1

The Gradience of the Dative Alternation

JOAN BRESNAN AND TATIANA NIKITINA

Natural uses of dative constructions in English reveal that the boundaries between categoricity and gradience are fluid in both lexicon and grammar.[1] In the lexicon, the mapping between semantic classes of dative verbs and alternative syntactic constructions rests on probabilistic biases rather than strict categories. In the grammar of argument type positioning, even the strongest of constraints on ditransitive complements shows variability, while a very weak statistical pattern corresponds to near categorical regularities elsewhere. Both the lexical and the grammatical gradience can be modeled within Stochastic Optimality Theory, and combining them has surprising empirical consequences.

1.1 Lexical Gradience

Many English ditransitive verbs appear in alternative dative PP and dative NP constructions:

(1) "You don't know how difficult it is to find something which will please everybody—especially the men."
"Why not just **give them cheques**?' I asked.
"You can't **give cheques to people**. It would be insulting."[2]

(2) "You **carrying a doughnut to your aunt** again this morning?" J.C. sneered. Shelton nodded and turned his attention to a tiny TV where

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[2]Davidse (1996a: 291), from Graham Green (1980) *Doctor Fischer of Geneva or the Bomb Party*. London: The Bodley Head.

Reality Exploration and Discovery: Pattern Interaction in Language and Life.
Linda Uyechi and Lian-Hee Wee.

> "Hawaii Five-O" flickered out into the darkness of the little booth. "Looks like you **carry her some breakfast** every morning."[3]

Examples (1) and (2) involve denial and repetition, which presuppose that *give* and *carry* have the same meaning in both constructions. Here the alternative syntactic constructions are apparently used primarily for a shift of emphasis. Elsewhere, however, different constructions are clearly associated with different semantics. For example, spatial goals normally do not alternate in English, as the contrasting examples in (3) show (Bresnan 1978, cited by Gropen et al. 1989):

(3) I sent a package to the boarder $\sim$ I sent the boarder a package.
I sent a package to the border. $\sim$ *I sent the border a package.

Human recipients usually resist the spatial interpretation—

(4) I sent a book to the library $\sim$ I sent a book there.
I sent a book to you $\not\sim$ I sent a book there.

—but PPs can be vague or ambiguous between spatial and dative uses, as in the following attested example from the Switchboard corpus (Godfrey et al. 1992) discussed by Cueni (2004), which could be either a spatial goal or a recipient:

(5) They take everything to the pawn shops and just hock everything.

Semantic approaches to explaining the dative alternation have proposed that alternative dative syntax always expresses alternative meanings, whether constructional (Goldberg 1995, Kay 1996) or lexical (Green 1974, Oehrle 1976, Gropen et al. 1989, Pinker 1989, Levin 1993, Davidse 1996b, Krifka 2001).

Abstracting away from differences in choice of syntactic representation, a central idea in these approaches is that dative verbs or idioms which have possessive semantics as in (i) are uniquely associated with the dative NP syntax [V NP NP], while datives with allative semantics as in (ii) are uniquely associated with the dative PP syntax [V NP [to NP]$_{\mathrm{PP}}$]:

(i)	'x causes y to have z'	(possessive)	$\Rightarrow$	NP V NP NP
(ii)	'x causes z to go to/be at y'	(allative)	$\Rightarrow$	NP V NP [to NP]

On these approaches, the dative NP and PP constructions are not alternative expressions of the same meaning, they are expressions of different meanings.

Semantic restrictions on the dative alternation, such as those involving motional transfer, communication, and idioms, respectively illustrated in (6), (7), and (8), have been taken to support these approaches (examples adapted from Pinker 1989:110–111, Levin 1993:46, 114, Krifka 2001).

[3] www.flagpole.com/Issues/12.23.98/shortstory.html

(6) I threw the box to John. $\sim$ I threw John the box.
I lowered the box to John. $\not\sim$ *I lowered John the box.

(7) Ann faxed the news to Beth. $\sim$ Ann faxed Beth the news
Ann yelled the news to Beth . $\not\sim$ *Ann yelled Beth the news.

(8) The lighting here gives me a headache. $\not\sim$ *The lighting here gives a headache to me.

For example in (8), giving someone a headache is causing them to have a headache, not transferring the headache from one location to another. Hence, by virtue of its meaning, it is argued, this idiom occurs only in the possessive dative NP construction (i) and does not alternate. Likewise, in (6) the meaning of *throw* specifies the causing event in the schema (i), while the meaning of *lower* specifies both the causing event and the movement event in schema (ii), since there is a homomorphoric mapping between the two events in lowering actions (Krifka 2001; Pinker 1989). Therefore *lower* and similar verbs cannot have the syntax associated with schema (i) because it omits an essential part of their meaning. With *yell* in (7), there is "a homomorphism between speech production (e.g. the activity of yelling) and the transfer of information," according to Krifka (2001), while with *fax* there is no homomorphism between the causing event and the movement event; only the initial stage of the transfer is specified as with *throw* in (6).

