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If you think twice, you might not forget: inhibition and memory-maintenance trade-offs in Russian single vs. Hausa bipartite negation

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Abstract

Several approaches have attempted to explain the skewed distribution across languages and regions of bipartite compared to single negation, the latter unequivocally the most common, but still often subject to diachronic change. It is a paradox that double negation arises, among other things, to strengthen negation semantically or define its scope, while at the same time, this fortification may lead to its demise. Several grammaticalization pathways result in double, discontinuous negation typologies negating single events or constituents, but such constructions seem to be inherently unstable. Here, I look into the possibility that when negation-induced forgetting, or NIF, a cognitive phenomenon which presumably affects all types of negation, is applied in bipartite negation, it simply becomes too much for memory to handle. NIF research has established that when negated sentences are processed, the mind simulates the affirmative as well as the negative version in parallel, straining processing capabilities. Working memory limits the number of units to be kept actively in mind to about four chunks, which directly impacts on how many syntactic constituents, and how long and complex they are, may intervene between a first and a second negator, in the case of double discontinuous negation. In the case of Hausa, this has the effect of moving the second negator forward to the next syntactic landing site, even if this means bisecting a negated constituent. Such behavior is absent in Russian simple, contiguous, and compact negation, undoubtedly the most common negation type

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across languages and regions. The possibility that Russian, too, might be in the process of developing a second negator is considered, and rejected. However, Russian single negation also faces memory-related drawbacks; it is argued that focal negation and late negator placement in incremental syntactic processing logically leads to deeper NIF effects compared to distributed and early negator systems. Evidently, linguistic negation typology does not select or reject negation strategies based on how deeply a negated content is forgotten; instead, memory might index negation strategies given that the same general neurocognitive mechanisms that produce NIF: activation, inhibition, prediction, and working-memory allocation, are also the mechanisms that shape real-time language processing.

1. Introduction

The present study is intended as a theoretical and explanatory contribution rather than an experimental one. Its aim is to integrate findings on negation phenomena from typology, grammaticalization, psycholinguistics, and cognitive neuroscience into a unified account of why bipartite negation systems may be diachronically less stable than monopartite systems. The hypotheses advanced here are grounded in established empirical findings from these fields but are not themselves tested experimentally. Instead, they are offered as theoretically motivated predictions that can be evaluated in future psycholinguistic and cross-linguistic research.

1. 1. Negation typology and distribution suggests recurrent change

Negation is an indispensable semantic relation in human language, yet despite its logical simplicity, its linguistic expression varies widely across languages. Linguistic typology reveals a rich variety of ways in which languages mark negation, the starkest contrast being that between a single negator contiguous to its negated material, and bipartite, discontinuous negators wide apart, both negating one event, not two.

Cross-linguistically, languages with a single standard negator[1] (most often preverbal, e.g., Russian, see (1)) clearly outnumber languages with obligatorily discontinuous (bipartite) negation, though bipartite patterns are far from marginal (van der Auwera & Krasnoukhova 2020; Lindblom 2013).

[1] Following the typological distinction between monopartite and bipartite negation, I use the more transparent terms **single negation** and **double negation** in the remainder of the paper to refer respectively to constructions with one versus two grammatical negators.

(1) Ja ne znaju *Russian*
1SG NEG know.1SG.PRS
'I don't know'

Discontinuous marking of standard negation is common and has been documented in numerous languages across diverse language families (Li 2019), including the Afroasiatic language Hausa (Newman 2000), see (2)):

(2) bà-n sanìi ba *Hausa*
NEG1-1SG know NEG2
'I don't know'

To get an impression of its distribution, the World Atlas of Language Structures Online (WALS: https://doi.org/10.5281/zenodo.13950591) report that among 1,325 languages of so-called "simple clausal negation", the majority (1,060) have a single negative marker either before (as in 3a) or after (3b) the verb, while 114 languages are coded as having obligatory double negation (3c), 80 as having optional double negation markers (3d), and 5 languages have optional triple negation with obligatory double negation (3e) (Dryer 2013: http://wals.info/chapter/143).

(3)

a) Kutenai (isolate; British Columbia, Canada and Idaho/Montana, USA; Dryer 2013)
ʔat=u **qa** ʔiknuquk-ni.
HABIT=1SUBJ NEG smoke(tobacco)-INDIC
'I don't smoke.'

b) Kresh (Central Sudanic, Nilo-Saharan; Sudan/Central African Republic; Brown 1994: 165)
Kôkó ãmbá gõkó **ˊdĩ**
Koko he.hit Goko NEG
'Koko did not hit Goko.'

c) Hdi (Chadic, Afro-Asiatic; Cameroon and Nigeria; Frajzyngier 2002: 380)
ɗvà **'á** xdí-xà tá l'école **wù**
like NEG Hdi-PL OBJ school NEG
'The Hdi (people) do not like school.'

d) Mupun (Chadic; Nigeria; Frajzyngier 1993: 353)
(ba) kə̀ n=se lua nyer **kas**
NEG PERF 1SG=eat meat bird NEG
'I did not eat the bird meat.'

e) Gunbalang (Gunwinyguan; Northern Australia; Harris 1969: 35)
ngayi **ngarra**-kirta-**ng**
1SG 1SG.NEG-go-PAST.NEG
'I didn't go.'
ngayi **ngunta** korro-kenta **ngarra**-kirta-**ng**
1SG NEG LOC.TO-there 1SG.NEG-go-PAST.NEG
'I didn't go down there.'

This indicates that roughly one in seven languages has some kind of systematic bipartite/discontinuous standard negation pattern, compared to a clear majority with a single preverbal or postverbal negator. Conversely, between 83-86% have a single negator in other data sets (van der Auwera and Krasnoukhova 2020), which prompts us to ask why single negator negation is much more common than bipartite negation. Before answering this question, however, we need to look into the various grammaticalization paths of double negation.

1. 2. The many paths to double negation

From a grammaticalization perspective, bipartite or double negation emerges through a limited but recurrent set of diachronic pathways rather than through a single invariant cycle. A central insight of recent work is that many languages possess lexical or pragmatic devices that reinforce negation, but only some of these are subsequently reanalyzed as structural components of the negation system. The development of a second negator (NEG2) is therefore neither inevitable nor uniform across languages (Breitbarth et al. 2010; van der Auwera & Krasnoukhova 2020). Breitbarth et al. (2010) argue that the emergence of new negators typically proceeds through two stages: first, a minimizer or generalizer becomes a negative-polarity expression; second, this expression may be reanalyzed as a marker of sentential negation. Crucially, many developments stop at the first stage and never proceed further.

One common source of NEG2 is **minimizers**, i.e. expressions denoting a minimal quantity such as 'step', 'drop', 'crumb', or 'thing'. Initially these occur as optional reinforcers in negative contexts, but they may later be reanalyzed as part of the negation construction (Breitbarth et al. 2010). The classic example is French *pas* 'step', illustrated in (4), which developed from a scalar minimizer into an obligatory postverbal negator before ultimately replacing the original preverbal marker *ne* in colloquial French (Jespersen 1917: 7; Breitbarth et al. 2010; Lindblom 2013: 5).

