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What's mine is yours: Stable variation and language change in Ancient Egyptian possessive constructions

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Abstract

Variation is described as two or more variants competing for finite resources. In this model, two outcomes are possible: language change or specialization. Specialization can be broken down further: specialization for different functions, and partial specialization – stable variation. In this paper, I analyze the differences between stable variation and language change using the two variables present in Ancient Egyptian possessive constructions. Observing four Egyptian possessive variants, split into two groups with two variants each – clitic possessor variants and full nominal possessor variants – for a total of 2251 tokens, I compare factors affecting variant choice in each possessive group. Results of distributional and multivariate analyses indicate that a) change over time occurs in clitic possession, while stable variation occurs with noun variants; and b) different kinds of factors govern the two sets: the continuous variable phrase complexity affects variant choice in nominal possession, but does not affect the clitic variants.

Keywords: possessive constructions, language variation, sociolinguistics, language change, Egyptian language

Résumé

On décrit la variation comme deux ou plusieurs variantes en concurrence pour des ressources finies. Dans ce modèle, deux résultats sont possibles : le changement linguistique ou la spécialisation sémantique. Cette dernière peut également être décomposée : la spécialisation pour différentes fonctions et la spécialisation partielle (ou variation stable). Dans cet article, j'analyse les différences entre la variation stable et le changement linguistique en utilisant les deux variables présentes dans les constructions possessives en égyptien ancien. En observant quatre variantes possessives, divisées en deux groupes de deux variantes chacun – variantes de possesseurs clitiques et variantes de possesseurs nominaux complets – pour un total de 2 251 occurrences, je compare les facteurs affectant le choix de variante dans chaque groupe. Les résultats des analyses distributionnelles et de régression multiple indiquent que a) le changement au fil du temps se produit dans les variantes clitiques, alors que la variation stable se produit avec les variantes nominales ; et b) différents types de facteurs conditionnent les deux ensembles : la complexité de la phrase variable continue affecte le choix de variante dans la possession nominale, mais n'affecte pas les variantes clitiques.

Mots-clés: constructions possessives, variation de langue, sociolinguistique, changement de langue, langue égyptienne

1. Introduction

While language change necessitates language variation, the reverse is not necessarily true – variation can remain relatively stable over time. Such stable variation is one of the most elusive phenomena in sociolinguistics, with very little variation not eventually leading to language change. Why a given variable remains stable in a given language over time, or conversely, why a given change happens in a given language at a given time are not well understood – indeed, the latter is none other than the famous actuation problem (Weinreich et al. 1968). It is this question that I investigate. To do so, I rely on syntactic theory to make predictions about four Ancient Egyptian possessive constructions, two of which remain in stable variation over the course of Egyptian history, and two of which represent a language change that takes place over the course of more than 1500 years. I then use variationist sociolinguistic methodology to test these predictions, with results that illustrate a way forward in mapping the trajectory of other variables, in Egyptian and in other languages.[1]

1.1 Egyptian Possessive Variants

The Egyptian possessives are divided into two types: nominal possessives, where both possessor and possessum are nouns, shown in (1a) and (1b), and clitic possessives – where the possessor is a clitic, shown in (1c) and (1d).[2]

(1) a. nb-∅ tɜ-wy
lord- MSG land- MDU
'lord of the two lands'

b. ḥz(w)-t n(j)-t mnṯw
favour- FSG *nisbe*- FSG Montu
'the favour of Montu'

c. pr-∅=k
house- msg
'your house'

d. pɜy=f sɜ-∅
DEM=3 MSG son- MSG
'his son'

I treat these two as separate variables because they have distinct structures and, as I will show, distinct behaviours. The analysis will show that the nominal possessives

[1]Abbreviations used: D: determiner; Def: definite; dem: demonstrative; DP: determiner phrase; fsg: feminine singular; mdu: masculine dual; mpl: masculine plural; msg: masculine singular; NumP: number phrase; TLA: Thesaurus Linguae Aegyptiae.

[2]All examples and tokens for data analysis for this project were obtained from the *Thesaurus Linguae Aegyptiae* (TLA), a free online corpus of Egyptian texts, which contains over 1.1 million words. All examples are transliterated from hieroglyphic or hieratic into the standard Gardiner (1957) transliteration system. Transliterations from the TLA.

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constitute a stable variable, and clitic possessives represent a language change. But in order to make predictions about whether the nominal possessives are an example of stable variation or of language change, we must discuss the nature of language change and what conditions it, as opposed to what permits stable variation. The proposal I will focus on for this study is Fruehwald and Wallenberg's (henceforth F&W) hypothesis (Fruehwald and Wallenberg 2013; Wallenberg 2013). This hypothesis begins with the Competing Grammars model of language change: we begin with two or more variants, which then "compete" for usage, and the innovative form grows in frequency – with the change taking the shape of the letter 's' (Kroch 1989, 2001, 2005). That is, there is a small increase in the new form at first, followed by a rapid increase in usage, and finally a plateau where competing forms specialize for different functions, or where the new form entirely replaces the old.

What is not clear from the Competing Grammars model is why a variable will occasionally remain stable over time, instead of the new form replacing an old one. F&W, in an effort to answer this question, propose that, given the Principle of Contrast, two forms with the same meaning should be diachronically unstable. In other words, the default scenario should be language change, because the Principle of Contrast means that two forms with the same meaning will not be able to coexist over time indefinitely, and one form will replace the other. However, since not all variation leads to language change, this means that in cases of stable variation, there must be something blocking the change. F&W propose that there exists some extra-grammatical dimension that does this. Namely, all stable variables will be governed by at least one factor that exists on a continuum. And indeed, they find that, in their English and Icelandic data, instances where stability occurs involve a continuous factor group – for example, a noun-verb scale constrains the ing variable in English. This proposal is appealingly simple: the reason for stable variation is that there is no single environment where one variant is favoured; instead there are many environments where the variant's likelihood of occurring slowly increases (or decreases) the further one travels along the continuum of that factor group (Fruehwald and Wallenberg 2013; Wallenberg 2013).