When the same verb appears with both dative NP and dative PP syntax on this account, the meanings of the two constructions differ. Either the verbs *throw*, *fax*, and the like are lexically polysemous, or polysemy is imposed by the differing constructional contexts they appear in, depending on the specific grammatical assumptions (lexical or constructional) of the approach. For cases where the meanings of the verbs does not obviously differ, such as the examples in (1) and (2) of denial and repetition, Krifka (2001), building on Gropen et al. (1989) and Pinker (1989), proposes for *give* that "every transfer of possession entails an abstract movement event in the dimension of possession spaces."[4] This proposal makes some polysemies empirically indistinguishable from the monosemy hypothesis (Levin and Rappaport Hovav 2002), which asserts that when verbs in the broad semantic classes (i) and (ii) have recipient rather than purely spatial arguments, each can occur with both dative NP and PP syntax, giving rise to alternation. We will see that alternation in this sense occurs with far more verb classes than has been recognized.

[4]The *give a headache* idiom is not affected by this meaning postulate, according to Krifka (2001), because the theme does not just change possession but comes into existence. The latinate verbs (*donate*, *contribute*, etc.) remain an exception to this generalization for morphophonological reasons.

Case 1: Verbs of imparting of force

"Verbs of instantaneous imparting of force in some manner causing ballistic motion" (Pinker 1989) occur with both dative NP and PP syntax:

(9) Lafleur throws/tosses/flips/slaps/kicks/pokes/flings/blasts him the puck; he shoots, he scores!
(cf. Lafleur throws/tosses/flips/slaps/kicks/pokes/flings/blasts the puck to him; he shoots, he scores!)

In contrast, according to Pinker (1989: 110–111) and Krifka (2001) among others, "verbs of continuous imparting of force in some manner causing accompanied motion" occur only in the dative PP construction:

(10) *I carried/pulled/pushed/schlepped/lifted/lowered/hauled John the box.
(cf. I carried/pulled/pushed/schlepped/lifted/lowered/hauled the box to John.)

Yet we find from an examination of documents available on the internet that verbs of continuous imparting of force are linguistically construable as depicting changes of possession, and are in current use. The following examples are a selection of our findings.

(11) VERBS OF CONTINUOUS IMPARTING OF FORCE

Karen spoke with Gretchen about the procedure for registering a complaint, and **hand-carried her a form**, but Gretchen never completed it.

As Player A **pushed him the chips**, all hell broke loose at the table.

Therefore, when he got to purgatory, Buddha **lowered him the silver thread of a spider** as his last chance for salvation.

Nothing like heart burn food. "I have the tums." Nick joked. He **pulled himself a steaming piece of the pie**. "Thanks for being here."

"Well. . . it started like this. . . " Shinbo explained while Sumomo **dragged him a can of beer** and opened it for him, "We were having dinner together and. . . "

Note that the context of the second example is a tournament poker game. Whoever wins the pot receives all of the chips, and the transfer can be achieved simply by pushing the chips across the table to the winner. In the last example, Sumomo is a very small servant robot, small enough to dance on a table, climb up his master's leg and perch on his shoulder. Sumomo serves the beer to the visitor Shinbo by dragging a can to him.

Case 2: Verbs of communication

Another widely repeated contrast occurs among verbs that can be used for describing types of communication (Pinker 1989, Levin 1993, Krifka 2001,

among others). "Verbs of instrument of communication" have uses with both dative NP and PP syntax:

(12) Susan cabled/emailed/faxed/phoned/telegraphed/... Rachel the news. (cf. Susan cabled/emailed/faxed/phoned/telegraphed/... the news to Rachel.)

In contrast, manner-of-speaking verbs are marked as ungrammatical with dative NP syntax:

(13) *Susan whispered/yelled/mumbled/barked/muttered... Rachel the news. (cf. Susan whispered/yelled/mumbled/barked/muttered... the news to Rachel.)

Despite the reported ungrammaticality of manner-of-speaking verbs with dative NP syntax, we again find representatives of the starred types of examples in current use:

(14) MANNER-OF-SPEAKING VERBS

Shooting the Urasian a surprised look, she **muttered him a hurried apology** as well before skirting down the hall.

"Hi baby." Wade says as he stretches. You just **mumble him an answer**. You were comfy on that soft leather couch. Besides ...

The shepherd-dogs, guardians of the flocks, **barked him a welcome**, and the sheep bleated and the lambs pattered round him.

I think he was poking fun at the charges that Blackmore has been making that he chronically forgets words — he went over to Jon Lord during 'Smoke' and seemed to be getting Jon to **yell him the words**!!

I still can't forget their mockery and laughter when they heard my question. Finally a kind few (three to be exact) came forward and **whispered me the answer**.

Case 3: *give* NP NP idioms

Idioms have been long and widely cited as showing that the dative NP and dative PP constructions differ semantically. Expressions like *give me a headache* and *give him a punch* cannot be said to describe transfers of possession, either literally or figuratively. Yet these idioms are in fact used with dative PP syntax, as are all of the possibly idiomatic *give* NP NP collocations we found in the Treebank Switchboard corpus (Marcus et al. 1993). The following is a representative selection.

(15) GIVE A HEADACHE TO

From the heads, offal and the accumulation of fishy, slimy matter, a stench or smell is diffused over the ship that would **give a headache to**

the most athletic constitution.

Design? Well, unless you take pride in **giving a headache to your visitors** with a flashing background?

(16) GIVE A PUNCH TO

When the corpse was bloodless, he got up and grinned to Ethan-vampire, oh so happy. "Oh yesssss!" He **gave his old mate**. "Let's find a bar, Ethan." . . .