(4)

a)	Jeo	ne	di		*Old French*
	1SG	NEG	say.PRS.1SG		
	'I do not say'				
b)	Je	ne	dis	pas	*Modern Standard*
	1SG	NEG1	say.PRS.1SG	NEG2	*French*
	'I do not say'				
c)	Je	dis	pas		*Modern colloquial*
	1SG	say.PRS.1SG	NEG2		*French*
	'I do not say'				

Related to minimizers are **focus-sensitive reinforcers** expressing meanings such as 'even' or 'at all'. These strengthen denial without necessarily becoming negators themselves. For example, Tamasheq *wæla* 'even, at all' occurs together with the negator

wər in (5), reinforcing the negative meaning and illustrating an incipient stage of negation reinforcement (van Gelderen 2011; Heath 2005: 589).

(5)	wər	i-ja	wæla	əndərræn	*Tamasheq*
	NEG	3MSG-be.done	even	little	
	'Nothing happened at all'				

A second major pathway involves indefinite pronouns and negative-polarity expressions. Breitbarth et al. identify generalizers such as 'thing' and 'anything' as particularly common sources of new negators, while emphasizing that most such expressions never progress beyond negative-polarity status. Welsh nevertheless provides a well-known case where this development did occur. Middle Welsh employed the preverbal negator *ny*, while Modern Welsh uses *ddim*, originally an indefinite expression meaning roughly 'anything' or 'at all', as the principal marker of negation (Willis 2006: 63), see (6). Other examples of phrasal indefinites being reanalyzed as negatives come from English, Celtic, Greek, Romance, and to some extent, Slavic (van Gelderen 2011).

(6)	a)	…**ny**	wnn	i	pwy	wytti	*Middle Welsh*
		NEG	know	1SG	who	are-2SG	
		'…I don't know who you are'					
	b)	Wn	I	**ddim**	pwy	wyt	ti	*Spoken Welsh*
		know	1SG	NEG	who	are	you	
		'I don't know who you are.'						

A similar development is found in Moroccan Arabic. In Standard Arabic, *mā* functioned as the negator ('not') while *šayʾ* meant 'thing/anything'. The frequent occurrence of *šayʾ* in negated expressions (*mā … šayʾ* 'not … anything') led to its reanalysis as the postverbal negative marker *-š* in Moroccan Arabic, yielding the bipartite pattern *ma … š* (Benmamoun 2000, cited in Bejja & Dkhissi 2023). See example in (7) (Bejja & Dkhissi 2023: 61).

(7)	a)	qrit	had	le-ktaab	*Moroccan Arabic*
		read-PAST	this	the-book	
		'I read this book'			
	b)	**ma**-qrit-š	had	lə-ktaab	*Moroccan Arabic*
		NEG-read.PAST.1SG-NEG	this	the-book	
		'I did not read this book'			

Beyond minimizers and indefinites, a third source domain is attested that may develop into second negators: discourse-pragmatic particles associated with denial, correction, or contradiction. Brazilian Portuguese provides such an example; alongside ordinary

preverbal negation (*não V*), many varieties permit *não V não*, where sentence-final *não* functions as a discourse-sensitive NEG2 associated with the rejection of an activated proposition (Schwenter 2005), see (8). Table 1 summarizes attested grammaticalization paths to second negators.

(8) A Cláudia não veio à festa não. *Brazilian Portuguese*
DEF Claudia NEG1 came to party NEG2
'Claudia didn't come to the party.'

Source domain	Typical meaning before grammaticalization	Representative example
Minimizers	'step', 'crumb', 'drop', 'thing'	French *pas* 'step'
Indefinites / NPIs	'anything', 'thing', 'nothing'	Welsh *ddim*, Arabic *šayʾ* > *-š*
Discourse particles	denial, correction, contradiction	Brazilian Portuguese sentence-final *não*

Table 1. Attested grammaticalization paths to second negators

The Hausa sentence-final negator *ba* (see examples in (2) and in section 2) appears to differ from the best-attested sources of second negators discussed above. Previous analyses have connected it either to existential negation (*baabùu/bâa* 'there is no') or to the sentence-final polar interrogative tag *ba/bâa* (Newman 2000, 2022). Although neither negative existentials nor polar-question particles are established sources of NEG2 in the Jespersen Cycle literature, both belong to the broader domain of propositional polarity. Negative existentials are well known to grammaticalize into markers of standard negation through the Negative Existential Cycle (Veselinova 2014), while interrogative particles encode a speaker's commitment to the truth value of a proposition. More generally, studies of bipartite negation have emphasized the close relationship between negation and polarity. Bejja and Dkhissi (2023), for example, analyze Moroccan Arabic discontinuous negation in terms of interacting polarity and negation features, arguing that negation fundamentally operates by reversing the polarity value of a proposition. Likewise, van Gelderen (2011) notes historical connections between negation, focus, and polarity-sensitive interrogative markers.

Viewed from this perspective, the clause-final position of Hausa NEG2 is particularly suggestive. Unlike minimizers such as French *pas* or indefinite expressions such as Welsh *ddim* and Moroccan Arabic *-š*, Hausa *ba* occurs at the right edge of the negated domain, effectively bracketing the proposition together with the preverbal negator. This distribution is consistent with a scope-marking or polarity-sensitive function, whereby NEG2 signals the boundary of the proposition whose truth value is being reversed. While the precise diachronic source of Hausa *ba* remains unresolved, the available evidence suggests that it may have originated in a polarity-related construction rather than through the minimizer or indefinite pathways most commonly associated with

Jespersen's Cycle. If correct, Hausa would represent a less familiar route to bipartite negation and provide further evidence that double-negation systems can emerge from multiple diachronic sources.

1. 3. Regional clustering

Not only is single negation more common, but bipartite negation is also regionally clustered across the world's languages (Vossen 2016). There are areal and family-level tendencies in how NEG2 and related grammaticalization paths occur, even though the underlying processes themselves are typologically widespread and not confined to a single region. The broad patterns that emerge from typological and diachronic research suggest clustering by language family, contact zones, and areal diffusion rather than purely random distribution (Krasnoukhova et al. 2023; Lucas 2009).

The classic development associated with bipartite negation often referred to as Jespersen's cycle (Meillet 1921; Dahl 1979) is historically and areally prominent in Indo-European, and especially Romance, languages (e.g., French *ne … pas*, Ladin *ne … nia*; Lindblom 2013) and often documented in Afroasiatic languages (e.g., varieties of Arabic and Berber) where a postverbal element joins or replaces an older negator. This pattern has been described in historical European contexts and in Afroasiatic contexts where language contact may have reinforced similar structures (e.g., bipartite negation spreading via contact between Coptic and Arabic; Lucas 2009). We already saw an example from Moroccan Arabic in (7). As for Berber, van Gelderen points out that 'all (Northern) Berber dialects have a preverbal negative element *ur/wer* and […] most have an optional postverbal element that is different in different dialects' (2011: 306; Ouali 2003: 245). See examples in (9)-(11).

(9)	ur	ssex	(sha)		*Tamazight*
	NEG1	drink-PF.1SG	NEG2		
	'I didn't enter.'				
(10)	ur	kshimegh	(ara)		*Taqbaylit*
	NEG1	entered.PAST.1SG	NEG2		
	'I didn't enter.'				
(11)	u-sn	twshi	(sha)	arbi	*Tarifit*
	NEG1	give.PAST.3SG	NEG2	grass	
	'She didn't give them grass.'				

