When Bases compete: a voting model of Lexical Conservatism[*]

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Abstract

This paper examines the interaction of the phonological grammar and the lexicon through the lens of Lexical Conservatism (Steriade, 1997). This is a theory that addresses how the distribution of bases (existing stem allomorphs in a morphological paradigm) influence the way those paradigms accommodate novel members. The idea is that a phonological alternation only applies to novel words if there is an existing base form present elsewhere in the paradigm that offers the needed phonological material. Thus *compénsable*, for "able to be compensated", undergoes stress shift (that is, **cómpensable*) because the existing word *compénsatory* contains the *compéns-* allomorph. In contrast, **inúndable*, for "able to be inundated" is judged worse than *ínundable*, since there is no existing base that can provide the stressed vowel (there is no form in *inuńd-*). Using experimental data from English and Mexican Spanish, I demonstrate that this dependency between paradigm structure and phonological process application generalizes to entirely novel words in a probabilistic manner. Further, contrary to previous accounts (Steriade, 1997; Steriade and Stanton, 2020), I find that all stem allomorphs in a paradigm play a role in determining the form of the novel word, rather than only those that could reduce the

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markedness of the novel form. I propose a novel grammatical model where all Bases in a lexical entry vote on the realization of the novel form, which is cross-cut by phonological markedness.

Keywords— Lexical Conservatism, word-formation, lexicon-phonology interaction

1 Introduction

This paper is about Lexical Conservatism, a phenomenon first observed by Steriade (1997) and Burzio (1998), and subsequently developed largely by Steriade and collaborators. Lexical Conservatism describes a correlation in the lexicon between the phonological shape of stem allomorphs in a paradigm, and the types of morphophonological alternations that word-formation processes induce in members of that paradigm. One well-known case from Steriade (1997) is that English words fall into two different classes with respect to stress placement under affixation with *-able*. For example, the form *íllustrate* yields an affixed coining *illústrable*, which undergoes rightward stress shift to relieve the long lapse created by the affix. On the other hand, the Local Base *írrigate* yields *írrigable* with fixed stress. This difference, Steriade argued, stems not from the Local Bases *íllustrate* and *írrigate* themselves, but rather from the other members of the morphological paradigms they are embedded in: *íllustrate* has a morphologically related form *illústrative* with stress on the second syllable, while *írrigate* has no morphologically-related form in **irríg-*. Thus, speakers are *lexically conservative:* they shift stress rightward in *illústrable* because the presence of *illústrative* allows them to remain faithful to the stress placement of *some* morphological relation of *íllustrate*'s, while still repairing the *LAPSE violation. In *írrigable*, on the other hand, speakers have no such recourse, and so remain faithful to stress placement of *írrigate*, at the expense of the marked lapse. In this paper, I use the term *Local Base* to refer to the paradigm member which is the semantically compositional, cyclically-contained source for the affixed form in question; I term the affixed form the *Derivative*. I term the form that is not the direct cyclic ancestor of the Derivative but rather a "sister" of the Local Base, the *Remote Base*. Using these terms, we can summarise Steriade's insight in table 1.

Local Base	Remote Base	Derivative
írrigate	-	*írrigable* ∼ **irrígable*
íllustrate	*illústrative*	**íllustrable* ∼ *illústrable*

Table 1: Distribution of paradigm members according to Steriade (1997).

Since their publication, Steriade's findings have been recognized to be revealing about the interaction between grammar and lexicon, with implications both for psycholinguistic models of grammar-lexicon interaction and phonological theories of word-formation (Burzio, 2002; Albright, 2002; Bermádez-Otero, 2011; Rolle, 2018). Specifically, the existence of dependencies between non-cyclically-contained surface forms has been acknowledged to be particularly difficult for strictly derivational theories of the phonology-morphology interface to handle (Bermúdez-Otero, 2017). Lexical Conservatism has also accrued a growing number of empirical cases: a possibly exhaustive list, as of the time of writing, is Burzio (1998) on Italian, Bat-El (2002); Asherov and Bat-El (2016) on Modern Hebrew, Pertsova (2005); Pertsova and Kuznetsova (2015) on Russian, O'Brien (2007) on Irish, Steriade (2008) on Romanian, Bonet and Torres-Tamarit (2010) on Catalan, Gunkel (2010, 2011) on Ancient Greek, Steriade (2012) on Latin, Simonović (2012); Simonović and Baroni (2014) on Serbo-Croatian, Steriade and Yanovich (2015) on Ukrainian, Steriade and Stanton (2020); Breiss (2021) on English, Guekguezian and Jesney (2021) on Chukchansi Yokuts, and Breiss (2021) on Spanish.

2 Contributions of this paper

Despite their well-attestedness in phonological typology, there are several respects in which the assembled data do not clearly delimit the status of the phenomenon in the synchronic grammar. This is because all studies after Steriade (1997) have been based in existing lexical data (with the notable recent exception of Steriade and Stanton (2020)). In this paper, I circumvent this limitation by using possible-but-unattested combinations of existing affixes and stems. If speakers generalize the Lexical Conservatism dependency to such forms, we will have evidence that the grammar encodes this dependency in a more general fashion, beyond the specific cases of the lexical data instantiating the pattern. I further expand on Steriade's original insight by verifying the structure of each speaker's paradigm (that is, whether they know the relevant Local and Remote Bases), and basing conclusions about the dependency between Local and Remote Bases in Derivative formation only on data from speakers who know both forms.

This paper reports four experiments: an in-depth investigation into the Lexical Conservatism in English stress placement discussed first in Steriade (1997) and later in Steriade and Stanton (2020), and also a new case of Lexical Conservatism in Spanish mid-vowel diphthongization. The following empirical generalizations emerge from the experimental data, and motivate a novel theoretical proposal for modeling Lexical Conservatism.