"Well, mate, you asked for it."- And he **gave a punch to the guy** in the middle of his face, splotching . . .

All three headed toward Mulan. She dropped kicked the first. Next she **gave a punch to the second man**. He blocked so she grabbed his arm and flipped him. . . .

She **gave a punch to the evil reporter that had asked the dumb ass question**.

(17) GIVE A BREAK TO

PUC **gives a break to big users of energy**.

"Why can't we **give a break to the people who organise them** [the matches]?"

Give a break to the overburdened who have no place to rest.

That's been the fairest way I can think of to protect the people who do register, and still **give a break to the people who have contributed to the project**. . .

They wonder what citizenship means if you **give a break to people who are here illegally**.

(18) GIVE A HARD TIME TO

The silly clowns sometimes **give a hard time to the emperor**.

The Necromancer has a wide area of spells he can use to either stay out of trouble or **give a hard time to his opponents**.

Those who have come before traditionally **give a hard time to those who have just come**.

(19) GIVE GRIEF TO

Still, I took it back today and **gave some grief to the assistant** and came out with a better scanner than I had paid for on Tuesday.

He **gave grief to those taking their time near the rear**, I remember watching him from outside the bus while we stood on the yellow footprints.

For further discussion of idioms in relation to usage data, see Snyder (2001), Davidse (1998), and especially Levin and Rappaport Hovav (2002).

Case 4: Verbs of prevention of possession

Even the verbs *cost* and *deny*, which are widely described as occurring only with dative NP syntax, we found to alternate. Contrast (20) (Krifka 2001, among many others) with (21) and (22):

(20) The car cost Beth $5000. $\not\sim$ *The car cost $5000 to Beth.
Ann denied Beth the ice cream. $\not\sim$ *Ann denied the ice cream to Beth.

(21) COST . . . TO

The IRS is unionized, and the union apparently has the fear that outsourcing will **cost jobs to their members**.

Any reduced rate, however, will still **cost jobs to Californians in the teleservices profession**, drive up costs, increase inefficiency, and place an undue restraint on technology.

He did so thinking it would **cost nothing to the government**.

(22) DENY . . . TO

Most grievances will involve only a dispute between the grievor and the employer. The employer has underpaid, or disciplined, or **denied a leave to a teacher**; resolution of the grievance does not impact directly on others.

definition of 'abnegate'. *The American Heritage Dictionary of the English Language*, 4th Edition: 1. To give up (rights or a claim, for example); renounce. 2. **To deny (something) to oneself**: The minister abnegated the luxuries of life.

After all, who could **deny something to someone** so dedicated to the causes of international friendship and collaboration?

We observe that the meanings of *give a headache, give a punch, give a break, give a hard time,* and *give grief* do not appear to vary across the dative NP and dative PP contexts. Likewise, the verbs of deprivation of possession *cost* and *deny* mean the same in the dative PP constructions. The verbs of continuous imparting of force *drag, carry, push, pull*, and *lower* still specify the same distinguishing manners of motion in the dative NP contexts cited as they do in the dative PP context. Likewise, the manner-of-speaking verbs

mutter, mumble, bark, yell, whisper continue to specify the same characteristic emissions of sound continuously accompanying the speech acts in the dative NP contexts cited as in the dative PP contexts.

1.2 Sources of Lexical Differences

Although both dative NP and dative PP constructions can be used to express transfers of possession, as we have seen, the fact is that there is a strong skewing of the syntax of alternating dative verbs toward the dative NP construction in conversational English usage. Dative NP constructions are 78.6% of a set of all alternating dative constructions collected from the Switchboard corpus of English telephone conversations by Bresnan et al. (2007). 51% of the total dative dataset are headed by the verb *give*, which favors the dative NP construction 84.6% of the time. If we take *give* to be prototypical of the class of transfer of possession verbs, then dative NP syntax is by far the preferred syntactic expression for this class of verbs.

Transfers of possession may occur in many ways. In a sport like hockey, possession of the puck can take place by means of a number of sudden actions in play, and there is much varied discourse about it. In the world more generally, or at least in present-day American life, if a person accompanies and holds, clings to, or otherwise stays in contact with a possession, it seems to us less likely that a transfer of possession is going on, and in many cases there is probably much less talk about it than about possession of a ball or puck in sports. A transfer of possession between people under normal circumstances is surely more common in situations where walking is a major mode of transportation. The previously given web examples are from present-day English, but many examples of *carry* with dative NP can be found on the web in depictions of life in rural areas, often predating the rise of the automobile.

(23) Pre-automotive uses of ditransitive *carry*

> Aurie and Pearl went to Humboldt that afternoon. I went back to Mrs. Kate's to **carry her some mustard salad**.
>
> "This evening she was late starting dinner because her second granddaughter has a cold, and she had to **carry her some pepper sauce** for her cough."
>
> Polly had been sick and Sara wanted to **carry her some food**.
>
> "Go, my dear, and see how thy grandmamma does, for I hear she has been very ill; **carry her a custard and this little pot of butter**." [from *Little Red Riding Hood*]

For the same reasons, *push* is probably less likely to be discussed as a mode of transferring possession than *carry*, with *pull* perhaps less so, and *lower* and

drag the least. These observations raise the possibility that our grammaticality judgments of the contrasting pairs of examples are being systematically biased by the probability of similar descriptions of the event types depicted by the examples.