As mentioned, similar structures are also found in Coptic (see (12)) and have been argued to have influenced the emergence of bipartite negation in Egyptian Arabic through language contact, with subsequent spread across parts of North Africa (Lucas

2007, 2009; Lucas & Lash 2010; Breitbarth et al. 2010: 158). The second negator *an* is believed to be derived from Late Egyptian *iwnʾ* 'indeed, certainly'.

(12)	ən	ti-sooun	an	pe-hoou.	*Coptic*
	NEG1	I-know	NEG2	the-day	
	'I do not know the day.'				

Certain regions, particularly South America, show a higher incidence of postverbal or clause-final negators, which are often the product of internal innovation or contact in language areas with SOV word order or clause-final preferences (as observed in northern South American families) and may develop through grammaticalization of verbs like *finish* or existential verbs into negators, a pathway related to the "negative existential cycle" (Croft 1991). Development of a second negator can further be linked to these languages' morphological history rather than to following a uniform global cycle. In Tujia (Sino-Tibetan), while there was only one original negator, other negators arose from fusion of negators with adjacent elements (Lu et al. 2020).

It has been proposed that "negation strategies each have their own focus area" (Krasnoukhova et al. 2023). The emergence of such regional clusters is most plausibly explained by shared genealogical history and language contact, which facilitate the diffusion of particular negation strategies. The present study does not challenge this view. Rather, it addresses a different question: why some bipartite negation systems persist whereas others disappear. I propose that, in addition to historical factors, the long-term stability of bipartite negation may be influenced by the cognitive demands it places on speakers during online language processing. If bipartite negation imposes greater processing costs than monopartite negation, such pressures could contribute to its repeated loss once it has arisen, helping to explain why bipartite systems remain geographically restricted and typologically uncommon despite their recurrent independent emergence.

1. 4. Processing limitations may affect linguistic structure

Within the usage-based tradition, linguistic structure is viewed not as independent of language use, but as emerging from repeated patterns of use over time. In particular, Bybee (1985) argued that frequency of use is itself a major force shaping grammatical structure and diachronic change, a view that has subsequently received support from research in phonology, morphology, syntax, language acquisition, and grammaticalization (Diessel 2007). The present study extends this usage-based perspective by asking whether another aspect of language use—the cognitive demands imposed on speakers during online processing—may likewise contribute to the distribution and long-term stability of negation patterns. Specifically, I argue that that to understand negation typology, one must also identify the cognitive costs and benefits

of how each negation type is processed: the structure and placement of negators influence working-memory demands during sentence comprehension and, consequently, the processing costs associated with different negation systems. These cognitive pressures may in turn affect the diachronic persistence of certain negation strategies.

1. 4. 1. Working memory and open dependencies

As we saw in examples (1) and (2), Russian resolves negation interpretation almost immediately upon encountering the negator, Hausa delays full confirmation until the clause-final NEG2. These structural differences are likely to influence how negation is processed. An insight that sets single vs. discontinuous negation apart is that given what is known from extensive research on open dependencies (Gibson 1998, 2000), a delayed NEG2 is likely to incur additional processing costs.

Working memory (WM), the cognitive system that temporarily holds and manipulates information needed for ongoing tasks (Baddeley and Hitch 1974) is a limited resource able to hold 7 ± 2 items at a time (Miller 1956), later adjusted to ~ 4 *chunks* (Cowen 2001). A chunk is a meaningful unit of information that is treated as a single item in working memory, even though it may consist of several individual elements. For example, the letters C A T can be remembered as one chunk; the word *cat*, and the numbers 1 9 4 5 can be recognized as the year *1945*. Importantly however, WM capacity is not limited to a fixed number of chunks *regardless of their size* (Thalmann et al. 2019). This flexibility has clear consequences for syntactic dependency processing. Chunking allows multiple elements to be compressed into a single representational unit by exploiting structure, regularity, or prior knowledge. This reduces item count, which is why WM performance improves when chunking is possible. However, as Thalmann et al. (2019) emphasize, this does not mean that chunking is cost-free: Larger chunks are more complex internally, they require more processing to construct and maintain, accessing internal elements of a chunk is slower and noisier, and chunks compete for attentional resources. Hence, WM capacity is flexible, but limited by representational complexity, not just by number. This knowledge interlaces neatly with linguistic syntax.

Syntax and working memory are interdependent phenomena. Open dependencies in syntax (e.g., wh-dependencies, agreement, bipartite negation) behave like unfinished commitments in WM, and, critically, each open dependency occupies attentional and retrieval resources, not just *a slot* (as would be predicted if the mind did not engage in chunking). What this also means is that working memory load during sentence processing is structure-driven, not just based on the number of stored items (Yadav et al. 2022). It counts open syntactic commitments, unresolved dependencies, and structural predictions. In this way, syntax shapes WM demands, and WM constraints

shape syntactic processing. They are distinct mechanisms but tightly linked and mutually constraining. Although theories differ in whether these limitations are attributed primarily to processing capacity, attentional focus, or retrieval mechanisms (e.g., Just & Carpenter 1992; Cowan 2001; Lewis et al. 2006), they all predict that increasing structural complexity imposes greater processing costs. The implications of this general prediction for bipartite negation are discussed below.

1. 2. 2. Negation-induced forgetting

Negation-induced forgetting (NIF) refers to the reliable finding that information processed under negation is less accessible in later memory than comparable information processed affirmatively. Empirical studies show that repeatedly negating a property or event (e.g., responding that a glass of wine was *not* red after seeing someone drink white wine) leads to poorer subsequent memory for the associated episode as a whole (that someone drank wine at all), than repeatedly affirming it, despite equivalent exposure (Mayo et al. 2014). This asymmetry highlights that negation is not merely a weaker form of affirmation, but involves qualitatively distinct cognitive operations. Crucially, NIF is theoretically grounded in psycholinguistic research on negation comprehension, particularly the work of Barbara Kaup and colleagues, who demonstrated that negation is processed via a two-step mechanism: comprehenders first activate a representation of the non-factual state of affairs (e.g., a stripy ladybird for "This ladybird is not stripy") and then suppress or deactivate it in favor of the actual situation (e.g., a dotty ladybird) (Kaup & Zwaan 2003; Kaup et al. 2006). Consistent with this account, Kaup's studies show that the accessibility of negated concepts drops below baseline shortly after comprehension and remains less accessible in long-term memory, indicating active inhibition rather than delayed integration. From this perspective, NIF can be understood as the downstream memory consequence of the same inhibitory mechanisms required for online negation processing: negation initially brings a concept to mind only to subsequently suppress it, resulting in weaker long-term representations. These findings have important implications for understanding linguistic typology and change, linking semantic interpretation, inhibitory control, and memory dynamics within a unified explanatory framework.

2. Hausa Negation

2. 1. Hausa discontinuous negation in brief

Apart from in subjunctive and progressive negated clauses, Hausa employs a two-component negation consisting of an initial low-tone *bà(à)* and a final high-tone *ba*,

enveloping the negated material (Newman 2000: 357). Negated sentences have the structure:

SUBJ- Noun [NEG1] TAM VP (IO) (DO) [NEG2] (ADV)

The tense-aspect marker (TAM) agrees with noun subjects in person and number, which means that when the subject is represented by a noun, subjects are redundantly specified as nouns *and* as pronouns. Without a noun subject TAM becomes the functional subject and the first negator *bà(à)* (NEG1) is positioned at the leftmost edge of the clause. A specific set of negative TAMs (short vowel, low tone) different from the affirmative TAMs (long vowel, high tone) likely cue negation as well. See table 2.