In order to test this proposal, we need a stable variable with a continuous factor group that governs it. It would also be helpful to have a language change variable from the same language at the same time for easy comparison – this way we can control for external factors such as language contact. Enter Ancient Egyptian possessive constructions.

2. EGYPTIAN

The Egyptian language is attested since approximately 3250 BCE, and was spoken until the 18th century CE, making it the longest continually-attested language in the world (Allen 2013). Furthermore, the desert climate of Egypt helped preserve writings on fragile papyrus rolls and other organic materials on which texts were written. Finally, ancient Egyptian society was very rigid and hierarchical – indeed there is an entire genre of literature from the Middle Kingdom period (c. 2055–1650 BCE) called "instructional literature," a type of text used to tutor upper-class Egyptians in ways of speaking impressively and conducting themselves appropriately

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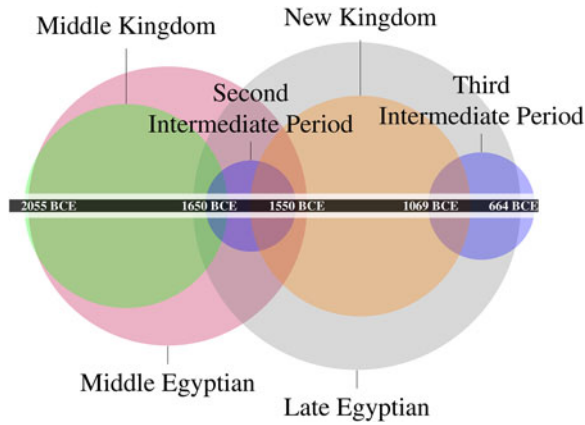

Figure 1. Timeline of Egyptian historical periods to be studied in this paper, and the language stages encompassing them.

in their language use (Fischer-Elfert 2003: 119–121), so as to advance themselves in society. "Proper" language use was so ingrained in Egyptian society that attempts were often made during the New Kingdom (c. 1550–1069 BCE) to continue to write in Middle Egyptian, especially for more formal registers. But since the spoken language had advanced so thoroughly into Late Egyptian even by the last part of the Middle Kingdom, many elements considered to be Late Egyptian, including the new variant of the clitic possessive variable, can be observed in texts from both the Middle Kingdom and the New Kingdom.

These three factors – the lengthy history of the written language, Egypt's dry climate preserving a number of texts, and the emphasis on speaking appropriately – make Egyptian an ideal candidate for the study of language variation and change. The best time period to investigate for this study ranges over a millennium, from the early Middle Kingdom (c. 2055 BCE) through the Third Intermediate Period (ending in 664 BCE); we begin when the language is Middle Egyptian and observe it as it develops through to Late Egyptian. Figure 1 illustrates this range of over a thousand years, the period in which the innovative variant of the change variable emerges and its usage takes off – the ideal backdrop for comparing a language change variable to a stable variable.

2.1 The Variables

Now we return to the variables themselves. As stated earlier, Middle and Late Egyptian had four ways of expressing possession, two of which involve clitic pronoun possessors, and two of which involve full-noun possessors.

2.1.1 Stable Variation

The first nominal construction involves simply two nouns, possessum and possessor, as shown in 2.1.1.

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(2) pr-Ø nswt-Ø
house- MSG king- MSG
'the king's house' (i.e., 'the palace')

Since this construction is similar to the Hebrew construct state construction (Ritter 1988), I refer to it the same way. The second construction, shown in (3), makes use of a *nisbe*, which in Semitic philology means any lexical item that is derived from another item of a different lexical category by adding the affix of the new lexical category (Hoch 1997; Allen 2010). In this case, the *nisbe* is derived from the preposition *n*, meaning 'to' or 'for.'

(3) ḥz(w)-t n(j)-t mnṯw
favour-FSG *nisbe*-FSG Montu
'the favour of Montu'

These two possessive constructions are not discussed in detail in the Egyptological literature or by the ancient Egyptians themselves, and no mention is made of either variant being new or innovative. There is no indication in previous literature that this variable is either stable or changing, nor is there any mention of it being affected by style or social judgments. Given the lack of discussion of this variable among Egyptologists, who in almost 200 years of study surely would have noticed a change as they did for clitic possession, I assume that the nominal possession structure is stable over time.

2.1.2 *Language Change*

The third and fourth Egyptian possessive constructions constitute the language change variable. These are clitic possessives; that is, the possessor is a clitic. The first of these, referred to henceforth as the *pr.k* possessive, is composed of the possessum followed by a possessor clitic. This variant is old: it is attested as far back as the first written stage of the language, Old Egyptian (Gardiner 1957; Hoch 1997; Loprieno 1995; Allen 2010). Examples are shown in (4).

(4) a. pr-Ø=k
house-MSG=2MSG
'your house'

b. nb-Ø=f
lord-MSG=3MSG
'his lord'

The second clitic possession structure is formed with the demonstrative, *pꜣ* (pronounced 'pa'), and its feminine and plural counterparts, *tꜣ* and *nꜣ*. The *pꜣ* possessive is a new, or innovative form, emerging several centuries after the prenominal demonstrative series itself begins to replace the post-nominal demonstratives that were typical of Old Egyptian (Allen 2010; Hoch 1997; Loprieno 1995; Gardiner 1957). Examples of this possessive construction are shown in (5).

(5) a. pꜣy=f sꜣ-Ø
DEM=3MSG son-MSG
'his son'

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b. t3y=j sn-t
DEM=1SG sibling-FSG
'my sister'

c. n3y=sn rmṯ-w
DEM=3PL people-MPL
'their peoples'

The prenominal demonstrative series and its associated possessive forms appear to have been stigmatized by the Ancient Egyptians themselves, as indicated by the statement in (6), found on the stela of Mentuwoser, written in the 12th dynasty, near the end of the Middle Kingdom.

(6) jnk mdw r r3-^{c} sr-w swy m ḏd-w p3-w
1SG speak to style nobleman-MPL free-from in saying-MPL *p*3-MPL
'I am one who talks according to the style of nobleman, free of saying *p*3'
(Sethe 1960: 79:17)

Nevertheless, in the same way that *be like* has taken over as a verb of saying in English, by the time of Coptic – the final stage of Egyptian – *p*3 demonstratives have fully replaced post-nominal demonstratives, and *p*3 possession has almost entirely replaced *pr.k* possession (Loprieno 1995; Allen 2013).