In summary, our hypothesis is this. We can use both dative NP and dative PP syntax to express transfers of possession, but the prototypical descriptions of giving are heavily biased toward the dative NP construction. These days transfers of possession are more likely to be described in the discourse of sports where motional verbs of instantaneous imparting of force (*throw, toss, kick, flip, slap, fling, etc.*) are more heavily used than in discourse about dragging, lowering, pushing, pulling, and even carrying. Hence, we are more likely to judge verbs in the *throw* class as acceptable with dative NP syntax than verbs in the *drag* class.

We can pursue a similar line of thinking about the verbs of communication. Both means-of-communication verbs and manner-of-speaking verbs are grammatically possible with alternative dative syntax, yet dative NP syntax seems to be preferred in grammaticality judgments of the former.

Notice that activities of cabling, emailing, faxing, phoning, telegraphing, and the like almost always involve communication—that is transfers of the possession of information. The most frequent verb of communication that occurs in dative constructions is *tell*. Over 95% of all dative uses of *tell* in the Switchboard corpus occur in the dative NP construction.[5]

In contrast to the activities described by means-of-communication verbs, whispering, yelling, mumbling, barking, muttering, and the like are more often, to varying degrees, noncommunicative. When used intransitively and with certain directional phrases, the manner-of-speaking verbs "describe the physical characteristics of a sound" rather than "an intended act of communication by speech" (Zwicky 1971: 225, 226):

(24) He whispered/yelled/mumbled/barked/muttered (but he wasn't saying anything).
He whispered/yelled/mumbled/barked/muttered at us/in our direction.

In fact, a search of the Treebank Switchboard corpus yields 17 occurrences of the five manner-of-speaking verbs, of which 12 are noncommunicative and 3 are semi-communicative (like "yelling for help", for which an interlocutor need not be present and, hence, the message may not be successfully communicated). Only 2 have complements which denote "the products of a speech act".

Granted that the uses of manner-of-speaking verbs are probably disproportionately describing noncommunicative activities, why should their commu-

[5]This count excludes nonalternating uses such as concealed questions (*I will tell you another plant that is purply*) and occurrences of the fixed expression *I('ll) tell you what*.

nicative uses favor the dative PP over the dative NP? Zwicky (1971: 226) observes that the directional *at, toward* phrases that modify manner-of-speaking verbs are in complementary distribution with the *to* PPs.

(25) He whispered/yelled/mumbled/barked/muttered at us/in our direction (*to John).

This fact suggests that these verbs have a variant of the allative type lexical semantics; here the PP denotes the orientation of the actor toward the goal rather than a path of movement. With these verbs the theme argument is usually a noncommunicative sound and less often the product of a speech act. The same PP syntax expresses both situations, with *at* selected for the former and *to* for the latter.

These observations are only suggestive, but they motivate our conjecture that *grammaticality judgments of contrasting pairs of examples may be systematically biased by the probability of similar descriptions of the event types depicted by the examples.*

We reemphasize that it is the probability of the *descriptions* of event types, not the events themselves, that we conjecture to be important in judging grammaticality. We have no idea whether yelling or muttering events are more or less probable than emailing or faxing events, but the proportions of yellings or mutterings that are described as communicative transfers of possession of information are much smaller, we suspect, than the proportions of emailings or faxings.

Thus, for communication verbs our hypothesis can be summarized in this way. We can use both dative NP and dative PP syntax to express communications, viewed as transfers of possession of information, but the prototypical dative verb of communication, *tell*, is heavily biased toward the dative NP construction. Now communication is more likely to be described in discourse about faxing, emailing, and other events involving means of communication than in discourse about whispering, yelling, mumbling, barking, and muttering. Hence, we are more likely to judge verbs in the *mutter* class as unacceptable with dative NP syntax than verbs in the *fax* class simply because there are far fewer instances of mutterings, mumblings, and yellings that are likely to be described as instances of tellings.

Empirical support for the hypothesis that frequencies of *descriptions* of events influence judgments of well-formedness comes from an experiment conducted by Bresnan (2006). Bresnan (2006) asked English speakers to rate various verbs in the dative NP construction in two conditions—either with a pronoun recipient (by far the most frequent usage in spontaneous conversations) or with the recipient headed by a lexical noun (much less frequent). The reportedly non-alternating verbs of motion and communication were rated higher with a pronominal recipient than the theoretically alternating verbs

with a lexical noun recipient. Thus the relative probabilities of descriptions of event types in usage appear to influence judgements of the well-formedness of the syntactic construction.

1.3 Grammatical Gradience

As we have seen, the gradience of the dative alternation pervades the lexicon, with the flexible and overlapping mappings of verbs and idioms to syntax. We now show that gradience also characterizes the grammar of datives, in two constraints on argument type positioning.

1.3.1 The *NP PRON Constraint

The *NP PRON constraint is widely cited in English linguistics. Personal pronouns, but not demonstrative or indefinite pronouns, are avoided when following lexical NPs if both are objects:

(26)

John gave it to Mary.	*Tom gave an aunt them.	*She gave John it.
John gave Mary it.	Tom gave them to an aunt.	I gave John that.
		She gave John one.
(Erteschik-Shir 1979:452)	(Collins 1995:39)	(Kay 1996)

In fact, however, the avoidance of NP Pronoun sequences appears to be gradient and not categorical in English. It is true that the Treebank Switchboard corpus has no examples of ditransitives with the NP Pronoun sequence, but the following examples are representative of those found in active use on the much larger corpus of web documents.