Person		Negative TAM	Affirmative TAM
1		bà nì / bàn	naa
2	SG	bà kà (M)/ bà kì (F)	kaa (M) /kin (F)
3		bài (M) /bà tà (F)	yaa (M)/ taa (F)
1		bà mù	mun
2	PL	bà kù	kun
3		bà sù	sun

Table 2. Tense aspect markers in Hausa perfective aspect (PF). Low tone in grave accent (`) high tones unmarked, falling tone with circumflex (^).

(13) a) Yaarinyàà **taa** daawoo *Hausa*
Girl TAM:F.SG.PF return.here
'The girl returned.'

b) Yaarinyàà **bà** **tà** daawoo **ba** *Hausa*
Girl NEG1 TAM:F.SG return.here NEG2
'The girl did not return.'

NEG2 typically occurs behind the verb phrase after core arguments like locative goals and direct and indirect objects. Simple adverbs of time, place or manner are usually placed before NEG2 (14a), but before adverbial clauses (14b), while some common temporal adverbs like *gòòbe* 'yesterday' or *jiyà dà yâmma* 'yesterday afternoon' may occur before or after NEG2 "with essentially the same meaning" (Newman 2000: 358).

(14) a) **Bàà** mukàn fita tsakaɾ̃ raana **ba**. *Hausa*
NEG1 1.PL.HABIT go.out midday NEG2
'We don't normally go out at midday.'
(Newman 2000: 358)

b) **Bà** zaa mù ƙaaràà masà àbinci **ba** *Hausa*
NEG1 FUT 1PL increase IO.3M food NEG2

sabòòda shii malààlàcii nèè

because 3M.SG.IND lazy COP.M
'We will not bring him more food because he is a slacker.'
(Newman 2000: 358)

2. 2. Structural features alleviating long distance dependency negation

2. 2. 1. Consecutive affirmative TAMs within negation scope

The two negators mark the scope of the negated material. Within this scope, however, if verbal predicates are chained in a sequence of coreferential subjects, NEG1 and NEG2 envelopes all predicates while intervening subject TAMs appear in the affirmative form (15a-b), irrespective of the number of TAMs (15b). A formal analysis might propose that only the TAM in the matrix clause should appear as a negative TAM, however evidently in online processing, an effect of serial affirmative TAMs within the negated scope could facilitate negation processing by preventing interpretations of too early negation termination (15a-b). This analysis is supported by consistent placement of the inherently negative *tùkùna* 'not yet' *after* NEG2 (Newman 2000: 358). This feature could serve to minimize redundant and potentially disrupting negative cuing elements complicating negation interpretation.

(15) a) **Bà** mù ci **mun** shaa **ba**. *Hausa*
NEG1 1PL.PF eat 1PL.PF.AFF drink NEG2
'We didn't eat and drink.'
(Newman 2000: 358)

b) **Bà** tà shaarèè ɗaakìì
NEG1 3SG.F.PF.AFF sweep room

taa yi wankaa **taa** tàfi
3SG.F.PF.AFF do wash 3SG.F.PF.AFF travel

makarantaa **ba**
school NEG2
'She didn't sweep the room, she didn't bathe, (and) she didn't go to school.'

Alternatively, each predicate may be enveloped by its own set of *bà(à) … ba*; however, then the chaining applies to separate *sentences*, not verbal predicates (Newman 2000: 360).

2. 2. 2. Deletion of adjacent NEG2 markers

Morphological haplology refers to the situation where one of two abutting NEG2s is deleted, e.g., when one negated sentence occurs within another negated sentence, and a single *ba* does "double duty" (Newman 2000: 359); in (16), * indicates non-occurrence.

This could serve a similar psycholinguistic function as within-negation-scope affirmative TAMs: to signal the perception of non-termination of negative scope.

(16) a) ***[Bàn** ga yaaròn dà *Hausa*
NEG1.1SG see boy.DEF REL

[bài tàimàki Laadìì **ba]** **ba]**
NEG1.3SG.M help Ladi **NEG2** **NEG2**

b) **Bàn** ga yaaròn dà *Hausa*
NEG1.1SG see boy.DEF REL

bài tàimàki Laadìì **ba**
NEG1.3SG.M help Ladi **NEG2**
'I didn't see the boy who didn't help Ladi.'

Crucially, NEG1 is never subject to haplology, even if, logically, conditions are met (17). Neither does NEG2 deletion happen before a NEG1 initial abutting clause, or when the phonologically similar question particle *bâa* follows immediately after NEG2 (18), thus excluding *phonological* haplology.

(17) [Yaarinyàr̃ dà bà tà hanà mu yi *Hausa*
Girl.DEF REL NEG1 3SG.F prevent 1PL do

barcii **ba]** **[bà** tà zoo ba]
sleep **NEG2** **NEG1** 3SG.F come NEG2
'The girl who did not prevent us from sleeping did not come.'

(18) a) Shii nèe direebàn bài *Hausa*
3SG.M.IND COP.M driver.DEF NEG1.3SG.M

zoo **ba,** **bâa?**
come **NEG2** **QP**
'Is he (not) the driver who didn't come?'

2. 3. Variable NEG2 placement truncates negation scope

In most cases, the negated material and enveloped material coincide, e.g., in verb phrase negation (Newman 2000: 357; Zimmermann 2008). Under certain conditions, however, the words physically bracketed by NEG1 and NEG2 do not harmonize with the semantic scope of negation. Either the scope of negation can be narrower than the expanse of the negation markers, or it can be wider. The first case applies when a constituent like the subject, object, or an adverbial is focused; the scope of negation will then be interpreted as narrowly negating only the focused element, even if the NEG2 is placed at the far end of the clause (19).

(19) [**Bàa** Tàlaatù tà zàgee shì **ba**. *Hausa*

NEG1 Talatu 3SG.F insult him NEG2
'**It was not Talatu** who insulted him.' (Newman 2000:187)

According to Hausa linguists, "Sentence negation occurs with overtly fronted focus constituents and *has the semantic effect of narrowly negating the focus constituent only*" (Zimmermann 2008, my emphasis; Newman 2000: 364).

Another mismatch relates to a notable flexibility of the second negator (Newman 2000), but with the opposite effect: the two negators envelope *less* than their negated scope. Normally, the second negator is situated between core and external arguments (adverbials), as shown in 2.1., however when an embedded sentence following a negated object is long or cumbersome (Mustapha Ahmad p.c., 2025), NEG2 may be moved forward and precede it. This within-scope – outside-brackets material can be 1) a relative sentence, 2) an adverbial, or 3) an indirect question (Newman 2000: 359), see examples in (20)-(22). Surprisingly, the preference for an early NEG2 can even split a constituent in two halves, as demonstrated in (23) (example from Crysman 2010: 271). The choice, according to Newman (2000), depends on "the length of the complement", who provides the sentences in (20)-(22). (The b) sentences are identical in meaning to those in a).)