2.0.1 Gradience

Although discussed qualitatively in Steriade (1997), subsequent work has not probed variability in the impact of the Remote Base on Derivatives. Data from both English (Experiments 1, 2, and 3, in section 3) and Spanish (Experiment 4, section 4) reveal that its influence is gradient, rather than absolute. For example, if a participant knew the Remote Base *illústrative*, they might still occasionally produced Derivatives like *íllustrable* that resembled the Local Base *íllustrate*. Conversely, if a participant didn't know the Remote Base, sometimes the Derivative might exhibit stress shift anyway (*illústrative*).

2.0.2 Priming

Experiments 2 and 3 ask whether it is simply the presence of a Remote Base in the speaker's lexicon that facilitates an alternation in the Derivative, or whether the Remote Base is actually accessed on-line during Derivative formation. I manipulated the Remote Base's resting activation explicitly by asking participants to declare their knowledge of the Remote Base before carrying out the Derivative-formation task. We find that Derivatives with primed Remote Bases more often exhibited stress shift, suggesting not only the contents, but also the trial-by-trial prominence, of the lexicon influences outcomes of the phonological grammar.

2.0.3 Helpful, unhelpful, and harmful Remote Bases

Finally, Experiments 3 and 4 provide evidence undermining the claim that the Remote Base only influences the Derivative if it is able to resolve a marked structure. In English, the marked structure is a long lapse (as in *cómpensable*), and in Spanish it is an unstressed diphthong (as in *mueblóso*, "full of furniture"). I manipulated whether the Remote Base was phonologically optimizing (which I will term *helpful*, as in *lábor* $\sim$ *labórious* — the type discussed to this point in the literature) or phonologically non-optimizing (which I term either *unhelpful* or *harmful*).

In English, I term cases like Local Base *resíde* with Remote Base *résident harmful*, since if the Derivative reflected the stress placement of the Remote Base, it would actually result in a more marked form (here, more lapse-ful) than simply being faithful to the Local Base. In experiment 3, I found that there were almost zero forms like *résidable*, where the Derivative matched the harmful Remote Base *résident*, while there were numerous cases of Derivatives like *labórable*, where the Derivative matches the helpful Remote Base *labórious*.

Spanish presents a different view on non-markedness-reducing Remote Bases, as seen in cases like the Local Base *juérga* "spree" with the Remote Base *juerguísta* "reveller". In these cases, the Remote Base has a structure – the unstressed diphthong – which is the same, with respect to markedness-reduction, as simply failing to repair the marked structure in the Local Base created by affixation and its accompanying obligatory stress shift. I term these cases *unhelpful* since, unlike the English case, a Derivative that resembles them is *as marked* as one would be if it did not undergo repair, rather than *more* marked, as in the case of *resíde* and *résident*. Alongside these cases of unhelpful Remote Bases, Spanish also has cases like the Local Base *muéble* "furniture" with a helpful Remote Base *moblár* "to furnish", which follow the same pattern as in English. Table 2 below summarises the types of Remote Base and their distribution throughout the experiments in this paper.

Local Base	Derivative	Remote Base	Remote Base type	Experiment
pláster	*plasterable*	–	None	1, 2, 3 (English),
noviémbre	*nov(i)embróso*	–		4 (Spanish)
lábor	*laborable*	*labórious*	Helpful	1, 2, 3 (English),
aciérto	*ac(i)ertóso*	*acertár*		4 (Spanish)
resíde	*residable*	*résident*	Harmful	3
diéta	*d(i)etóso*	*dietética/o*	Unhelpful	4

Table 2: Summary of the types of Remote Bases treated in this paper, with example Derivatives.

2.0.4 A voting-based theory of Base competition

To account for these facts, I propose a model where Lexical Conservatism emerges from the interaction of grammar and lexicon where different listed allomorphs compete to have their structure reflected in the Derivative, with their influence scaled by their *resting activation*, alongside well-understood phonological principles of markedness and faithfulness. The behavior seen in English ("classical" Lexical Conservatism, with only helpful Remote Bases having an impact on Derivative formation) and the more unexpected behavior seen in Spanish (where both unhelpful and helpful Remote Bases play a role) both emerge from the proposed framework under differing strengths of markedness, which contrasts with other models of the phenomenon in the literature (Steriade, 1997; Steriade and Stanton, 2020).

3 Lexical Conservatism in English stress

This section reports the results of three experiments on English that address questions of generalizability, the involvement of the lexicon, and the role of harmful Remote Bases. I discuss the phonological determinants of Derivative formation, as well as whether the *presence* of a Remote Base matters or not, and present qualitative summaries of the priming effects in Experiments 2 and 3. In order to increase statistical power and generalizability when examining lexical effects on Derivative formation, I report a combined statistical analysis of all Derivatives with known helpful Remote Bases, collapsing across all three experiments, later in section 3.12.

3.1 Experiment 1

Experiment 1 replicates and extends Steriade (1997) on English stress shift.

3.2 Methods

3.2.1 Participants

36 UCLA undergraduate students were recruited to participate, and were compensated with course credit. Data from 5 were excluded because they did not self-report having spoken English since before the age of 7, leaving data from 31 subjects for analysis.

3.2.2 Materials

57 of the Local Bases were drawn from Steriade (1997): 29 Local Bases with helpful Remote Bases (such as Local Base *íllustrate* with Remote Base *illústrative*) and 28 Local Bases without Remote Bases (such as *éducate* with no Remote Base in **edúc-*). I also included 62 new Local Bases: 30 Local Bases with helpful Remote Bases (such as Local Base *lábor* with Remote Base *labórious*), and 32 Local Bases without (such as *pláster*). Because the Local Bases contained a mixture of morphologically-complex (*-ate*-suffixed, as in *domesticate*) and morphologically-simple (unsuffixed) Local Bases (as in *labor*), I used a reading-aloud task in Experiment 1 to limit participants' production choices to those of vowel quality and stress placement; stimuli from Experiment 1 are listed in table 25 in the Appendix.

Four affixes were chosen for testing: *-able, -ism, -ify,* and *-ity*. *-able* and *-ism* were combined with the 57 Local Bases drawn from Steriade (1997), and the other two were combined with the novel Local Bases, yielding 234 target Derivatives. The reason why the affixes were separated by Local Base source in this way (i.e., not fully crossed) was to balance the desire to replicate Steriade's original findings with her own stimuli, test the generalizability of the *principle* of Lexical Conservatism to novel affixes, and also to keep the total length of the experiment no more than an hour.