(27) VERB NP PRONOUN

Note: I don't give children peanut butter until they are 3 years old since it is recommended not to **give children it** to avoid possible allergies.

You should never give out your address or phone number online and you should never **send someone them** in the mail either.

Per[c]eptions about God's absence are due to our lack of **showing people him** through our life.

Mega Blast beam: This is kakuri's strongest ki attack only he has what it takes to know how to use it he can **teach people it** but it takes at least 2 years.

Please follow these simple rules and **teach your children them**, however most dogs are friendly.

Second graders finished their underwater scenes and are very proud of these. They could not wait to **show their parents them** and can't wait

to bring them home.

Speakers also vary in that some avoid pronouns in second object position even when the primary object is also pronominal:

(28) *... gave her it (Erteschik-Shir 1979: 452)
... gave him it (Hawkins 1994: 312)

1.3.2 A Soft Effect of Person

Bresnan, Dingare, and Manning (2001) found that there is a soft constraint in English aligning first and second persons with the subject argument and third persons with non-subject argument of dyadic verbs, whether active or agentive passives. This constraint matches a 'hard', or near-categorical constraint on the distribution of person in Salish languages like Lummi .

A similar constraint appears in the complements of English dative verbs (active voice). In the full Switchboard corpus, dative NPs of all types (pronominal and nominal) are more frequent than dative PPs of all types: 78.6% ($n = 1859$) of all the dative arguments collected are expressed as dative NPs, and only 21.4% ($n = 505$) as dative PPs. If we split up these dative arguments by person, we find that the distribution of local (first and second) persons is skewed toward dative NPs while the distribution of nonlocal (third) persons is skewed toward dative PPs (Fisher's exact test, p-value $= 1.874e-14$).[6] See Table 1.

TABLE 1 Person of Recipient by Dative Construction in SWITCHBOARD

	NP		PP		Total	
1ST, 2ND PERSON	688	(91%)	72	(9%)	760	(100%)
3RD PERSON	1171	(73%)	429	(27%)	1600	(100%)
ALL PERSONS	1859		501		2360	

A major problem with interpreting this finding is that person is highly correlated with other properties: for example, pronouns are short, definite, and tend to be given, and local person pronouns are in addition animate and seem nearly always given in conversations. We know that there is an effect of weight (correlated with word-length) on the dative alternation (Thompson 1990, 1995; Hawkins 1994: 212–213, 311–313; Collins 1995; Wasow 1997, 2002). Since local person pronouns are all short while nonlocal person NPs

[6] Here Fisher's exact test measures the strength of the association between person and recipient syntax—specifically, whether the ratio of local- to third-person recipients expressed as NPs differs significantly from the ratio of those expressed as PPs. This statistic is not affected by small cell counts or large imbalances in the table of data (such as the fact that there are many fewer prepositional dative constructions in the dataset than ditransitives). The extremely small p-value indicates that the association is unlikely to be accidental.

are longer on average, the weight or length effect would be in the same direction as the person effect: the shorter would tend to precede the longer. That would bias local-person recipients toward dative NP position adjacent to the verb and away from dative PP position following the often heavier or longer themes. Several regression studies have shown that weight and information status have distinct effects on ordering in alternating dative and possessive constructions in English (Arnold et al. 2000, Wasow 2002, Bresnan et al. 2007, Rosenbach 2005), but none to our knowledge have previously addressed whether the asymmetrical distribution of person observed in Table 1 can be explained by the other properties of weight, pronominality, animacy, givenness, and verbal semantics.

To answer this question we annotated the Treebank Wall Street Journal (WSJ) data from the Bresnan et al. study for person of recipient. We then fit a mixed-effect logistic regression model which added to the combined-corpus model of Bresnan et al. (2007) the factor of 'person' as a fixed effect and retained verb senses as a random effect. We found that there is indeed a small but significant effect of person, shown in Table 2.

TABLE 2 Dative Model Effects (95% Confidence Intervals)

Fixed Effects Odds Ratios for V NP PP Realization

			lower	est.	upper
(Intercept)			1.21	2.40	4.77
RECIPIENT accessibility	=	non-given	3.00	4.31	6.18
THEME accessibility	=	non-given	0.14	0.22	0.35
modality	=	WSJ	1.34	1.90	2.69
RECIPIENT pronominality	=	noun	3.99	6.21	9.67
THEME pronominality	=	noun	0.10	0.15	0.24
length difference (log scale)			0.27	0.31	0.36
RECIPIENT definiteness	=	indefinite	1.49	2.10	2.97
THEME definiteness	=	indefinite	0.20	0.28	0.39
RECIPIENT person	=	non-local	1.19	1.81	2.76
RECIPIENT animacy	=	inanimate	2.71	4.44	7.28

Table 2 shows the estimated parameters of the model and their 95% confidence limits. The fixed effects are those that hold across all of the verb senses. They show, for example, that a non-local person recipient is about 1.8 times more likely to be realized as a dative PP than a local person recipient, after adjusting for the larger effects of animacy and pronominality of the recipient. All of the fixed effects including person of recipient are significant, with the 95% confidence intervals all well-bounded away from 1.