Embedded relative dependent clause:

(20) a) [**Bàn** ji daaɗii [dà kukà shaa biyàà] **ba**.]
NEG1.1SG.PF feel pleasure REL 2PL.REL drink beer NEG2

b) [**Bàn** ji daaɗii **ba** [dà kukà shaa biyàà].]
NEG1.1SG.PF feel pleasure NEG2 REL 2PL.REL drink beer
Both: 'I am not happy that you drank beer.'

Embedded subjunctive dependent clause:

(21) a) [**Bài** kàmaatà [Tankò yà biyaa hàraajìì **ba**.]
NEG1.3M.PF fitting Tanko 3M.SUBJ pay tax NEG2

b) [**Bài** kàmaatà **ba** [Tankò yà biyaa hàraajìì].]
NEG1.3M.PF fitting NEG2 Tanko 3M.SUBJ pay tax
Both: 'It is not fitting that Tanko pay taxes.'

Indirect question:

(22) a) [**Bài** gayà minì [koo nawà zân biyaa **ba**].]
NEG1.3M tell DAT.1SG QP how.much FUT.1SG pay NEG2

b) [**Bài** gayà minì **ba** [koo nawà zân biyaa].]
NEG1.3M tell DAT.1SG NEG2 QP how.much FUT.1SG pay
Both: 'He didn't tell me how much I should pay.'

Object within relative clause (object marked in italics):

(23) a) [**Bà sù** yi sallàà tàare [dà [*mutàànee* ***ba***
NEG1.3PL do prayer together with people NEG2

	[dà	*sukà*	*zoo*	*masallaacii*]]].]		
	REL	3PL.REL	come	mosque		
b)	[**Bà sù**	yi	sallàà	tàare	[dà	[*mutàànee*
	NEG1.3PL	do	prayer	together	with	people

[dà	*sukà*	*zoo*	*masallaacii*]]]	**ba**.]
REL	3PL.REL	come	mosque	NEG2

Both: 'They didn't pray together with the people who came to the mosque.'

In (20b), the relative clause left outside negation brackets functions as a direct object in the main clause. Without the information provided in the relative clause the reason for the negated state cannot be grasped and so should fall under negation scope as in (20a), where scope and negator placement coincide. A similar situation applies in (21b). The embedded clause is functionally the direct object of the main clause and effectively is what is under negation; still NEG2 is allowed to preempt the negated material. Likewise, the indirect question is a mandatory part of the main clause, a core constituent, but falls outside of negation brackets. The most astounding example, however, is (23b), in which NEG2 effectively disconnects the direct object, of which *mutàànee* 'people' is the head, from its adjoining relative clause.

Counting the number of sentential constituents, it is interesting to note that core constituents amount to up to four items (Subject/TAM – VP – IO – DO), and that it is the last "chunk" that is compromised, harmonizing with what was discussed above on working memory limits. Noteworthy is the fact that although a constituent is "severed", NEG2 landing site is not random but syntactically motivated between the head and its adjunct. That is, it lands at *the nearest juncture*.

The inclination of moving NEG2 forward in the sentence can be dialectal; in the case of embedded interrogative clauses, an early cued NEG2 is preferred in Western Hausa (Newman 2000: 359). This suggests that early placement of NEG2 has stabilized as a grammatical feature in this dialect and therefore represents a diachronic change.

3. Russian negation: compact and contiguous

3. 1. Contiguity with negated material and within composite component negators

The core sentential negator in Russian is the particle *ne* (не), which is morphosyntactically a clitic-like particle that immediately precedes the lexical host it negates, see example in (1') (repeated here for convenience):

(1')	Ja	ne	znaju	*Russian*
	1SG	NEG	know.1SG.PRS	

‘I don’t know’

When negation combines with negative indefinites (negative concord), the specialized negative pronouns (e.g., *nikogo/никого* ‘no-one/anyone-GEN’, *nikogda/никогда* ‘never’) co-occur with *ne* while the clausal negator keeps the same adjacent position before the verb, as in (24).[2]

(24)	Ja	nikogo	ne	videl	*Russian*
	1SG	nobody.GEN	NEG	see.PAST.M.SG	
	‘I didn’t see anyone.’				

Negation targets other categories with the same adjacency: infinitives take *ne* directly before the infinitive form, cf. (25), and adjectives/nouns are negated with *ne* immediately before the adjective, (26a), or noun, (26b):

(25)	On	ne	xočet	čitat’.	*Russian*
	3SG.M	NEG	want.3SG.PRS	read.INF	
	‘He does not want to read.’				

(26)	a)	On	ne	gotov	*Russian*
		3SG.M	NEG	ready.M	
		‘He is not ready.’			
	b)	On	ne	drug.	
		3SG.M	NEG	friend	
		‘He is not a friend’			

From these examples, it seems that Russian follows a general trend formulated in Dahl (1979) about Jespersen (1917) where:

1) Negation tends to be placed early in the sentence, and
2) Negation tends to be placed immediately before the verb

Other negation constructions may be evaluated for potentially possessing discontinuous status. A distributive negation in Russian is the *ni…ni…* “neither … nor” construction, which realize an emphatic negation. These *ni*-items are formally discontinuous (they appear on each conjunct) but crucially immediately precede the nominal or adverbial they modify (e.g., *ni ryby ni mjasa* ‘neither fish nor meat’; *nikuda ne* ‘to nowhere’ in sentences such as *on nikuda ne šël* ‘He was not going anywhere’). Functionally, *ni-*

[2] Note that throughout this paper, *double negation* refers to bipartite (discontinuous) standard negation, in which two grammatical markers of sentential negation (NEG_1 and NEG_2) jointly express a single negated proposition (e.g., French *ne ... pas*, Hausa *bâ ... ba*). This should be distinguished from **negative concord**, in which only one element functions as the sentential negator while accompanying negative indefinites (n-words) depend on that negator for their interpretation. Thus Russian *Я не знаю ничего* (‘I don't know anything’) is a case of negative concord rather than bipartite negation: *не* is the sentential negator, whereas *ничего* is a negative indefinite. Likewise, colloquial English *I didn't do nothing*, traditionally referred to as "double negation," is analyzed in modern linguistic typology as negative concord.

intensifies or extends the scope of the clausal negation while respecting the surface adjacency of negators to their hosts. Strictly speaking, this construction does not count as a distributed *single* negation (Li 2019: 9), since the negators here negate separate clausal or phrasal parts. This becomes evident when looking at Hausa, where the equivalent negating verbal actions uses two sets of distributed negators, not one, sometimes adding *kuma* 'also': [***Bài*** *ga koomee* ***ba]***,(*kuma*) [***bài*** *jii koomee* ***ba***] 'He neither saw nor heard anything', and negated nouns use an existential *bâa/baabùu* 'there is not', comparable to Russian *net* (НЕТ), e.g., ***bâa*** *yàboo* ***bâa*** *fàllasàa* 'Neither praise nor blame', with negators immediately preceding negated material.

