `http://csli-publications.stanford.edu/site/1575862344.html`.

Francez, Itamar. 2009. Existentials, predication, and modification. *Linguistics and Philosophy* 32:1–50.

Francez, Itamar, and Andrew Koontz-Garboden. 2010. The grammar of property possession. Paper presented at the Workshop on Adjectives and Relative Clauses, Venice, June 17, 2010.

Gawron, Jean Mark. 1996. Quantification, quantificational domains and dynamic logic. In *The handbook of contemporary semantic theory*, ed. Shalom Lappin. Oxford: Blackwell.

Geach, Paul. 1980. *Reference and generality: An examination of some medieval and modern theories*. Ithaca, NY: Cornell University Press.

Green, Thomas. 1999. A lexicographic study of Ulwa. Doctoral Dissertation, MIT, Cambridge, MA.

Green, Thomas. 2004. Electronic version of dictionary in Green (1999). Unpublished raw XML.

Hale, Kenneth L., and Danilo Salamanca. 2002. Theoretical and universal implications of certain verbal entries in dictionaries of the Misumalpan languages. In *Making dictionaries*, ed. William Frawley et al., 25–59. Berkeley, CA: University of California Press.

Heim, Irene. 1985. Notes on comparatives and related matters. UT Austin.

Heim, Irene. 2006. Remarks on comparative clauses as generalized quantifiers. Unpublished manuscript, MIT.

Husband, E. Matthew. 2010. On the compositional nature of stativity. Doctoral Dissertation, Michigan State University, East Lansing.

Jacobson, Pauline. 2000. Paycheck pronouns, Bach-Peters sentences, and variable-free seman-

tics. *Natural Language Semantics* 8:77–155.
Jaggar, Philip. 2001. *Hausa*. Amsterdam: John Benjamins.
Kamp, J.A.W. 1975. Two theories about adjectives. In *Formal semantics of natural language*, ed. Edward Keenan, 123–155. Cambridge: Cambridge University Press.
Kennedy, Christopher. 1999. *Projecting the adjective: The syntax and semantics of gradability and comparison*. New York: Garland.
Kennedy, Christopher. 2007a. Modes of comparison. In *Proceedings of CLS 43*. Chicago: Chicago Linguistic Society.
Kennedy, Christopher. 2007b. Vagueness and grammar: The semantics of relative and absolute gradable adjectives. *Linguistics and Philosophy* 30:1–45.
Kennedy, Christopher, and Beth Levin. 2008. Measure of change: The adjectival core of degree achievements. In *Adjectives and adverbs: Syntax, semantics, and discourse*, ed. Louise McNally and Christopher Kennedy, 156–182. Oxford: Oxford University Press.
Kennedy, Christopher, and Louise McNally. 1999. From event structure to scale structure: Degree modifcation in deverbal adjectives. In *Proceedings of SALT 9*, ed. Tanya Matthews and Devon Strolovitch, 163–180. Ithaca, NY: CLC Publications.
Kennedy, Christopher, and Louise McNally. 2005. Scale structure, degree modification, and the semantics of gradable predicates. *Language* 81.
Klein, Ewan. 1980. A semantics for positive and comparative adjectives. *Linguistics and Philosophy* 1–45.
Koontz-Garboden, Andrew. 2007. States, changes of state, and the Monotonicity Hypothesis. Doctoral Dissertation, Stanford University, Stanford, CA.
Koontz-Garboden, Andrew. 2009a. Locative and existential constructions in Ulwa. *Anthropological Linguistics* 51:1–25.
Koontz-Garboden, Andrew. 2009b. Ulwa evidentials: A preliminary overview. In *Proceedings of the 14th Workshop on the Structure and Constituency of the Languages of the Americas*. Vancouver: UBC Working Papers in Linguistics.
Koontz-Garboden, Andrew. 2009c. Ulwa verb class morphology. *International Journal of American Linguistics* 75:453–512.
Koontz-Garboden, Andrew, and Itamar Francez. 2010. Possessed properties in Ulwa. *Natural Language Semantics* 18:197–240.
Kratzer, Angelika. 1977. What 'must' and 'can' must and can mean. *Linguistics and Philosophy* 1:337–355.
Kratzer, Angelika. 1991. Modality. In *Handbuch Semantik/handbook of semantics*, ed. Arnim von Stechow and Dieter Wunderlich, 639–650. Berlin/New York: de Gruyter.
Lappin, Shalom. 1989. Donkey pronouns unbound. *Theoretical Linguistics* 15:263–286.
Link, Godehard. 2002. The logical analysis of plurals and mass terms: A lattice-theoretical approach. In *Formal semantics: The essential readings*, ed. Paul Portner and Barbara Partee, 127–146. Oxford: Blackwell. Originally published 1983 in R. Bäuerle, Chr. Schwarze, and A. von Stechow, Eds., *Meaning, use, and interpretation of language*, de Gruyter, Berlin, pp. 302-323.
Minor, Eugene E., and Dorothy A. Minor. 1987. *Vocabulario bilingüe Huitoto-Español, Español-Huitoto*. Lomalinda: Editorial Townsend. Available online: http://www.sil.org/americas/colombia/pubs/abstract.asp?id=21705.
Minor, Eugene E., Dorothy A. Minor, and Stephen H. Levinsohn. 1982. *Gramática pedagógica Huitoto*. Ministerio de Gobierno. Available online: http://www.sil.org/americas/colombia/pubs/abstract.asp?id=16189.
Moltmann, Friederike. 2009. Degree structure as trope structure: A trope-based analysis of