2.2 The Syntactic Connection

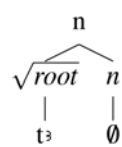
In order to make appropriate predictions about these variables, we must understand their syntactic structures. This is to say that syntactic theory can provide us with structural information about these possessives that will give us insight into how the language change takes place, and why the nominal variable is stable.

2.2.1 Competing Grammars

The Egyptian clitic possessives are an excellent example of a change in the grammar that potentiates the replacement of an older form by a new form: clitic possession would never have changed if it were not for the emergence of the *p*3 demonstrative. That is, I propose that this demonstrative is actually the first instance of a full, overt D in Egyptian, and that once this D appears, it creates changes in the possessive system via the demonstrative system.

Originally, Egyptian clitic possessives could only occur as *pr.k* constructions. I propose that this Egyptian construction, like the Hebrew construct state construction (Ritter 1988), is derived by head movement of the possessum to D. However, since the possessum is a full noun with a lexical root, rather than a clitic, the root first combines with the category-defining nominal head, *n*. After this, *n* has the structure in (7).

(7)



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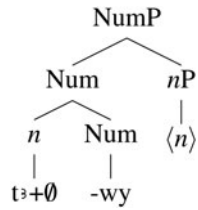
Next, the complex *n* head moves from its original position low in the tree, via head movement, to join with the Number head (Ritter 1992). This results in the various singular, dual, and plural gender suffixes we see on Egyptian nouns. For example, the structure for the dual word *t*ɜwy ('two lands') is shown in (8):

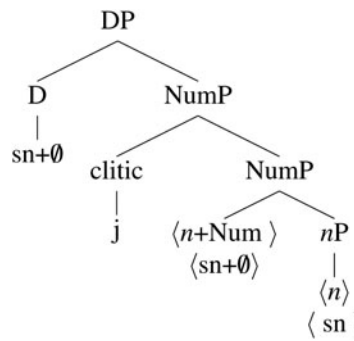
(8)



I therefore propose the structure in (10) for the clitic possessive construction in (9).

(9) sn-∅=j
sibling-MSG=1SG
'my brother'

(10)



As shown in (10), the possessum moves into the D head, just as in the Hebrew construct state construction (Ritter 1988). D is phonologically empty, but carries the uninterpretable features uN and uDefinite. uN attracts the nominal head, now in Num, while uDef agrees with the possessor DP to value its definiteness. This results in the combined *n* + Num moving up into D. In addition to this structure, I also propose that all Egyptian possessors are located in the specifier position of the Number Phrase (NumP), which is just below DP. I propose that this is necessary for all phonologically empty Ds in Egyptian, regardless of whether they are possessive constructions. Therefore, the resulting structure is shown in (12) for the DP in (11). This accounts for the highest D probe bypassing the DP in spec/NumP in nominal possession: the complex noun head there has already moved into its own D to value the features there, and the structures for nominal possessives that arise from this will be discussed further in the section below.

(11) pɜy hrw
m-DEM day-MSG
'this day'

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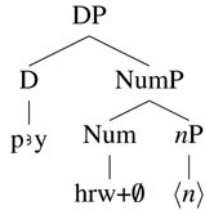
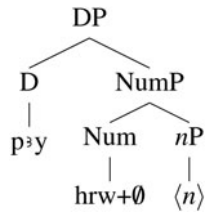
(12)



Therefore, in a non-possessive DP with a pre-nominal determiner, D will have no need to pull up the complex noun head in NumP; it is has already valued the necessary features by way of the pre-nominal determiner. Its structure, sans possessive, is therefore as follows in (14) for the DP in (13).

(13) pʒy hrw
m-DEM day-MSG
'this day'

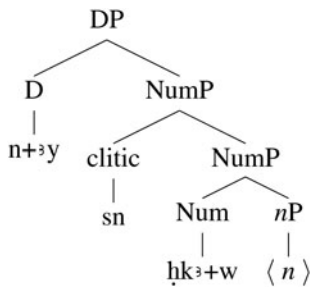
(14)



Since D is already occupied by a demonstrative, it will be impossible for the possessum to move into that slot whenever a demonstrative is present – leaving no way to create the *pr.k* possessive construction. Thus, the *p*ʒ possessive emerges, illustrated in (15); the proposed structure is shown in (16).

(15) nʒy=sn ḥkʒ-w
DEM=3PL sorcerer-MPL
'their sorcerers'

(16)



In this way, the change in the grammar that allowed for a pre-nominal D also created the *p*ʒ possessive. Once the new form appeared, the two demonstratives – pre- and post-nominal – competed for use. As the pre-nominal demonstrative won out, it

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also moved into the possessive system, and the *p3* posssessive out-competed the older variant there as well.

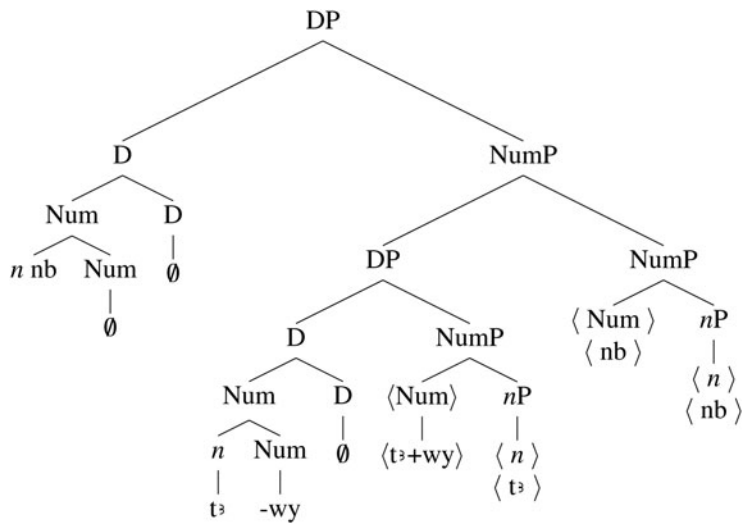
2.2.2 *Stability*

In contrast to the clitic possessives, the two nominal possessive constructions reveal some starker differences in their structure. To begin, let us consider the construction that uses only two nouns, as seen in (17).