Notice further in the table that the recipient predictor values all have magnitudes greater than 1, thus favoring the V NP PP structure, while the same values for the theme predictors all have magnitudes less than 1, favoring the V NP NP structure. In other words, nominality, non-givenness, indefiniteness, inanimacy, and non-locality of person in the recipient favor the non-Core (PP) realization, compared to the contrasting values of the recipient (pronominality, givenness, definiteness, animacy, and locality of person), which favor the core (NP) realization. (The complementary effects hold for the theme.) This is a pattern of *harmonic alignment*, softly manifested in probabilities (see Bresnan et al. 2007 for a more detailed discussion).

1.3.3 A Hard Effect of Person

We have seen that the boundaries between categoricity and gradience are fluid. We therefore might expect to find languages in which the gradient but broadly motivated person pattern we have discovered in English dative constructions is hardened into categorical rule systems.

Why person in particular would play a large role in the grammar of argument positioning is dissussed by Evans (1997: 398): "… [I]s only the role important, or does the choice of cast also influence the way an event is portrayed?" As Evans observes, the dative alternation (and the behavior of applicatives) depends not only on the verbal semantics of the roles of possessor or goal, but also on the properties of the cast of referents that fill the roles: animacy, person, information status (Evans 1997). He cites cases where comitative applicative constructions depend on 'cast' properties such as animacy and person.

Several languages show categorical pronominal and person splits in the dative alternation (Haspelmath 2004), but we consider just one here. Kanuri, a Nilo-Saharan language spoken in Nigeria, Niger, and Cameroon, shows a person split across alternative dative structures (Hutchison 1981). In Kanuri with the verb *give* a non-local person recipient can be expressed only in a postpositional phrase, (29a). However, if the recipient is second or first person, it is normally expressed as a direct object prefix on the verb, as in (29b). It appears to be highly dispreferred to drop the third person recipient, (29c).[7]

(29)	(a)	*shí-rò*	*yíkə́nà*	(b)	*nj-íkìn*	(c)	?*yíkə́nà*
		him-to	give.PRF		2SG.OBJ-give.IMP		Ø-give.PRF
		'I gave (it) to him'			'I give (it) to you'		'I give (it) to him'

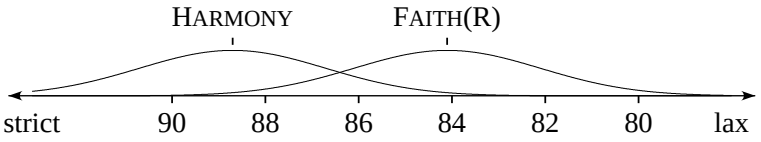
Note that in Kanuri only the single verb meaning *give*, according to Hutchison, shows a dative alternation. All other verbs express all recipients, whether local or nonlocal persons by means of postpositional phrases.

[7] All third person recipients found with the verb *give* in Hutchison (1981), Ellison (1937) and Lukas (1937) are marked by the postposition. (All of these examples are also specific.)

1.4 A Stochastic Optimality Theoretic Model

A simple Optimality Theoretic (OT) model of the dative alternation can be based on two conflicting constraint families, a faithfulness constraint family FAITH(REC) requiring that the recipient role of the verb be expressed by a morpholexical form which carries recipient meaning and a constraint family HARMONY penalizing disharmonic combinations of semantic argument type and type of syntactic expression. This model assumes the same input for each candidate set; the choice of syntax is always relative to a given meaning to be expressed. To model variability, we assume stochastic ('noisy') evaluation of constraints ranked on a continuous scale (Boersma 1998, Boersma and Hayes 2001). See Figure 1.

FIGURE 1 Constraint ranking on a continuous scale with stochastic evaluation



	HARMONY	FAITH(REC)
☞ give them cheques		*
give cheques to them	*!	

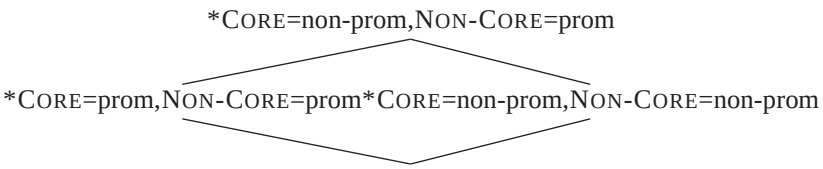
	FAITH(REC)	HARMONY
give them cheques	*!	
☞ give cheques to them		*

In OT with stochastic evaluation the variable rankings of HARMONY and FAITH(REC) produced by noisy evaluation will lead to constraint ranking reversals at a frequency which is a function of the distance between the constraints on the continuous ranking scale. Given variable ranking normally distributed around a mean, the closer together the constraints are, the more the ranking reversals, and the more variable the outputs. In this way an OT grammar with stochastic evaluation can generate both categorical and variable outputs. Categorical outputs arise when crucially ranked constraints are distant. As the distance between constraints increases, interactions become vanishingly rare.