Distributive negation with a single negated scope does occur in Russian, but with the semantic addition of emphasis in the *ni ... ne* construction, as illustrated in (27). The quantified expression *ni odnoj devočki* ('not a single girl') functions as a scalar minimizer, referring to the smallest possible quantity. Unlike the ordinary neutral negative indefinite *nikakix devoček* ('any/no girls'), which simply expresses negation, *ni odnoj devočki* adds emphatic scalar force ('not even one'). In this respect it resembles historical French *pas* ('step'), reinforcing the negation while remaining a lexical expression rather than developing into a neutral second negator (Lindblom 2013: 4-5; Breitbarth et al. 2010). Russian thus illustrates another potential source of NEG2 that has not undergone the final stage of Jespersen's Cycle.

(27) *Russian*

V	ėtom	li	klube	vy
in	this.M	QP	club.M.LOC	2PL
ni	odnoy	devočki	ne	znaete
NEG	one.F.GEN.SG	girl.F.GEN.SG	NEG	know.2PL

'Is it in this club that you don't know a single girl?'

(Brown and Franks 1995: 272)

Many second negators attain their negative semantics from cooccurrence with an original negator, by usage-based association. In Russian, case marking of the direct object in the genitive is an associated with negation, known as the *Genitive-of-Negation* (Gen-Neg). Direct objects that in affirmative clauses would be case-marked accusative shifts to genitive when the verb is negated, for no other reason than occurring in a negative construction. The direct object then receives an indefinite, non-specific, or absent/non-existential reading, as opposed to definite, specific, or present in the accusative, see (28). Importantly, both cases are allowed, but accusative is marked.

(28) *Russian*

Ivan	ne	čitaet	žurnaly/ žurnalov
Ivan.NOM	NEG	read.3SG.PRS	magazines.ACC / -GEN

'Ivan isn't reading the magazines / any magazines.'

Indefinite readings of direct objects relates cross-linguistically to negative constructions. In Bantu and Oceanic languages as well, noun phrases under negation are indefinite or

non-referential (Miestamo 2005: 208; Miestamo et al. 2022). This applies in Hausa too, see (29). Zimmermann (2008) points out that these notions are conceptually incompatible: "The bare object NP *hùulaa* 'cap' in [29] cannot have a specific reading *and* take scope over negation" In Hausa, these objects are not overtly marked; referential nouns would be suffixed -`ř/-ǹ 'masc./fem.'.

(29) Audù **bài** sàyi hùulaa à kàasuwaa **ba**. *Hausa*
Audu NEG1.3SG.M buy cap at market NEG2
'Audu didn't buy a cap in the market.'
*'There is a (certain) cap that Audu didn't buy.'

Genitive direct objects signal unaffectedness or partial affectedness, an interpretation in accordance with the gen/acc alternation in many Circum-Baltic languages (Miestamo et al. 2022), of which a non-occurring action would be the ultimate prototype in a low-transitive construction (Hopper and Thompson 1980).

Repeatedly encountering *ne* before a verb may shape expectations for the kinds of objects and quantifiers that follow. Genitive objects might therefore come to be associated with – and potentially signal – negation in speakers of Russian, which may be even more crucial when objects are fronted (see 30a-b).

(30) a) Ljudej ja **ne** videl. *Russian*
people.GEN.PL 1SG NEG saw
'People did I not see.'

b) Ja ne videl ljudej.
1SG NEG saw people.GEN.PL
'I didn't see (any) people.'

Repeated exposure to genitive-marked objects in negative clauses may lead speakers to associate genitive case with negation, an association confirmed experimentally by Kazanina (2017), who shows that Russian speakers process genitive objects as strong predictors of an upcoming negation. At first sight, this resembles the early stages of Jespersen's Cycle, since indefinite expressions are well-attested cross-linguistic sources of second negators (Breitbarth, Lucas & Willis 2010; van Gelderen 2011). However, Breitbarth et al. (2010) argue that grammaticalization into a new negator is frequently blocked when the candidate element retains overt case morphology. Case marking continually confirms the noun's status as an argument of the verb, making reanalysis as an independent negative-polarity marker—and ultimately as a sentential negator—considerably less likely. Robust case systems therefore constitute a structural constraint on the emergence of NEG2.

Russian Gen-Neg fits this prediction remarkably well. Although genitive objects acquire an indefinite interpretation in negative clauses and are strongly associated with negation both typologically and in speakers' online processing, the genitive ending

remains a productive case marker encoding argument structure, affectedness, and referential interpretation. Rather than being reanalyzed as an exponent of negation, it continues to function as case morphology. The Russian Gen-Neg construction has therefore become a highly reliable cue to negation, but not a second sentential negator.

This comparison highlights an important contrast with Hausa. Russian satisfies several semantic and psycholinguistic preconditions associated with the emergence of a second negator, yet its morphological architecture blocks the crucial reanalysis. Hausa, by contrast, shows that a suitable source can grammaticalize into NEG2 when it is structurally available for reanalysis. Together, these two languages demonstrate that the development of bipartite negation is contingent rather than inevitable.

4. Discussion: Implications of negation types for cognitive processing

In this paper I examined ongoing syntactic change in Hausa negation, focusing especially on the syntactic effects of WM constraints in the morphological dependencies of bipartite negation, contrasted with Russian negation, which hosts a single negation marker contiguous to its negated material. Several potential bipartite negators were examined in Russian, including the Gen-Neg marking of negated, indefinite objects, but which, crucially, has not grammaticalized into a new negator despite its psycholinguistic status as a negative *cue*. The Hausa case illustrates how complex interactions between working memory, dual-route sentence processing, and negation-induced forgetting can shape surface grammar in ways that illuminate the cognitive foundations of linguistic structure. We have observed a tension between maintaining a wide scope between negators and keeping processing costs low. One strategy was moving NEG2 forward is one strategy; keeping TAM markers in the affirmative mode up until NEG2 closes negation scope (in the case of multiple predicates), is another, possibly to prevent the occurrence of "false closures". These two strategies in concert aid lowering processing costs of bipartite negation. In the following, however, I shall focus on the tension between WM (maintenance) and focal NIF effects and discuss whether these aspects of memory could have an effect on negation typology.

4. 1. Working memory constraints and long-distance dependencies

Hausa bipartite negation patterns provide an informative testing ground for understanding how general working-memory constraints interact with sentence-level processing strategies. As seen in many languages with discontinuous dependencies, Hausa negation involves a temporally extended relation between discontinuous negators. The temporal distance between these two elements creates a "holding interval" in which the presence of an unfulfilled dependency places exceptional demands on

language users' working memory. The observed tendency for Hausa speakers to advance NEG2 to structurally earlier junction points, sometimes even interrupting syntactic constituents, suggests that this pattern is not merely an idiosyncratic morphological alternation, but rather reflects general architectural pressures in human sentence processing.

WM seeks to reduce cognitive costs. Theories of sentence comprehension hold that linguistic input is parsed incrementally and that structural commitments must be maintained in an activated state until they can be integrated with subsequent material (Gibson 1998; Lewis & Vasishth 2005). Long-distance dependencies, including filler-gap relations and bipartite morpheme dependencies, are therefore inherently costly. The Dependency Locality Theory (Gibson 2000) predicts that the integration cost of linking two elements increases with the number and complexity of intervening syntactic heads, an assumption that concurs with known WM constraints. The longer this expectation must be kept active, the greater the probability of decay, interference, or retrieval failure.