(17) nb-∅ t3-wy
lord-MSG land-MDU
'lord of the two lands'

The structure I propose for this construction will be essentially the same as for the *pr.k* possessive, and therefore also similar to Hebrew. The difference here is that the possessor is a full noun rather than a clitic, which means it is also subject to head movement into Num, and is a complex *n* head like the possessum. Recall that even though the possessor is a full noun, it is located in spec/NumP, so the D probe will still bypass it. The result is the same as before: movement of the possessum into D. Since both possessor and possessum are nouns, this structure bears more resemblance to the Hebrew construct state construction (Ritter 1988) than does the *pr.k* construction – so much so that it can be considered the Egyptian equivalent of it. Its full structure is illustrated in (18).

(18)



Recall that the highest D probe will need to bypass the complex noun head in the lower DP because that D requires the lower noun head for itself. It becomes clear from this structure that there could be a continuous factor at work here: the number of modifying elements in the DP, or what I will call phrase complexity. Given the movement of the possessum into D, anything added to modify either noun (e.g., adjectives, which are always post-nominal in Egyptian) will always

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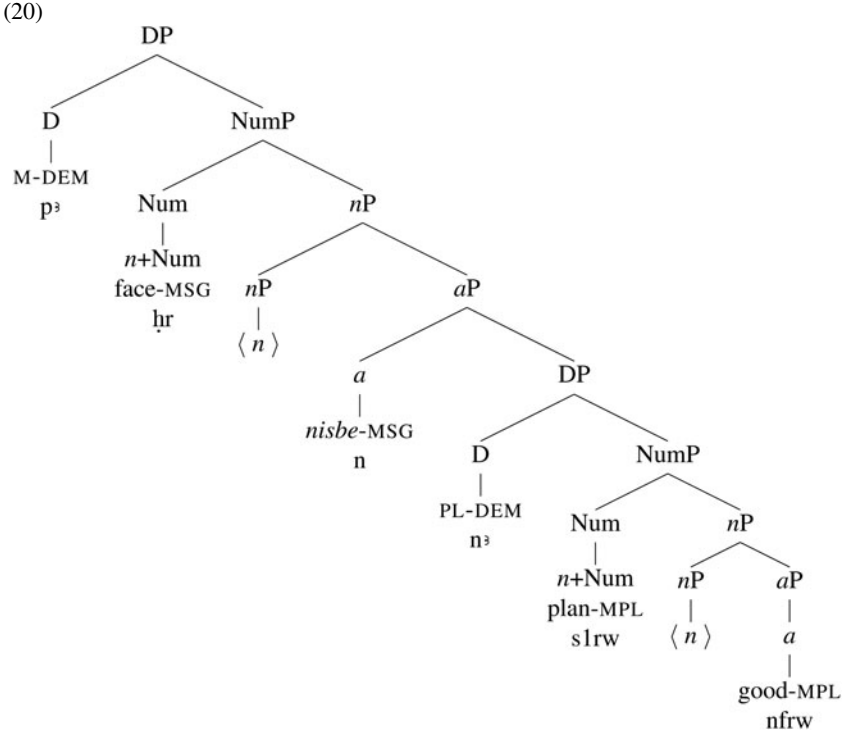
show up after the possessor in surface structure, whether it modifies possessor or possessum. This means that, on the surface, any modifying elements in this construction have the potential to be ambiguous about which noun they modify – possessor or possessum. Since Egyptian adjectives generally agree in gender and number with the noun they modify, such an ambiguity will not arise if possessor and possessum differ in gender and/or number. However, practically speaking, a majority of Egyptian nouns are masculine, and the overwhelming majority of the tokens obtained were masculine singular in both possessor and possessum. Indeed, so few feminine tokens (N < 200) and so few dual tokens (N < 20) were obtained in either possessor or possessum that an analysis of gender/number could not be properly conducted, although work is currently in progress using a larger dataset to investigate the effects of the individual words that appear as possessor and possessum.

Therefore, based on this structure, I predict that the more additional modifying information there is, the less likely a speaker is to use this possessive form. In addition, the form is less likely to be used with multiple *p3* demonstratives. It does not have space for an overt prenominal D since the slot is already filled by the possessum.

More "complex" constructions should therefore make use of the second nominal possessive type: the *nisbe* construction, whose proposed structure is shown in (19).

(19) p3 ḥr-∅ n-∅ n3 sḫr-w nfr-w
DEM face-MSG *nisbe*-MSG DEM plan-MPL good-MPL
'the face of the good plans'

(20)



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This example of *nisbe* possession already has three extra elements: two pre-nominal Ds not part of a *p*3 possessive, and a modifying adjective after the possessor.[3] This construction works like the English *of*-possessive, in that the *nisbe* 'of' adjective is an adjunct. In terms of its extra elements, this example would receive a score of + 3 along a complexity continuum – one point for each prenominal D and one for the modifying adjective 'good'.

2.3 Predictions

Given the syntactic structure of these constructions, and the historical and social background discussed above, we can make the predictions listed in (21) about Egyptian possessive constructions.

(21) a. Nominal possession and clitic possession are two different variables in Egyptian.
b. Since they are different variables, they should be governed differently and/or by different factors.
c. Nominal possession is stable variation (and clitic possession is language change).
d. Nominal possession should be constrained by at least one continuous factor, namely phrase complexity.

3 Methods

To test the hypotheses above, variationist sociolinguistic methods were applied. Tokens of each of the four possessive variants were extracted from the *Thesaurus Linguae Aegyptiae* (TLA 2016). Tokens were extracted from magical texts and letters from the Middle Kingdom through the Third Intermediate Period. I then coded each token for the factors listed in (22).