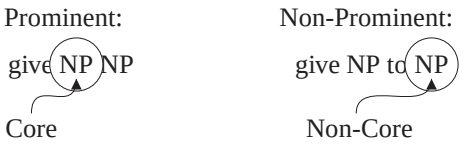
Our grammatical constraints on argument type positioning can be modeled by the HARMONY constraint family. We make use of a hierarchy of constraints schematized in Figure 2 which align nominal expression types with

Core and Non-Core argument positions (Prince and Smolensky 1993, Aissen 1999, 2002). Prominent argument types are preferentially aligned with core positions, and Non-prominent, with non-core. In the English verb phrase, as illustrated in (30), bare NP complements are Core arguments, while prepositional phrase complements are non-Core.

FIGURE 2 Constraint Hierarchy Schema



(30)



The *NP Pron constraint. Pronouns are more prominent than lexical NPs on the hierarchy of nominal expression types (Silverstein 1976, Aissen 1999, 2003). In Figure 2, therefore, by instantiating "prom" and "non-prom" with "Pron(oun)" and "Noun", respectively, we generate a hierarchy of constraints HARMONY(PRON) that can model the *NP PRON phenomena. Each constraint penalizes a disharmonic alignment of argument-types and positions, with the top of the hierarchy representing the most disharmonic combination and the bottom, the most harmonic.

The FAITH(REC) constraint ensures a faithful expression of the recipient and is violated when the recipient is not expresed in a canonical way (e.g. with a dative preposition). If FAITH(REC) dominates the entire prominence subhierarchy, all prominence types of the adpositional constructions will be optimal; conversely, if FAITH(REC) is dominated by the entire subhierarchy, no prominence types of adpositional constructions will be optimal. At intermediate points where it can be interleaved in the subhierarchy, FAITH(REC) splits possible constructions according to their harmony; for example, only the most disharmonic adpositional constructions are avoided when FAITH(REC) is dominated by the top constraint(s). Thus, the theory of harmonic alignment logically entails an implicational scale of construction types.[8]

[8]Equivalently, we can model the harmonic alignment by providing an implicational seman-

(31)

	FAITH(REC)	*CORE=Pron, NON-CORE=Noun
give Mary them	*!	
☞ give them to Mary		*

For example, the bottom constraint in the hierarchy—*CORE=Pron,NON-CORE=Noun—can be ranked so much lower than FAITH(REC) that the result is effectively a categorical absence of variation for [VERB NP PRON] inputs.

The middle constraints on the hierarchy of Figure 2 are mutually unordered. The speaker differences in (28) are captured by the rankings in (32).

(32) FAITH(REC) ≫ *CORE=Pron, NON-CORE=Pron ≫ *CORE=Pron, NON-CORE=Noun
FAITH(REC) , *CORE=Pron, NON-CORE=Pron ≫ *CORE=Pron, NON-CORE=Noun

In the first set of ranked constraints, FAITH(REC) is ranked high enough to suppress noticeable alternation when the recipient is pronominal, accounting for speakers who reject **gave her it*. In the second set, FAITH(REC) and *CORE=Pron, NON-CORE=Pron are ranked closely enough together to create a threshold of alternation through noisy evaluation, which results in allowing instances of double object construction with pronominal recipients, as for those speakers who accept *gave her it*.

Person effects. As for the soft and hard person effects, note that as designators of speech act participants, local (1ST, 2ND) persons are considered more prominent than non-local (3RD persons, and person shows harmonic alignment with Core and Non-Core argument positions (Aissen 1999, 2002; Bresnan, Dingare, and Manning 2001; Dingare 2001). In Figure 2, therefore, by now instantiating "prom" and "non-prom" with "Local" and "Non-Local", respectively, we generate a hierarchy of constraints HARMONY(PERS) that can model the person effects.

The Kanuri person split is straightforwardly captured by the constraint ranking in (33).

(33) *CORE=3,NON-CORE=1,2 ≫FAITH$_{give}$(REC) ≫ OTHER HARMONY

/give it to him/	*CORE=3,NON-CORE=1,2	FAITH(REC)	OTHER HARMONY
☞ him-to (it) give			*
(it) him-give		*!	

tics to the constraints rather than using a fixed hierarchical order, for example, by designing the constraint violations to have a subset relation. Both formulations must make equivalent stipulations of what constitutes the 'top' of the prominence hierarchy, either through constraint ordering relations or by constraint definition.

/give it to you/	*CORE=3,NON-CORE=1,2	FAITH(REC)	OTHER HARMONY
you-to (it) give	*!		*
☞ (it) you-give		*	

In Kanuri *CORE=3, NON-CORE=1,2 is ranked above FAITH$_{give}$(REC), and so if the input is 'I give it to you', the candidate with the recipient expressed in a postpositional phrase is excluded by highly ranked *CORE=3, NON-CORE=1,2. All other harmony constraints on person (*CORE=3, NON-CORE=1,2, *CORE=3, NON-CORE=3, *CORE=1,2, NON-CORE=3) are ranked far below the opposing constraint FAITH$_{give}$(REC). If the input is 'I give it to him' (the recipient is non-local person), the variant with postpositional expression of the Recipient (satisfying FAITH$_{give}$(REC)) wins.

Lexical variation and gradience. We can easily incorporate lexical variation into our model by distinguishing FAITH(REC) for smaller lexical and constructional semantic classes, as already shown in (33).[9] Then the greater resistence to alternation of some dative verbs will correspond to their more faithful observance of the constraint to mark a Recipient role. Thus a model of the Kanuri constraint system is shown in (34).