Some of the Local Base + affix combinations were existing words of English, and potentially known to participants (such as *illustrable*, largely drawn from Steriade's original stimuli) and some were designed to be novel (such as *plasterable*). For each Derivative, a carrier sentence was created which gave a periphrastic definition of the Derivative using the Local Base. For example, for the Local Base *illustrate* and the affix *-ism*, the carrier sentence was "*An ideology which centers on illustrating could be called illustrism.*"

3.2.3 Procedure

Participants completed the experiment individually in a sound-attenuated room in the presence of a member of the study team. Participants were assigned to one of four randomization lists, and were told that they would be reading definitions of possible new English words. They were advised that some of the words might sound a little unusual, or might not be exactly how they'd choose to express a certain concept (for example, one might prefer to call an ideology centered around illustrating "illustrationism" or simply "an illustration cult"), but that they should pronounce the stimuli however felt most natural to them. Participants were instructed to read the sentence to themselves silently in their head, and then say the last word of the sentence, the Derivative, out loud. After the researcher guided participants through six practice trials, they completed the 234 Lexical Conservatism task trials at their own pace.

After the Lexical Conservatism task, participants were asked to read each Local Base out loud and indicate whether they knew the word or not. They were instructed that "knowing the word" meant that they wouldn't need to stop and ask what the word meant if they heard it in conversation. Participants were also instructed that if they felt sure hadn't heard the word before but could deduce its likely meaning from its constituent parts (i.e., its morphemes), they should still indicate that they did not have prior knowledge of the word. After the list of Local Bases, participants were asked to read aloud and indicate whether they knew each Remote Base, for the half of Local Bases which had them. The experiment concluded with a short language-background questionnaire; the entire session took approximately an hour.

3.3 Data processing and analysis

Each Derivative was coded for whether it underwent stress shift or its stress matched the Local Base. Each Derivative was also coded for whether the participant indicated knowing the Local Base and (if there was one) the Remote Base. Trials on which the participant did not know the Local Base were excluded from analysis.

Statistical analysis was carried out in R (R Core Team, 2021) using Bayesian hierarchical logistic regression implemented using the `brms` package (Bürkner, 2017). Bayesian models estimate the posterior distribution of credible values for the statistical parameters of interest by integrating prior information (if any) about the likely values of the parameters with information in the data being analyzed. For a linguistically-oriented introduction to Bayesian methods for both theory-building and data analysis, see Nicenboim and Vasishth (2016); for tutorial materials on the `brms` package in a linguistic context, see Vasishth et al. (2018); Nalborczyk et al. (2019); for a more general primer in Bayesian modeling, see Kruschke (2014).

Common summary statistics for the posterior are the median value, and the range of values contained in the central 95% the distribution, known as a 95% Credible Interval (abbreviated "95% CI", followed by upper and lower bounds in square brackets). Another way of assessing the evidence for an effect is by calculating the proportion of posterior credible values which lie to one side of zero; this measure ranges from 0.5 (equal evidence for an effect in the opposite direction of the coefficient as one in the direction of direction of the parameter's coefficient) to 1 (extremely strong evidence for a nonzero effect in the direction of the parameter's coefficient). Both methods are reported in this paper. Full details of the models fit, including posterior samples, are provided in the supplementary materials.

3.4 Results

First, we find that the experimental data robustly replicate the asymmetry between Derivatives with helpful Remote Bases and those with no Remote Bases described by Steriade (1997). Figure 1 plots stress shift in Derivatives by whether or not the participant knew the Remote Base. The facets of the plot divide the data by source, novel to this experiment vs. taken from Steriade (1997).

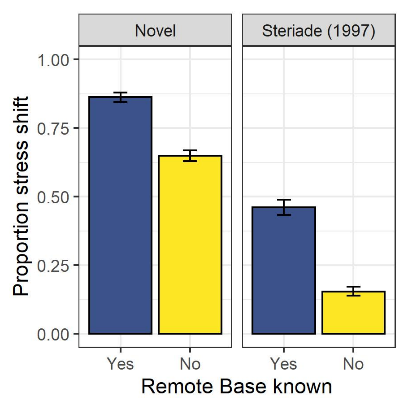

Figure 1: Means and binomial confidence interval of the proportion of stress shift in Derivatives in Experiment 1, split by knowledge of the Remote Base (horizontal axis) and source of the Local Base (facets).

Local Base	Derivative	Remote Base	Source
organ	*organify, organity*	*organic*	Novel
tartan	*tartanify, tartanity*	–	
demonstrate	*demonstrable, demonstrism*	*demonstrative*	Steriade (1997)
venerate	*venerable, venerism*	–	

Table 3: Examples of Deriviates for categories displayed in figure 1.

Although the effect of the Remote Base is robust in both groups, it is also evident that the effect is not categorical. This means that sometimes participants who know the relevant Remote Base still fail to produce stress-shifted Derivatives from time to time, and further that sometimes participants who don't know the Remote Base still sometimes violate faithfulness to Local Base to repair the long lapse. I find that two types of factors condition the variation, above and beyond the presence or absence of a Remote Base: phonological, which I discuss here in the context of the same regression model used to verify the effect of the Remote Base, and lexical which I discuss in section 3.12. Because the characteristics of the stimuli differed substantially across the those from Steriade and those which are novel – including in morphological complexity of the Local Base – it is not clear to which factor we should attribute the difference in overall propensity to undergo stress shift, which is higher in novel items. Nevertheless, the effect of the Remote Base remains, cross-cutting this distinction.

It is well known that syllable weight, vowel quality, and secondary stress both affect primary stress placement in English (cf. Chomsky and Halle, 1968; Hayes, 1982; Burzio, 1994; Pater, 2000). Affixes also influence stress placement with some theories proposing a binary distinction between stress-neutral and stress-affecting affixes (Siegel, 1974), or proposing by-affix propensities to trigger stress shift (cf. Zuraw and Hayes, 2017; Zymet, 2018; Shih, 2018). Figures 2 and 3 plot Derivative stress shift against these two predictors, split by the source of the Local Base; this split is retained because there were numerous characteristics that differed between the two groups (lexical stratum, affix, whether the Local Base required stripping *-ate*, etc.)