(22) a. text type
b. time period
c. syntactic complexity
d. noun type

Text type was included because previous results (Gardiner 2015, In press) indicate that this factor had a significant effect on clitic possession. Since the innovative *p*3 variant was considered colloquial, it should be favoured by vernacular texts like letters. Furthermore, it is important to include text type in order to show whether the two possessive types were different variables. If indeed they are two different

[3]I treat this *nisbe* as a possessive adjective, not a preposition, which describes the "belonging-to" status of the possessum. Like adjectives, it occurs with very highly modified nouns, follows the noun it modifies, and agrees with the noun, using adjectival gender/number agreement suffixes which never appear on prepositions. Like an adjective and unlike a preposition, it does not host clitics.

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variables, nominal possession should be affected differently by text type than clitic possession is.

Time period was included because previous work (Kammerzell 2000; Kupreyev 2013; Gardiner 2015, In press) indicates that clitic possession is an instance of change over time, which predicts that time period should be a significant factor in clitic possession. Since nominal possession is predicted to be stable over time, it should not be affected by time period. If borne out, these two predictions would support the hypothesis that the two variables are distinct. Tokens of unknown time period were excluded from the study.

Syntactic complexity was included as the continuous factor. Any possessive construction that contained only the elements required to create that construction received a complexity score of zero. Each additional element – optional demonstratives, adjectives, etc. – raised the complexity score by one. For example, a p3 possessive consisting of the demonstrative, clitic, and possessum would receive a score of zero, while a modifying adjective would raise the score to one. In contrast, any *nisbe* possessive consisting of noun + *nisbe* + noun that also included a demonstrative on one of the nouns would received a complexity score of 1, because the demonstrative in this case is not required to build the possessive construction, as it would be in a p3 possessive. Any given token could in theory have received a score anywhere from zero to infinity, but in fact the highest score assigned was six. For example, consider the tokens in (23).

(23) a. p3y hrw-∅
DEM day-MSG
'this day'

b. p3 ḥr-∅ n-∅ n3 sḏr-w nfr-w
DEM face-MSG *nisbe*-MSG DEM plan-MPL good-MPL
'the face of the good plans'

The nominal in (23a) would receive a complexity score of zero, because the demonstrative is necessary for the creation of the *p3* construction. However, (23b) would receive a complexity score of three. Recall that all that is required for *nisbe* possession are the possessor, possessum, and the *nisbe* itself. Therefore, neither the two demonstratives, nor the modifying adjective 'good', is necessary to construct *nisbe* possessives. Complexity is predicted to affect nominal possessives, but not clitic possessives.

Noun type was included because it is claimed in previous Egyptological work that the *pr.k* and nominal construction state constructions are equivalent and that both occur exclusively with inalienable nouns, while only *p3* possessives and *nisbe* possessives occur with alienable nouns (Kammerzell 2000).[4] Unfortunately, there is no list of agreed-upon "alienable" or "inalienable" in Egyptian. To investigate this claim, I therefore created the list of noun categories in (24).

[4]This also provides us with a discrete internal factor to compare with the continuous internal factor complexity.

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(24) a. intrinsic (unchanging) characteristics, which consisted of names and body parts
b. non-intrinsic (changeable) characteristics, which consisted of words and actions
c. family members
d. other

Nouns denoting intrinsic characteristics should act as inalienable, and therefore favour the *pr.k* construction, along with family members. Nouns denoting non-intrinsic characteristics and those classed as "other" should act as alienable and therefore favour the demonstrative genitive. Nouns denoting family members should fall in between the intrinstic category and the two alienable categories, since changing one's family members is decidedly more difficult than changing one's actions or one's material possessions. I also predict that, contra Kammerzell (2000), these factors will not behave the same way for the nominal possessives – that is, I predict that *nisbe* possessives are *not* equivalent to *p*3 possessives and therefore should not pattern the same way, and it follows from this that *pr.k* constructions will likewise *not* behave equivalently to nominal construct-state constructions. That is, nominal possessives are again hypothesized to be a different variable from clitic possessives.

A total of 2251 tokens were obtained, 1045 for clitic possession and 1206 for nominal possession. Distributional and multivariate logistic regression analyses were conducted using Rbrul (Johnson 2015), a package that operates in R (R Core Team 2013). Logistic regression is the most common way of analyzing sociolinguistic data, in particular data involving binary dependent variables like the ones we have here. The choice between variants is the dependent variable, while all possible contributing factor groups are independent variables. Since each variant choice is a discrete outcome rather than a continuous outcome, linear regression is not possible. In any given logistic regression analysis, the independent variables – the factor groups discussed above – can be discrete or continuous. In this study, only phrase complexity is continuous, while the other variables are discrete.

Once the distributional and multivariate analyses are performed, variationists use the result to build three kinds of evidence: significance, hierarchy of constraints, and strength of effect (Tagliamonte 2006). "Significance" in this case refers to statistical significance, a measure used in many other scientific disciplines. In sociolinguistics, when any given factor group is significant, it means that the pattern of influence on variant choice shown by that factor group is very unlikely to have been obtained by chance. Statistical significance is indicated by a *p*-value of a specific number, a value that represents the probability of observing an effect if the null hypothesis were true. In this context, the null hypothesis is always that the factor group has *no* measurable effect on variant choice. If that factor group is statistically significant, the conclusion is that there *is* a measurable effect on variant choice. The accepted threshold for significance here, as in most disciplines, is a *p*-value of less than 0.05, which means that there is less than a 5% likelihood that the results look the way they do due to random chance (that is, that they are not due to any effect at all).

Where significance tells us whether the factor group has any kind of effect on variant choice, the second kind of evidence – the hierarchy of constraints – tells us

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how that factor group affects variant choice. Recall that each dataset has two variant choices as its dependent variables. In Rbrul, one of these choices must be set as the "application value", which means that any factor in a given factor group that favours this choice – that is, that makes its choice more likely over the other variant – will have a high factor weight. Likewise, any factor that disfavours this choice (and therefore favours the other variant) will have a low factor weight. The value of a factor weight is always a number between zero and one, with zero being low and one high. The factor with the highest weight affects variant choice in the opposite way from the factor with the lowest weight, and every factor in a given factor group will be ranked from highest factor weight to lowest factor weight. This allows us to determine which factors increase or decrease the likelihood of each variant in each factor group. Rbrul also provides log odds in its results. These provide the same information as factor weights, except that for log odds the halfway point is zero, and factors disfavouring the application value are given negative numbers, while factors that favour the application value are given positive numbers. Returning to the case at hand, I predict here that text type will have a statistically significant effect on the clitic possessives, where *p*3 is disfavoured in more formal texts and favoured in more vernacular texts because of its lack of prestige.