(34) FAITH$_{other}$(REC) $\gg$ *CORE=3,NON-CORE=1,2 $\gg$ FAITH$_{give}$(REC)) $\gg$ OTHER HARMONY

The Kanuri constraint system for the dative alternation resembles that of English, but the Kanuri constraints will be spread sufficiently far apart on the continuous scale to produce a (near-)categorical person split.

1.5 Consequences

If frequency differences among semantic classes of verbs in English are modeled in the same way as the lexical variation in Kanuri (namely, by lexical specializations of FAITH(REC)), then an interesting prediction is derived from the model: *the more highly biased a verb is toward the dative NP construction, the more driven by harmonic alignment it should be.* We illustrate this prediction with reference to the English verb *give*.

The verb *give* is often taken to be the prototypical dative verb; it is the highest-frequency dative verb in the Treebank Switchboard corpus, constituting 53% of all alternating dative verbs. Yet it does not have the same distribution of syntactic argument types as the pool of other dative verbs. Many uses of *give* are abstract, as in the attested examples *Um, but still, it gives **it** some variety*; *but I'm going to give **it** thumbs down*; *you know, give **it** a great deal of thought*; *and you can add hamburger if you want to give **it** a little more body*. To test our prediction, we should confine ourselves to semantically comparable cases of concrete event descriptions of transfer of possession.

[9] This idea was suggested to us by Stemberger's (2001) work.

Table 3 counts the realized constructions of dative verbs describing transfers of possession with animate recipients and concrete theme arguments in the full Switchboard corpus (Godfrey et al. 1992). It shows that *give* is more biased toward the ditransitive NP NP construction than the general pool of dative verbs (binomial test $x = 164, n = 233, p = 0.59$, p-value $= 0.0003$).

TABLE 3 Construction Type for 'Concrete' Transfers, *give* vs. All Dative Verbs

	give		All Dative Verbs	
NP NP	164	(70%)	304	(59%)
NP PP	69	(30%)	213	(41%)
Total	233	(100%)	517	(100%)

Analyzing the proportions of human and pronominal recipients of transfer of concrete possession uses of dative verbs, we show in Table 4 that person is harmonically aligned more strongly for *give* than for the dative verbs in general, as predicted by our model, (proportion test, $\chi^2_2 = 7.1036$, p-value $= 0.02867$). Thus *give* has a stronger preference for local-person recipients than the set of all dative verbs. This difference, though small, is still statistically significant and is in the direction implied by the model.

TABLE 4 Animate Pron. Recipients in 'Concrete' Transfers, *give* vs. All Dative Verbs

	give		All Dative Verbs	
1ST, 2ND person	92	(39%)	187	(36%)
3RD person personal pronoun	90	(39%)	187	(36%)
3RD person not personal pronoun	51	(22%)	143	(28%)
Total	233	(100%)	517	(100%)

The combined model of lexical and grammatical gradience has a further very interesting consequence: *the more highly biased a verb is toward the dative PP construction, the less driven by harmonic alignment it should be.* PP-biased dative verbs will show at most *partial* alignment effects, so that they will alternate (if at all) only with those dative NP configurations that avoid the most disharmonic PP constructions in Figure 2.

In our model, PP-biased verbs are represented by lexically specialized FAITH(REC) constraints which must dominate the constraint hierarchies of Figure 2 to avoid alternation with the dative NP construction. But variation – modeled by noisy constraint ranking reversals – occurs at a frequency which is a function of the distance between the constraints on the continuous ranking scale. Hence reranking a dominating FAITH(REC) constraint, if it occurs,

will occur most often at the top of the constaint hierarchy. For example, the first and second constraints in (35) will rerank more than the first and third.

(35) FAITH$_{drag}$(REC) $\gg$ *CORE=Noun, NON-CORE=Pron $\gg$ *CORE=Noun, NON-CORE=Noun

In this way the model explains contrasts like those in (36) and (37) (Bresnan et al. 2007, Bresnan 2006).

(36) He dragged him a can of beer. *vs.* ??He dragged a guest a can of beer.

(37) Karen hand-carried him a form. *vs.* ??Karen hand-carried a man a form.

This hitherto unexplained phenomenon is well illustrated by the verbs sampled from usage in Sections 1 and 2.

In conclusion, by incorporating both lexical and grammatical variation into the same stochastic model, we have shown how it is possible to model the fluid boundaries between categoricity and gradience in dative constructions and to derive new quantitative predictions of the relation of verb bias to argument harmony.[10]

An Anecdote

Mohanan is very fierce in argument, but for him it is a form of play. We have argued so often with Mohanan that in the end we gave up all pretense of argument and simply played. We drank beer with lime. We went jogging in the park before the sun rose in Singapore. We drove around strange places at night looking for strange cloth with our eyes rolling in our head and our head rolling on our neck. 'We' excludes the second author, who wishes she had been there, we think.

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[10] We note that the stochastic OT model used in the present study belongs to a family of new probabilistic approaches that permit unifying explanations of categorial and gradient effects in syntax. Other promising models include partially ordered constraint ranking (Anttila and Fong 2004, Fong and Anttila, this volume), the wide range of probabilistic models discussed in Bod, Hay, and Jannedy (eds) (2003), Manning (2003), and the pioneering cumulative stochastic model of OT of Mohanan and Mohanan (2003).

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