Local Base	Derivative	Remote Base	Target Syllable Weight	Source
tártan	*tartanify, tartanity*	–	Light	Novel
métal	*metalify, metality*	*metállic*	Light	

spa\5ndex	*spandexify, spandexity*	–	Heavy	
ágent	*agentify, agentity*	*agéntive*	Heavy	
tólerate	*tolerable, tolerism*	–	Light	
equílibrate	*equilibrable, equilibrism*	*equilíbrium*	Light	Steriade (1997)
obfuscate	*obfuscible, obfuscism*	–[1]	Heavy	
cómpensate	*compensable, compensism*	*compénsatory*	Heavy	

Table 4: Stimuli examples for the plot in figure 2.

Figure 2 demonstrates the expected effect of heavy syllables increasing the probability of a stress-shifted Derivative to satisfy the Stress-to-Weight principle (Pater, 2000).

Figure 3 also demonstrates the effect of secondary stress on predicting Derivative stress placement. This influence, I argue, comes from the diminished faithfulness penalty for promoting to full stress a vowel which already has secondary stress in the Local Base.

Local Base	Derivative	Remote Base	Target syllable vowel quality	Source
spándèx	*spandexify, spandexity*	–	Full	
ágènt	*agentify, agentity*	*agéntive*	Full	Novel
tártan	*tartanify, tartanity*	–	Reduced	
métal	*metalify, metality*	*metállic*	Reduced	
állòcate	*allocable, allocism*	–	Full	
ímprègnate	*impregnable, impregnism*	*prégnant*	Full	Steriade (199)
rélegate	*relegable, relegism*	–	Reduced	

[1]When Remote Base *obfúscatory* is not known to the participant. Steriade's stimuli did not include any Local Bases with heavy target syllables that categorically lacked Remote Bases.

cústody	*custodiable,* *custodism*	*custódian*	Reduced

Table 5: Examples for Derivatives show in figure 3.

We also find, as expected, that affixes differ in their propensity to trigger stress shift (not pictured).

To examine the contribution of these factors to Derivative stress placement, I fit a model which predicted whether the Derivative underwent stress shift relative to the Local Base stress (levels 1 = undergoing stress shift, 0 = matching Local Base stress) on the basis of whether the Remote Base was known (levels 1 = *yes*, 0 = *no*), and Affix identity (levels *-able, -ism, -ity, -ify*). I also used two metrical well-formedness constraints, both referring to the status of what I term here the "target syllable", the syllable in the Derivative to the right of the stress placement in the Local Base (the underlined syllable in *rémedy, párody, íllustrate*, etc.): the weight of the target syllable (levels 0 = *light* as in *indicate*, 1 = *heavy* as in *inundate*), and whether the target syllable hosted secondary stress in Local Base (levels 0 = *no* as in *cústŏdy*, 1 = *yes* as in *ícòn*). The model also included random intercepts for subject, Local Base, and unique Derivative combination of affix and Local Base, with random slopes of all fixed effects by subject, and of Remote Base Known and Affix by Local Base. Table 6 contains a summary of the fixed effects of the model.

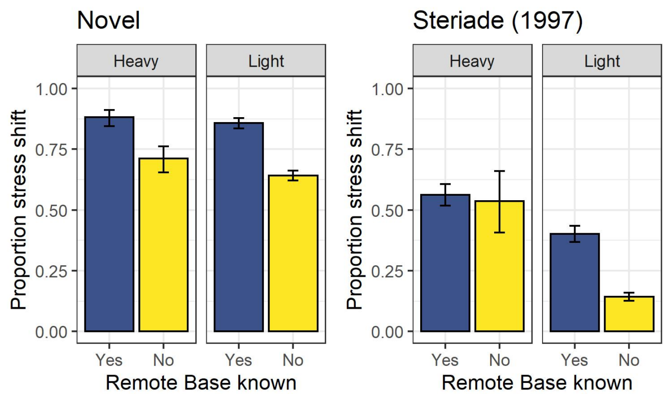

Figure 2: Means and binomial confidence interval from Experiment 1 of the proportion of Derivative stress placement (vertical axis), split by source of the Local Base (between plots), weight of the target syllable (facets within plots), and knowledge of the Remote Base (horizontal axis within plots). Examples are provided in table 4.

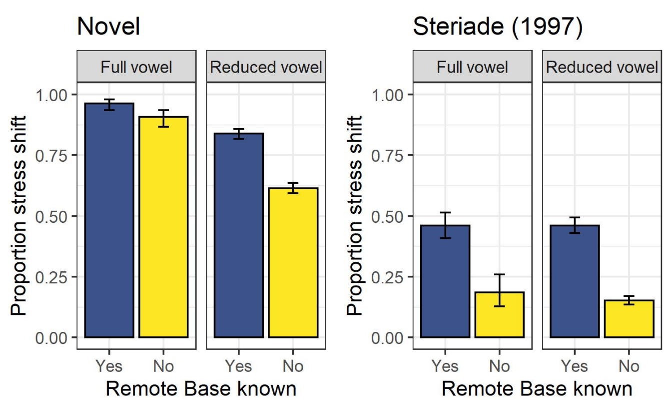

Figure 3: Mean and binomial confidence interval of the proportion of stress shift in Derivatives from Experiment 1 (vertical axis) split by source of the Local Base (between plots), secondary stress of the target syllable (facets within plots), and knowledge of the Remote Base (horizontal axis within plots). Examples are listed in table 5.