The third kind of evidence ties into the previous two. While significance tells us whether the factor group affects variant choice at all, and constraint ranking tells us how each significant group affects variant choice, relative strength measures *how much* each factor group is influencing the choice of variant. Factor weights very close to zero at one end of the factor group, and very close to one at the other end mean that the effect is strong. Factor weights close to the midpoint mean the effect is weak. For log odds, a greater range of both positive and negative numbers indicates a stronger effect. In Egyptian, time period should have a strong effect on clitic possession, because it is an example of language change.

4. Results

I first discuss the results of the analysis of clitic possessives, before turning to nominal possession.

4.1 Clitic Possession

The results of the distributional and multivariate analysis of clitic possessives indicate that significant external factors in clitic possession were text type ($p < 0.01$) and dynasty ($p < 0.01$), as well as the internal factor noun type ($p < 0.01$). Complexity was *not* significant. The results are shown in Table 1. All factors, including non-significant ones, were included in both the distributional and logistic regression analyses. Only significant factors are reported on.[5]

[5]Dynasty divisions were made based on token availability and Egyptological divisions of time periods: Dynasties 11–14 constitute the Middle Kingdom and the beginning of the Second Intermediate Period; Dynasties 17–18 constitute the Pre-Amarna New Kingdom; Dynasty 19

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	pr.k		*p*3		weight	log odds
	N	%	N	%		
Dynasty						
20–21	285	83.5	49	14.7	0.89	+2.04
19	303	87.3	44	12.7	0.73	+1.02
17–18	96	93.2	7	6.8	0.25	−1.12
11–14	249	95.4	12	4.6	0.13	−1.94
Range					*76*	
Text Type						
letter	269	73.7	96	26.3	0.85	+1.72
magical	664	97.6	16	2.4	0.15	−1.72
Range					*70*	
Noun Type						
other	241	76.0	76	24.0	0.81	+1.46
family	121	84.6	22	15.4	0.74	+1.07
non-intrinsic	88	88.9	11	11.1	0.50	+0.01
intrinsic	483	99.4	3	0.6	0.07	−2.53
Range					*74*	
Complexity						
0	1029	91.4	97	6.8	[ ]	[ ]
1	35	72.9	13	27.1	[ ]	[ ]
2	0	0.0	2	100.0	[ ]	[ ]
3	1	100.0	0	0.0	[ ]	[ ]

Table 1. Significant factors for clitic possession ($p < 0.05$). *p*3 possession was the application value. Complexity was not significant but was included in the regression model, and its distributional values are included here.

As illustrated clearly by the results in Table 1 and again in Figure 2, time period behaves exactly as predicted: the later the period, the more the innovative *p*3 variant is favoured. The ranges of the factor weights (0.13 to 0.89) and log odds (–1.94 to + 2.04) also tell us that the effect is strong. The large jump from 6.8% to 12.7% that occurs between Dynasty 18 and Dynasty 19, the largest increase in the dataset, is especially noteworthy: Kupreyev (2013) claims, from an Egyptological perspective, that this is the period when the *p*3 possessive increased greatly in usage. During this period, the pharaoh Akhenaten made the decision to move Egypt's capital to what is now called Amarna, a city located in the eastern desert. In his capital, Akhenaten endorsed new writing styles, among other changes (Redford 1984). His son, the famous Tutankhamun, tried to restore the old ways at the end of the 18th Dynasty (Redford 1984), but these results, consistent with Gardiner (2015, In press), indicate

constitutes the "Golden Age" of Ancient Egypt; Dynasties 20–21 make up the Ramesside period Allen (2013, 2010); Gardiner (1957).

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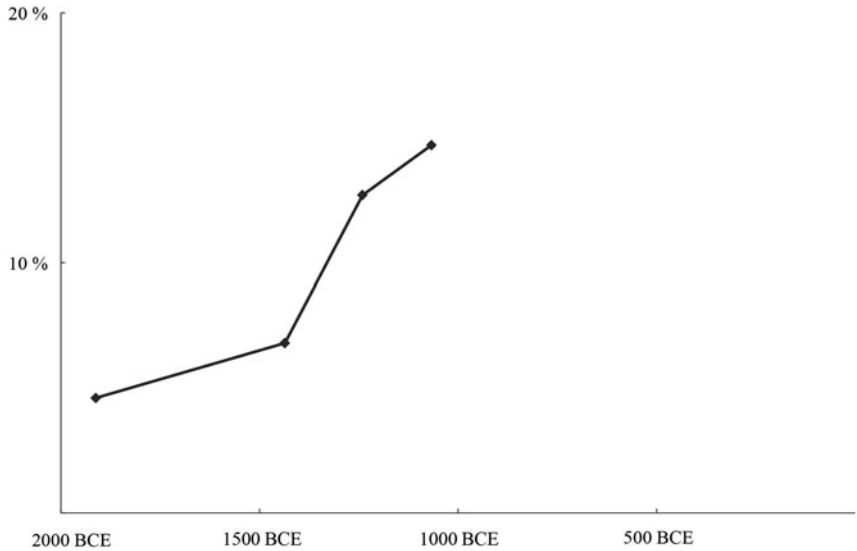

Figure 2. The percentage of *p*3 tokens in each time period.

that restoration attempts could not stop the spread of the *p*3 language change. The steep part of the s-curve had already begun.

Text type was significant as well, also in line with Gardiner (2015, In press): letters, the vernacular text type, unsurprisingly favour the innovative *p*3 variant. Magical texts are more conservative. The range in factor weights and log odds is quite large, indicating that this effect is quite strong as well. This is a new finding, but a relatively unsurprising one: any non-epistolary text is likely to be written in a more formal register than a letter would be. These magical texts, most of which are formal medical/magical instructions for curing headaches or other ailments, would certainly fall under that larger umbrella of non-epistolary texts. Therefore, it is reasonable that they should be written in a more formal register than letters, thereby disfavouring the more stigmatized vernacular *p*3.