positive and comparative adjectives. *Linguistics and Philosophy* 32:51–94.
Naden, Tony. 1982. Existence and possession in Bisa. *Studies in African Linguistics* 13:211–214.
Neal, Stephen. 1990. *Descriptions*. Cambridge, Mass: MIT Press.
Newman, Paul. 2000. *The Hausa language: An encyclopedic reference grammar*. New Haven, CT: Yale University Press.
Nicolas, David. 2010. Towards a semantics for mass expressions derived from gradable expressions. *Recherches Linguistiques de Vincennes* 39.
Parsons, F.W. 1955. Abstract nouns of sensory quality and their derivatives in Hausa. In *Afrikanistische Studien [Festschrift Westermann]*, ed. J. Lukas, 373–404. Berlin: Akademie-Verlag.
Peters, Stanley, and Dag Westerståhl. 2006. *Quantifiers in language and logic*. Oxford: Oxford University Press.
Roberts, Craige. 1995. Domain restriction in dynamic semantics. In *Quantification in natural language*, ed. Emmon Bach, Eloise Jelinek, Angelika Kratzer, and Barbara H. Partee, 661–700. Dordrecht: Kluwer.
Rotstein, Carmen, and Yoad Winter. 2004. Total adjectives vs. partial adjectives: scale structure and higher-order modification. *Natural Language Semantics* 12:259–288.
Schwarzschild, Roger, and Karina Wilkinson. 2002. Quantifiers in comparatives: A semantics of degree based on intervals. *Natural Language Semantics* 10:1–41.
Stassen, Leon. 2009. *Predicative possession*. Oxford: Oxford University Press.
von Stechow, Arnim. 1984. Comparing semantic theories of comparison. *Journal of Semantics* 3:1–77.
Travis, Charles. 1989. *The uses of sense: Wittgensteins philosophy of language*. Oxford: Oxford University Press.
Ultan, Russell. 1972. Some features of basic comparative constructions. *Stanford Working Papers on Language Universals* 9:117–162.
Westerståhl, Dag. 1984. Determiners and context sets. In *Generalized quantifiers in natural language*, ed. Johan van Benthem and Alice ter Meulen, 45–71. Dordrecht: Floris.