Parameter	*Median*	*95% CI*	$P(\lvert\hat{\beta}\rvert > 0)$
Intercept: Affix = *-able*, Know Remote Base = *no* Target Syllable Heavy = *no*, Target Syllable Secondary Stress = *no*	-2.21	[-2.93, -1.50]	
Target Syllable Heavy = *yes*	0.86	[0.11, 1.66]	0.99
Target Syllable Secondary Stress = *yes*	1.27	[0.46, 2.15]	≈ 1
Affix = *-ify*	2.37	[1.53, 3.21]	≈ 1
Affix = *-ism*	-0.58	[-0.95, 0.22]	≈ 1
Affix = *-ity*	4.17	[3.34, 5.05]	≈ 1
Know Remote Base = *yes*	1.30	[0.74, 1.84]	≈ 1

Table 6: Model of Experiment 1, all Local Bases. Coefficients are in log-odds, with positive signs indicating an increase in stress shift relative to the intercept.

The statistical model indicates that knowledge of the Remote Base increases the chance of stress shift, alongside the avoidance of marked structures in the Derivative, as discussed above.

3.5 Discussion

Experiment 1 confirms that the effect of the Remote Base replicates robustly in both Steriade's original stimuli, and also that it extends to new stimuli where the Derivatives are entirely novel. The effect is also probabilistic, and that Remote Base makes itself known as one effect among many other well-known phonological ones that jointly influence stress placement in the Derivative.

3.6 Experiment 2

Experiment 2 adds a priming manipulation to see if primed Remote Bases influence Derivative formation more than unprimed ones. This acts as a more stringent test for the role of the Remote Base in Derivative formation, and can tell us whether our model of the mechanisms underlying Lexical Conservatism needs to be sensitive to only static characteristics of the Remote Base (existence, as well as possibly long-run frequency and semantic similarity to the Local Base), or static *and* dynamic factors, such as the resting activation of the Remote Base in the lexicon in the moment the Derivative is formed. This can allow us to distinguish between two different theoretical mechanisms for implementing the relationship between Local and Remote Bases. Cases where only static factors of the Remote Base matters, and Derivatives with primed Remote Bases shift stress at a rate similar to Derivatives with unprimed Remote Bases, are compatible with a representational account. Local Bases that have Remote Bases might be represented differently than those with Remote Bases, perhaps with a specific diacritic attached during acquisition when morphological relation is established, similar to ideas by (Bermúdez-Otero, 2017). This would enable them to be sensitive to the presence of the Remote Base, but not its real-time lexical status. If, on the other hand, both static and dynamic factors influence Derivative formation, a representational account where the Remote Base is not actively co-present in real time with the Local Base during the Derivative formation process is ruled out, and we must consider the specific mechanisms that allow multiple Bases in the lexicon to jointly influence the phonological grammar during Derivative formation.

Experiment 2 also more systematically controls the characteristics of the Local Bases, and fully crosses Local Bases with affixes, so as to examine the effect of Steriade's original affix *-able* in entirely novel Derivatives.

3.7 Methods

3.7.1 Participants

Participant population, recruitment, screening, and compensation was the same as in Experiment 1. 34 participants were recruited and 4 excluded, leaving data from 30 participants to be analyzed.

3.7.2 Materials

Local Bases were 40 disyllabic nouns of English, balanced for the weight of the target syllable, whether the target syllable bore secondary stress, and whether or not they had a Remote Base. Some of the Local Bases were also used in Experiment 1. All of the Local Bases were free-standing stems; that is, there was no need for participants to strip an affix such as *-ate* from the Local Base *illustrate* to access the appropriate morphological stem for the intended Derivative. Stimuli for Experiment 2 are listed in table 26 in the Appendix. Two affixes were selected — *-able* and *-ic* — and were fully crossed with Local Bases so that each participant saw each affix attached to each Local Base. This yielded 80 unique Local Base + affix pairs in the Lexical Conservatism task. To accommodate the priming intervention in the experiment, Remote Bases were divided into two groups at random for separate vocabulary checks.

3.7.3 Procedure

Experiment 2 was conducted over the internet using the Experigen experimental platform (Becker and Levine, 2020), and used auditory presentation of stimuli to avoid possible orthographic influences on responses. Participants were encouraged to seat themselves in a quiet room and use headphones for the duration of the experiment, and their spoken responses were recorded. Instructions and practice trials were similar to Experiment 1.

Before the Lexical Conservatism task, participants completed a pre-task vocabulary check for all Local Bases and the half of the Remote Bases to prime them, with the same criteria as in Experiment 1. They then completed the Lexical Conservatism task, and afterwards a post-task vocabulary check for the other half of the non-primed Remote Bases, and a short language background survey. The experiment was entirely self-paced, and took approximately 40 minutes.

Data processing and analysis followed Experiment 1, with the with the addition that the combinations of Local Bases *person* and *habit* with the affix *-able* were excluded because they were real words. All details of the model fit, including posterior samples, can be found in the supplementary materials.

3.8 Results

3.8.1 Confirming Lexical Conservatism and phonological determinants of Derivative stress

As in Experiment 1, we find that both lexical and phonological factors influence Derivative stress placement. These are plotted in figure 4, and statistical analysis is reported in table 8.

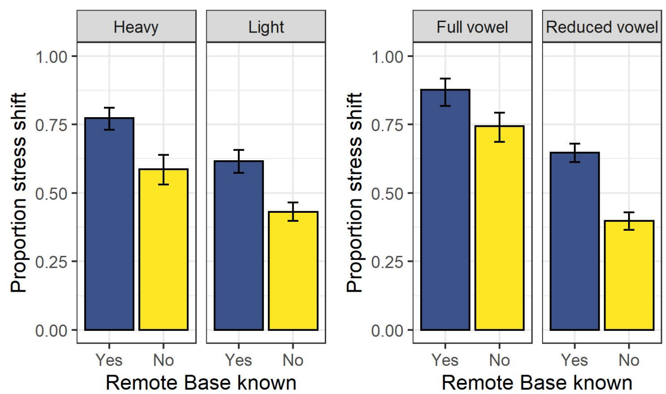

Figure 4: Mean and binomial confidence intervals from Experiment 2 of the proportion stress shifted Derivatives (vertical axis) by target syllable weight, and target syllable secondary stress (across facets), divided according to whether the participant knew the Remote Base (horizontal axis within each plot). Examples are listed in table 7.