Evidence from chunking models of sentence processing further illuminates these pressures. Chunk-based frameworks (e.g., Christiansen & Chater 2016) posit that the parser groups incoming material into manageable units based on probabilistic and structural cues. When a dependency spans multiple chunks, maintaining it requires cross-chunk coordination, which is fragile and susceptible to forgetting. If NEG1 in Hausa is anchored in one chunk (e.g., TAM), and the listener perceives that the current chunk is about to close, the parser may attempt to complete the pending dependency by realizing NEG2 earlier than its canonical position. Such an early realization reduces the duration over which the first element must be actively held in WM, thereby lowering memory cost, even if it produces surface patterns that contradict idealized syntactic constituency.

These explanations become even more compelling when considered in light of dual-route processing within long-distance dependencies. Numerous findings suggest that during the maintenance of an unresolved relation, speakers keep track of both the linear sequence of material and a hierarchical set of structural expectations (Frazier & Clifton 1996; Hale 2001). When these two processing streams diverge, the cognitive load increases. In a long bipartite negation dependency, speakers must simultaneously maintain the dependency (a structural commitment) and process intervening lexical and phrasal material (a linear burden). Empirical work shows that such dual commitments amplify susceptibility to interference: as more lexical items intervene, both the retrieval of the first element and the accuracy of its syntactic representation become vulnerable to decay (Van Dyke & Johns 2012). Thus, the Hausa NEG1–NEG2 configuration is predisposed to instability simply by virtue of its distributed architecture.

4. 2. Processing as a Shaper of Grammar

Cross-linguistic evidence indicates that natural languages systematically minimize dependency length, suggesting that grammatical structure reflects pressure to reduce memory load during comprehension and production (Futrell et al. 2020). From this perspective, grammars may come to reflect what speakers can reliably plan, store, and retrieve under WM pressure, even if memory is not treated as a grammatical primitive. This logic is made explicit in cognitive and usage-based theories, where grammar is understood as *emergent from language use* and learning under domain-general cognitive constraints: WM limitations directly affect which constructions are learnable, entrenched, and stable, favoring shorter dependencies, chunked representations, and reduced hierarchical depth (Hopper 1987; Tomasello 2003; Goldberg 2006). Accordingly, Gómez-Rodríguez et al. (2022) propose that memory limitations may be "hidden in the grammar" itself. Taken together, these observations suggest that psycholinguistic and usage-based models are right in assuming that usage and general cognitive capabilities indeed have the potential to affect linguistic structure, converging on the view that memory limitations can exert genuine causal force on syntactic structure.

4. 3. Negation-induced forgetting

Combining NIF with working-memory load provides a compelling explanation for the Hausa data. If the appearance of NEG1 triggers a brief coexistence of both affirmative and negated representations, maintaining the morphosyntactic dependency until NEG2 is encountered becomes even more costly. The Hausa speaker must (1) sustain the syntactic expectation for NEG2, (2) maintain at least some semantic representation of the negated content, and (3) resolve competition between affirmative and negated interpretations. The resulting load magnifies decay, making the canonical clause-final position of NEG2 especially vulnerable to memory-based disruptions. Early placement of NEG2, therefore, can be interpreted as a cognitive strategy that reduces two forms of forgetting simultaneously: it minimizes the time during which the syntactic dependency remains open, and it rapidly confirms the negated interpretation, helping suppress the competing affirmative representation.

Under this view, the observed non-canonical placement of NEG2 is neither arbitrary nor merely stylistic. Rather, it reflects the interface between structural distance, temporal activation demands, chunking constraints, and the cognitive asymmetry between negated and affirmative representations. Long open dependencies are already difficult to maintain. When they involve negation – an operator known to by itself promote representational instability – the interplay of these factors creates a system in which early discharge of the dependency offers a measurable processing advantage. The Hausa case therefore illustrates how complex interactions between working memory, dual-

route sentence processing, and NIF can shape surface grammar in ways that illuminate the cognitive foundations of linguistic structure. However, whether bipartite or single negation is cognitively more costly – in sum – depends on whether these two negation types respond differently to NIF.

4. 4. Negation types and vulnerability to forgetting

A prediction that follows directly from what we know about negation processing, inhibition, and memory is that NIF is best understood as a consequence of *inhibitory control* (Johnson and Anderson 2004; Marko and Riečanský 2021): the comprehender must activate the negated proposition and then suppress it (Kaup et al. 2006a, 2007; Tian et al. 2010). A viable hypothesis of how this relates to single vs. double negation is: "the stronger or more focal the inhibition, the greater the downstream reduction in memory accessibility."

Given that NIF arises from inhibitory mechanisms engaged during negation processing in language (Dudschig et al. 2021a, 2021b; Liu 2020; Liu et al. 2020, 2024), drawing from neural reuse principles (Anderson 2010; Beltrán et al. 2021), languages in which negation is expressed by a single, clause-internal operator are predicted to be more vulnerable to forgetting than languages with bipartite negation, where negation is structurally distributed and can constrain interpretation earlier and more globally. Supportive of this hypothesis is that people with lower inhibitory responses (ADHD subjects) respond slower to negation than neurotypical subjects (Dudschig et al. 2021a). Testing this prediction cross-linguistically, however, remains an open empirical question, i.e., whether inhibition applies to a wider variety of negation (Dudschig et al. 2021b), and how.

4. 5. 1. Single-negator languages concentrate inhibition

In single-negator languages like Russian, negation is typically monomorphemic, clause-internal, and often syntactically and prosodically light. This means that the negated proposition is strongly activated during compositional interpretation. The burden of exclusion ("this is not the case") is carried primarily by a single operator, placing maximal weight on conceptual suppression rather than on distributed structural cues. From a cognitive perspective, this favors strong post-activation inhibition, which is exactly the mechanism that produces NIF (Beltrán et al. 2018).

Double-negator languages, by contrast, distribute negation across structure. In bipartite negation systems like Hausa (*bàà ... ba*), negation is structurally distributed, edge-marked, and highly salient in the syntactic frame. This has two consequences: The listener can anticipate negation early and maintain it as a global discourse constraint, rather than computing it late as a local semantic reversal. The negated proposition *may*

then never reach the same level of full affirmative simulation before suppression, because negation is scaffolded by structure rather than resolved purely at the conceptual level. As a result, less severe inhibition of a fully instantiated affirmative simulation is required, which predicts attenuated NIF. Important to note, however, although this is a theoretically well-motivated prediction grounded in psycholinguistic models of negation, it is not yet a settled empirical fact given that there is presently little direct experimental work comparing single- vs. double-negator languages on memory outcomes.

4. 5. 2. Russian Gen-Neg may alleviate NIF

For the same reasons, the Gen-Neg in Russian is predicted to alleviate the strength of NIF, especially in configurations where the object is focused and precedes the verbal negator; functioning as an early cue partially redistributes the cognitive work of negation away from late conceptual inhibition and toward anticipatory constraint during incremental processing. As established in the NIF literature, forgetting arises when a comprehender fully activates an affirmative representation and then subsequently suppresses it once negation is encountered (Mayo et al. 2014). Crucially, Russian Gen-Neg is not semantically empty. Russian speakers treat genitive marking on direct objects as a reliable probabilistic cue to negation. The alleviating effect on NIF should be strongest when the genitive-marked object precedes *ne*. In such configurations, the object is not only processed early, it is also discourse-prominent and morphologically marked in a way that biases interpretation toward negation. This constellation maximizes the chance that negation is anticipated rather than retroactively imposed, thereby weakening the activation-then-suppression cycle that gives rise to NIF.