In terms of internal factors, only noun type had a significant effect on clitic possession. This is consistent with Egyptological claims, and indeed the constraint ranking of nouns, shown in Table 1, does also appear to be consistent with Kammerzell's (2000) claim that alienable nouns favour the *p*3 variant and inalienable nouns favour the *pr.k* variant. It is also consistent with results reported by Gardiner (In press), where noun type was found to be a significant predictor – though in that work, this factor was presented as binary (alienable vs. inalienable). This effect appears to be quite strong as well – the only potentially odd result here is the extremely low factor weight for intrinsic nouns. However, a look at the interaction of noun type with text type reveals that the low factor weight is due to the fact that most intrinsic nouns appear in magical texts, which we have already seen have their own effect on variant choice. This is illustrated by Figure 3.

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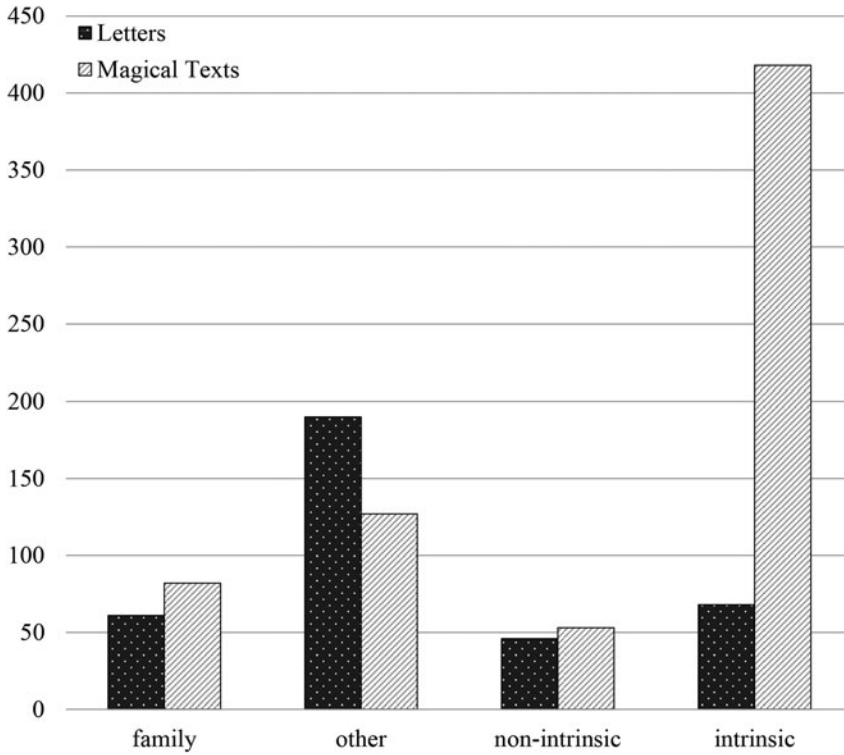

Figure 3. Noun type composition of magical texts and of letters, by number of tokens.

Removing all the magical-text tokens from the analysis does not eliminate the significance of noun type, so we can conclude that it is significant on its own as well. Likewise, a second logistic regression analysis with an interaction factor group of noun type by text type, shown in Table 2, reveals a similar pattern (while also keeping the effects of Dynasty). We can also see from this table that the effect of this interaction group is quite strong: Factor weights for noun type range from 0.02 to 0.96 and the log odds range from −4.12 to +3.24. It is also evident that the effect of noun type is slightly stronger than the effect of text type: the preference of intrinsic nouns for the *pr.k* possessive is so strong that even in letters its factor weight is quite low at 0.29. In other respects, letters strongly favour the innovative *pꜣ* variant while magical texts strongly favour the older *pr.k* variant.

In summary, the clitic possession results are consistent with the predictions outlined, and are also in line with Egyptological claims and the results in Gardiner (2015) and Gardiner (In press). Complexity was not found to be statistically significant, in line with the hypotheses outlined above.

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	pr.k		*p*3		weight	log odds
	N	%	N	%		
Dynasty						
20–21	285	83.5	49	14.7	0.89	+2.11
19	303	87.3	44	12.7	0.75	+1.08
17–18	96	93.2	7	6.8	0.22	−1.27
11–14	249	95.4	12	4.6	0.13	−1.92
Range					*76*	
Noun Type by Text Type						
family – letter	41	67.2	20	32.8	0.96	+3.24
other – letter	125	65.8	65	34.2	0.96	+3.10
non-intrinsic – letter	37	80.4	9	19.6	0.83	+1.57
other – magical	116	91.3	11	8.7	0.49	−0.06
intrinsic – letter	66	97.1	2	2.9	0.29	−0.92
non-intrinsic – magical	51	96.2	2	3.8	0.24	−1.18
family – magical	80	97.6	2	2.4	0.16	−1.64
intrinsic – magical	417	99.8	1	0.2	0.02	−4.12
Range					*94*	

Table 2. Significant factors for clitic possession ($p < 0.05$). *p*3 possession was the application value. Complexity was not included here, as it was previously found not to be significant.

4.2 Nominal Possession

A second, separate set of distributional and multivariate logistic regression analyses were performed on nominal possessives. Only two factors were found to be significant in the results of the distributional and logistic regression analysis of nominal possession: noun type ($p < 0.01$) and phrase complexity ($p < 0.01$). These results are illustrated in Table 3. All factors, including non-significant ones, were included in both the distributional and logistic regression analyses. Only significant factors were reported on.

Noun type was found to be significant, but it affects nominal possession differently from clitic possession: here both kinds of characteristics (intrinsic and non-intrinsic) favoured the *nisbe* adjective possession. These data support (Kammerzell 2000) in terms of non-intrinsic traits, as these should be alienable. However, they oppose Kammerzell (2000) for intrinsic traits, as these are generally considered inalienable. Likewise contrary to Kammerzell (2000), the "other" category of nouns, considered to be alienable, quite strongly favours the construct-state possessive construction. These results indicate that, contra Kammerzell (2000), the *pr.k* clitic possessive construction does not parallel the nominal construct state possessive construction, nor does the *p*3 possessive construction line up with the *nisbe* possessive construction.