Local Base	Derivative	Remote Base	Target syllable quality
scáffold	*scaffoldable, scaffoldic*	–	Heavy
túmult	*tumultable, tumultic*	*tumúltuous*	Heavy
pláster	*plasterable, plasteric*	–	Light
hábit	*habitable, habitic*	*habítual*	Light
nýlòn	*nylonable, nylonic*	–	Full vowel
ínsèct	*insectable, insectic*	*insécticide*	Full vowel
vélvet	*velvetable, velvitic*	–	Reduced vowel
coúrage	*courageable, courageic*	*courágeous*	Reduced vowel

Table 7: Examples for stimuli in figure 4.

As in Experiment 1, the presence of the Remote Base in an individual participant's lexicon leads to a higher rate of stress shift. This basic finding of Lexical Conservatism is again gradient, and sits alongside familiar phonological markedness avoidance effects and affix-conditioned behavior.

These findings were confirmed using a regression model, fit to all Derivatives with known Local Bases. The dependent variable was whether the stress placement in the Derivative matched that of the Local Base (= 1) or the Remote Base (= 0), and the model included as fixed effects the weight of the target syllable (*light* = 0 vs. *heavy* = 1), whether the target syllable bore secondary stress (*no* = 0 vs. *yes* = 1), Affix (*-able* = 0 vs. *-ic* = 1), and whether the subject knew the Remote Base (*no / none exists* = 0 vs. *yes* = 1). The model contained random intercepts for subject, Local Base, and Local Base + Affix combination, with random slopes of all fixed effects by Subject, a random slope of affix and whether the Remote Base was known by Local Base, and a random slope of whether the Remote Base was known by Local Base + Affix combination.

3.8.2 Priming the Remote Base

Turning to the point of interest for Experiment 2, we also find that a primed Remote Base exerts a greater impact on Derivative formation than an unprimed one; I plot this

Parameter	*Median*	*95% CI*	$P(\lvert\hat{\beta}\rvert > 0)$
Intercept:			
Affix = *-able*			
Target Syllable Heavy = *no*			
Target Syllable Secondary Stress = *no*			
Know Remote Base = *no*	-1.45	[-2.00, -0.90]	
Affix = *-ic*	1.77	[1.18, 2.34]	≈ 1
Target Syllable Heavy = *yes*	0.48	[-0.19, 1.12]	0.92
Target Syllable Secondary Stress = *yes*	1.82	[1.07, 2.61]	≈ 1
Know Remote Base = *yes*	1.21	[0.66, 1.74]	≈ 1

Table 8: Model of Experiment 2, all Local Bases. Coefficients are in log-odds, with positive signs indicating an increase in probability of stress shift relative to the intercept.

below, but statistical analysis is reserved for section 3.12.

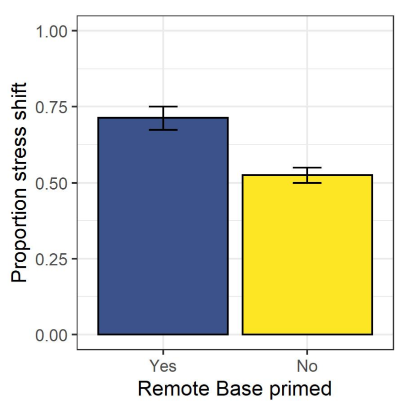

Figure 5: Mean and binomial confidence intervals from Experiment 2 of the proportion stress shifted Derivatives (vertical axis) by whether the Remote Base was primed (horizontal axis). An example of this type are the Derivatives *laborable* and *laboric*, with the Local Base *lábor*, and the Remote Base *labórious* either known and also primed (left bar) or known but not primed (right bar).

In summary, Experiment 2 replicated the core findings of Experiment 1, and extended it by demonstrating that the Remote Base was accessed in the process of forming the Derivative, indicated by its influence being able to be manipulated by priming.

3.9 Experiment 3

Experiment 3 probes whether *any* Remote Base will exert an influence on the Derivative, or whether as Steriade assumed, only a Remote Base that allows for a reduction in markedness will do so. We address this question by manipulating whether faithfulness to the Remote Base on on the part of the Derivative yields a phonologically-optimizing (markedness-reducing) result (as in *labórable* with Remote Base *labórious*, or a phonologically-non-optimizing (markedness-increasing) result (as in *résidable* with Remote Base *résident*.

3.10 Methods

3.10.1 Participants

Participant population, recruitment, screening, and compensation was the same as in Experiment 2. 54 participants were recruited, and 23 were excluded (15 for not having spoken English since before the age of seven consistently in some context, and 8 for technical problems relating to the sound quality), leaving 31 participants with data included in this study.

3.10.2 Materials

I report here results from a set of 50 disyllabic Local Bases, 20 with initial stress (ex., *cárrot, coúrage, hábit*) and 30 with final stress (ex., *presérve, propóse, províde*). Within each of these stress-groups, half of the Local Bases have Remote Bases with stress placed on the other syllable of the Base: for example, 10 of the initially-stressed disyllabic Local Bases had Remote Bases with final stress (ex. *coúrage* ∼ *courágeous, hábit* ∼ *habítual*), and 15 of the finally-stressed disyllabic Local Bases had Remote Bases with initial stress (ex. *províde* ∼ *próvidence, resíde* ∼ *résident*).

I selected two affixes, *-able* and *-ist*, based on the description in Marchand (1960) that the suffixes were not stressed nor obligatorily stress-attracting (cf. also Aronoff, 1976). To avoid possible confounds associated with non-standard selection frames in Experiments 1 and 2, a mixture of the two affixes was paired with disyllabic Local Bases, depending on the lexical category (nouns or adjectives). Stimuli for Experiment 3 are listed in table 27 in the Appendix.