In sum, Gen-Neg in Russian should attenuate but not eliminate NIF. It does not function as a full negator, but still redistributes negation processing temporally, reducing reliance on late inhibitory mechanisms. This supports a broader conclusion: morphosyntactic cues to negation matter for memory, and NIF is sensitive not just to semantic negation, but to how negation is *signaled and anticipated* in the grammar.

4. 5. 3. Two competing pressures on memory: inhibition versus maintenance

The apparent NIF advantage of bipartite negation can be partially offset by the working-memory costs imposed by long-distance dependencies in bipartite systems. Whether bipartite negation ultimately *reduces* NIF relative to single negation depends on how these two forces trade off in real-time processing. The prediction that single-negator languages are more vulnerable to NIF rests on inhibitory load: late-resolving negation encourages full affirmative simulation followed by strong inhibitory effects.

Bipartite negation, by contrast, reduces this inhibition by making negation structurally salient and predictable early.

However, bipartite negation introduces a different cost requiring the comprehender to maintain a negation dependency across the clause. This maintenance taxes working memory, particularly executive and attentional resources (Gibson 1998; Lewis et al. 2006). Working-memory load does not create NIF in the same way as inhibition, but it can weaken encoding. When resources are tied up maintaining an unresolved dependency, fewer resources are available for constructing a detailed situation model, leading to shallower encoding and reduced later recall (Just & Carpenter 1992; Unsworth & Engle 2007). Crucially, this means that bipartite negation may reduce inhibition-driven forgetting while increasing resource-driven forgetting. The net memory outcome is therefore not trivial. Once working-memory costs are factored in, the simple typological prediction ("bipartite negation causes less NIF") might become susceptible to variation. Single negation implies high inhibitory effects and suppression leads to strong NIF. On the other hand, bipartite negation implies lower inhibition but higher maintenance cost, leading to potentially comparable forgetting, but *via a different mechanism*.

Thus, bipartite negation systems may not show uniformly better memory outcomes; instead, they may shift the source of memory degradation from inhibition to resource limitation. This trade-off reinforces a key point implicit in the NIF framework: memory consequences of negation depend on processing dynamics, not negation per se. NIF is therefore best understood as one outcome in a broader space where inhibition, prediction, and working memory jointly shape linguistic memory.

4. 6. Why NIF matters to negation typology

To close the loop from where we started, looking at the uneven distribution of single vs. double negation across the world's languages, why should it matter to negation typology how deeply the negated contents is forgotten? The answer is that forgetting is not the causal factor, processing is. The key point is that negation typology is not plausibly shaped by forgetting per se, but by the processing dynamics that also give rise to forgetting. NIF matters only insofar as it is a *diagnostic consequence* of how negation is computed online. There is no claim (and should be none) that languages evolve particular negation strategies *because* speakers forget negated contents. What matters is that the same mechanisms that produce NIF: activation, inhibition, prediction, and working-memory allocation, are also the mechanisms that shape real-time language processing. NIF is therefore an epiphenomenal footprint of deeper processing trade-offs, not a selective pressure in itself. In Kaup's framework, the critical variable is how much affirmative structure is built and then suppressed during negation comprehension. NIF simply reveals how extreme that suppression is.

4. 6. 1. Why depth of suppression matters for processing stability

Negation types differ in how they distribute negation cues temporally: Single negation implies later semantic reversal and a strong activation–suppression cycle. Bipartite negation involves an early structural constraint and brings about weaker suppression, but longer maintenance costs. The depth of suppression matters because strong inhibition destabilizes representations, not just in memory, but during comprehension itself. This could have consequences for discourse continuity and incremental model updating, as well as the perceptibility under noise or divided attention. Languages that rely heavily on late inhibition make comprehension more brittle under cognitive load. That brittleness is what NIF indexes.

Typology tracks communicative well-functioning, not memory outcomes. Negation typology is sensitive to how well processing works across contexts, not to long-term recall accuracy. The implications for negation typology could be this: systems that require repeated strong inhibition (as single negators do), or long-distance dependency maintenance (as in bipartite negation) each impose costs. Typological distributions reflect which cost is more tolerable across populations, discourse styles, and diachronic pathways, not which yields better memory. I hypothesize that single negation wins globally because working-memory costs are minimized, dependencies are short, and inhibitory mechanisms are already ubiquitous. Bipartite negation survives where early predictability or pragmatic reinforcement outweighs the cost of maintaining a dependency (van der Auwera & Van Alsenoy 2016), until this maintenance becomes too costly, as is the case for Hausa.

4. 6. 2. What NIF contributes to typology (and what it does not)

What NIF contributes is evidence that negation types differ in how they engage inhibition, not that one type is better remembered. So, the correct inference is that negation typology is shaped by how negation is processed, and NIF reveals the *inhibitory profile* of that processing. Therefore, NIF helps diagnose which processing pressures different negation systems impose. Stated concisely, negation-induced forgetting is not itself a driver of typological distribution, but a *measurable consequence* of the inhibitory dynamics involved in negation processing. Because negation types differ in how they distribute activation, prediction, and suppression over time, NIF serves as an index of processing stability and representational sturdiness, factors that plausibly shape the diachronic viability of negation systems.

5. Conclusion

Bipartite and single negation are unevenly distributed across regions and language families. I have looked into the processing mechanisms behind these negation strategies

and suggested they contribute to this unevenness besides other mechanisms like language contact and communicative clarity. Single negation likely induce higher inhibition costs and more severe NIF effects. By contrast, although bipartite negation is predicted to attenuate negation-induced forgetting by distributing negation cues early, the working-memory demands imposed by long-distance negation dependencies may counterbalance this advantage, yielding memory costs that arise from resource limitation rather than inhibitory suppression. On balance, these negation strategies both face memory-related challenges, which underlyingly may contribute to these systems stability or susceptibility to change.

The account proposed here is necessarily theoretical. Rather than presenting new experimental evidence, it synthesizes typological, grammaticalization, and psycholinguistic findings to formulate a cognitively motivated explanation for the relative rarity and diachronic instability of bipartite negation. The hypotheses developed here therefore invite empirical evaluation. Future work should test the predicted processing differences between monopartite and bipartite negation directly—for example, through behavioural, eye-tracking, ERP, or other online processing studies comparing languages such as Russian and Hausa. Confirmation of these predictions would provide a stronger empirical foundation for the cognitive explanation proposed here and is most welcome.

Key to abbreviations

1SG	first person singular
2SG	second person singular
3SG	third person singular
1PL	first person plural
2PL	second person plural
3PL	third person plural
ACC	Accusative
AFF	Affirmative
COP	Copula
DEF	Definite
F	Feminine
FUT	Future tense
GEN	Genitive
HABIT	Habitual
IND	Independent pronoun (emphatic)
INDIC	Indicative
INF	Infinitive
IO	Indirect object
LOC	Locative
M	Masculine
NEG, NEG1, NEG2	Negator, first negator, second negator
PAST	Past tense

PF	Perfective aspect
PL	Plural
PRS	Present tense
QP	Question particle
REL	Relative (form of TAM or relative verb)
SG	Singular
TAM	Tense Aspect Marker

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