Complexity, the continuous factor, *is* significant for this variable. It indicates that the more complex the possessive (the more additional elements it possesses), the

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	construct state		*nisbe*		weight	log odds
	N	%	N	%		
Text Type						
letters	399	60.3	263	39.9	[ ]	[ ]
magical	325	51.8	302	48.2	[ ]	[ ]
Dynasty						
20–21	172	53.9	147	46.1	[ ]	[ ]
19	161	52.1	148	47.9	[ ]	[ ]
17–18	92	53.2	81	46.8	[ ]	[ ]
11–14	240	59.3	165	40.7	[ ]	[ ]
Noun Type						
intrinsic	47	23.9	150	76.1	0.77	+1.22
non-intrinsic	53	43.8	68	56.2	0.60	+0.40
other	475	61.0	304	39.0	0.40	−0.39
family	90	82.6	19	17.4	0.23	−1.24
Range					*54*	
Syntactic Complexity						
letter	continuous	+1				+0.736

Table 3. Significant factors for nominal possession ($p < 0.05$). *Nisbe* possession was the application value. Text type and time period were not significant but were included in the regression model, and their distributional values are included here.

more likely it is to occur with the *nisbe* construction rather than the construct state.[6] Since complexity was not found to be significant in the clitic possessives, and since it affects the nominal possessives in this continuous way, this finding is in striking support of the continuity hypothesis proposed by Fruehwald and Wallenberg (2013) and Wallenberg (2013).

These results provide excellent support for all four hypotheses as well: text type was not significant, indicating that at least one of the factors governing clitic possession does not have the same effect on nominal possession.

Likewise, time period was also not significant, indicating that this variable, at the very least, does not follow the typical s-curve pattern. At most, it indicates that this variable is stable, unlike its clitic counterpart. Further evidence from the raw numbers and percentages reveals that the latter is most likely. This is shown in Table 4, where we see for Dynasties 17–21 a distribution of slightly more than 50% for construct state possessives and slightly less than 50% for *nisbe* possessives.

The only exception to the 55–45 split is the period from Dynasty 11 to Dynasty 14, but this is accounted for by the distribution of noun type by time period. Recall from Table 3 that *nisbe* possessives are favoured by intrinsic and non-intrinsic nouns,

[6]This factor was also modelled discretely in a separate run of the analysis, and was found to be significant in the correct order – ascending from 0 to 6 in favour of the *nisbe* construction.

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	construct state		*nisbe*	
	N	%	N	%
Dynasty				
20–21	172	53.9	147	46.1
19	161	52.1	148	47.9
17–18	92	53.2	81	46.8
11–14	240	59.3	165	40.7

Table 4: Nominal possessives by dynasty.

while construct state possessives are favoured by "other" and family nouns. A look at Figure 4 makes it clear that the period of Dynasties 11–14 simply has more family nouns, and especially more "other" nouns, as well as slightly fewer intrinsic nouns – thereby tipping the scales both against the *nisbe* variant and in favour of the construct state variant.

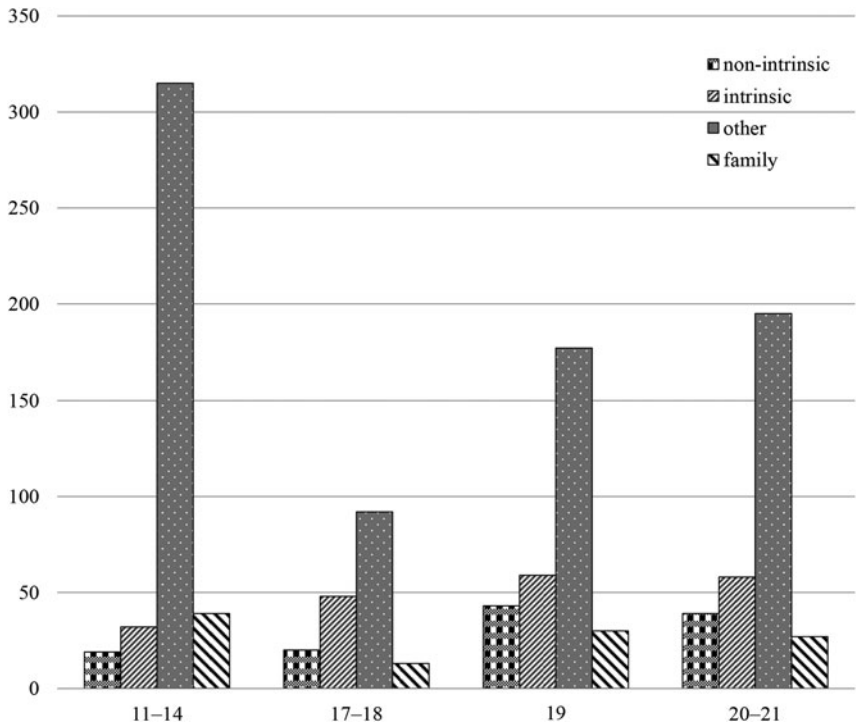

Figure 4. Noun type for each time period in nominal possession, by number of tokens.

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5. Conclusions

The results of the statistical analysis support all four hypotheses proposed. Nominal possession and clitic possession do behave like different variables. They are constrained by different factors, and where the factor groups do overlap, they affect each variable differently. Likewise, the results support the hypothesis that nominal possession is stable over time, and that clitic possession is undergoing language change, with the p3 form increasing in usage and slowly replacing the *pr.k* variant. And finally, these results also support the continuity hypothesis proposed by Fruehwald and Wallenberg (2013) and Wallenberg (2013): nominal possession, the stable variable, is constrained by the continuous factor syntactic complexity, while clitic possession, the change variable, is not. These results do not tell us definitively what stable variation or language change should look like, but they are a first step forward in our understanding of variation over long periods, and in being able to make predictions about whether any given variable will change, or remain stable over time.

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