3.10.3 Procedure

Experiment 3 was conducted over the internet using the Labvanced experimental platform (Finger et al., 2017). Instructions, procedure, structure, and data annotation were identical to that of Experiment 2. Due to an error in the configuration of the randomization structure for the trials, each participant only saw a randomly-selected subset of 80 out of the 95 unique Lexical Conservatism trials; vocabulary-check trials were not affected. Since the missing trials were distributed randomly among item types and subjects, I do not judge this to be a reason to believe the results of Experiment 3 should be biased in any particular direction; however it is likely that parameter estimates in statistical models fit to this data will have greater uncertainty because of the smaller sample size. Data exclusion criteria and statistical analysis followed Experiments 1 and 2, with the addition that trials of the Derivative *opposable* were excluded for being dictionary-listed, and therefore likely known to participants.

3.11 Results

In this set of Local Bases, we're interested in whether speakers treat harmful Remote Bases (ex., *résident*, a phonologically non-optimizing Remote Base for Local Base *resíde*) in the same way that they do helpful ones (ex., *habítual*, a phonologically-optimizing Remote Base for Local Base *hábit*).

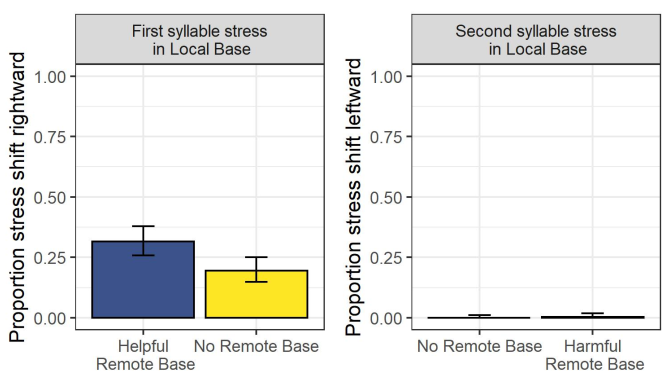

Figure 6: Results of the Lexical Conservatism task with disyllabic Local Bases from Experiment 3. The vertical axis plots the mean and binomial confidence interval of the proportion of stress shift in Derivatives, split by the stress of the Local Base (facets), and the type of Remote Base (horizontal axis within facets). Examples are as listed in table 9.

Local Base	Derivative	Remote Base	Remote Base type
pláster	*plasterable*	–	None
lábor	*laborable*	*labórious*	Helpful
finésse	*finessable*	–	None
resíde	*residable*	*résident*	Harmful

Table 9: Example stimuli for Derivatives plotted in figure 6.

Local Bases with helpful Remote Bases underwent stress shift at a rate higher than the baseline rate of unfaithfulness in Local Bases without any Remote Bases, while Local Bases with harmful Remote Bases did not form Derivatives that were meaningfully different from Local Bases without any Remote Bases. This is plotted in in figure 6. Strikingly, out of 340 trials where Derivatives were formed to final-stressed disyllabic Local Bases — those with harmful Remote Bases — only two were attested, *ópposist* and *ímposist*, and these occurred on trials when the relevant Remote Bases were primed.

In the statistical model, the stress of Derivatives formed to disyllabic Local Bases was predicted by fixed effects of whether the target syllable (the second syllable of the Local Base, where stress would fall if it matched the Remote Base and/or was unfaithful to the Local Base) was heavy, secondarily stressed, and whether the Remote Base was known to the participant. Because speakers treated Local Bases with helpful and harmful Remote Bases *very* differently, I fit the model only to those Derivatives formed to Local Bases with initial stress.

Parameter	*Median*	*95% CI*	$P(\|\hat{\beta}\| > 0)$
Intercept: Target Syllable Heavy = *no* Target Syllable Secondary Stress = *no* Know Remote Base = *no*	-3.99	[-5.63, -2.65]	
Target Syllable Heavy = *yes*	2.37	[0.47, 4.61]	0.99
Target Syllable Secondary Stress = *yes*	2.43	[0.05, 4.92]	0.98
Know Remote Base = *yes*	1.28	[-0.16, 2.81]	0.96

Table 10: Model of Experiment 3, all disyllabic Local Bases with initial stress. Coefficients are in log-odds, with positive signs indicating an increase in stress shift relative to the intercept.

The statistical model fit to the data confirmed the observations made above, along with the consistent effects of syllable weight attracting stress, and secondary stress in Local Bases making better targets for primary stress in the Derivative.

These findings are in line with the traditional interpretation of Lexical Conservatism; the Remote Base only exerts a pull on Derivative formation when it is phonologically-optimizing to do so. This finding stands in marked contrast to the pattern observed in Spanish diphthongization in section 4; I take up this conflict in section 5.2 where I propose a model where the two behaviors emerge as two ends of a continuum of behavior derived from a single theory.

3.11.1 Lexical results

As with Experiments 2, I plot the data broken down according to priming, but reserve statistical analysis for section 3.12.

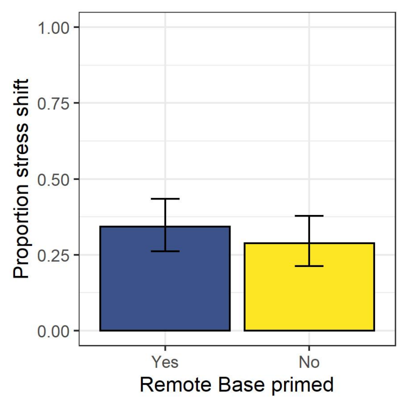

Figure 7: Mean and binomial confidence intervals from Experiment 3 of the proportion stress shifted Derivatives (vertical axis) by whether the Remote Base was primed (horizontal axis).

The results of priming Remote Bases for disyllabic Local Bases was largely in line with the results of Experiment 2: some evidence in favor of primed Remote Bases yielding more Derivatives with stress mismatching the Local Base.

3.12 Combined analysis of lexical characteristics of English

We now turn to the combined analysis of the influence of lexical characteristics of Remote Bases on Derivatives using combined data from Experiments 1, 2, and 3. The aim of the analysis here is to aggregate evidence from across the three English experiments by using a larger sample size (3,929 data points), and also a wider range of semantic similarities and frequencies.

I fit a mixed-effects Bayesian logistic regression model to the data from Local Bases with helpful, known Remote Bases from Experiment 1, 2, and 3. The model had a dependent variable of Stress Shift ($yes = 1$, $no = 0$), and fixed effects of whether the target syllable was heavy ($yes = 1$, $no = 0$), whether the target syllable was secondarily-stressed ($yes = 1$, $no = 0$), whether the Remote Base was primed ($yes = 1$, $no = 0$), the source Experiment (a three-level unordered factor), and affix (a five-level unordered factor). The model also contained centered and scaled coefficients for semantic similarity and their interaction with centered and scaled Remote Base log-frequency. Semantic similarity was estimated using a norming experiment described Breiss (2021:Appendix B). The model had random intercepts for Local Base, participant, and Derivative, with random slopes of all fixed effects except Experiment by participant, random slopes of priming and Experiment by Local Base, and Experiment by Derivative.

3.12.1 Results

The results of the model are reported in table 11 below.

Parameter	*Median*	*95% CI*	*P* $(\vert\hat{\beta}\vert > 0)$
Intercept:			
Target syllable secondary stress = *no*			
Target syllable heavy = *no*			
Affix = *-able*			
Experiment = *1*			
Remote Base = *unprimed*			
Remote Base log-freq. = *average values*			
Semantic similarity = *average values*	-0.47	[-1.17, 0.22]	
Target syllable heavy = *yes*	0.79	[0.10, 1.47]	0.99
Target syllable secondary stress = *yes*	1.05	[0.21, 1.89]	0.99
Affix = *-ic*	1.80	[1.10, 2.54]	≈ 1
Affix = *-ify*	2.08	[1.24, 2.94]	≈ 1
Affix = *-ism*	-0.57	[-1.08, -0.06]	0.99
Affix = *-ist*	-0.89	[-3.19, 1.29]	0.81
Affix = *-ity*	4.01	[3.03, 5.06]	≈ 1
Experiment = *2*	0.14	[-0.76, 1.06]	0.62
Experiment = *3*	-0.89	[-2.63, 0.82]	0.86
Remote Base = *primed*	0.46	[-0.02, 0.96]	0.97
Semantic similarity (*scaled 1-unit increase*)	-0.30	[-0.66, 0.06]	0.95
Remote Base log-freq. (*scaled 1-unit increase*)	0.02	[-0.30, 0.34]	0.55
Freq. × sim. (*scaled 1-unit increase*)	0.03	[-0.29, 0.35]	0.58

Table 11: Model of combined data from the wug test in Experiments 1, 2, and 3. Coefficients are in log-odds, with positive signs indicating an increase in chance of stress shift relative to the intercept.

Of critical interest here are how (and if) lexical characteristics of the Remote Base influenced the Derivative. We find that priming increases the odds of stress shift robustly (figure 8, left), and that increased semantic similarity between the Local and Remote Bases yields a reliable inhibitory effect on the chance of stress shift in the Derivative, even though that stress shift would lead to the Derivative more closely resembling the Remote Base (figure 8, right). The direction of this effect is unexpected, and we take it up again in detail in section 6.3.1. There was no evidence suggesting any role for a main effect of Remote Base log-frequency, nor for an interaction with semantic similarity.

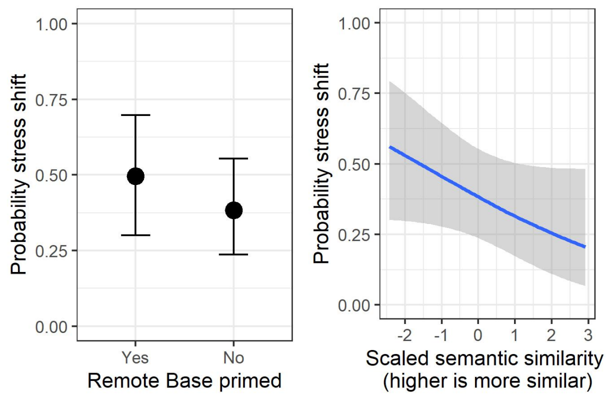

Figure 8: Plots of the effect of priming (left) and of scaled semantic similarity (right).

3.13 Summary of English experiments

Experiments 1, 2, and 3 on English stress replicated and extended the findings of Steriade (1997). I found that the dependency between paradigm shape and that of novel coinages replicates robustly in existing and novel Derivatives, but is probabilistic with counterexamples in both directions. Conditions on this variation include an independent role of phonological markedness avoidance, as well as static (semantic similarity) and dynamic (resting activation, as manipulated by priming) characteristics of the contents of the lexicon. I also found that phonologically non-optimizing Remote Bases in English exerted almost zero effect on Derivative formation. In the next section we consider the case of Spanish diphthongization, which presents an apparently-contradictory view that phonologically non-optimizing Remote Bases do indeed exert an influence on the Derivative.

4 Lexical Conservatism in Spanish diphthongization

The second case of Lexical Conservatism comes from the distribution of mid-vowels *e* [e] and *o* [o], and their diphthongal counterparts *ie* [je] and *ue* [we], in Spanish. I examine the contexts under which Spanish speakers monophthongize a diphthong when the licensing stress is moved off of it to probe whether phonologically non-optimizing

Remote Bases also influence Derivative formation. Recall that Spanish contrasts with English in the type of non-optimizing Remote Bases which are present.

4.1 Background on Spanish diphthongization

All dialects of Spanish exhibit an alternation which affects some stressed diphthongs <ié>[ˈje] and <ué>[ˈwe], yielding alternation with corresponding unstressed monophthongs <e>[e] and <o>[o]. This can be seen in forms such as *truéno* ∼ *tronámos* "I thunder ∼ we thunder" and *siénto* ∼ *sentámos* "I sit ∼ we sit". The alternation is unpredictable, however, since some diphthongs do not alternate with monophthongs when unstressed, as in *miédo* ∼ *miedóso* "fear ∼ afraid" and *puéblo* ∼ *pueblíto* "(a) town ∼ (a) small town", and further not all unstressed monophthongs alternate with diphthongs under stress *podámos* ∼ *pódo* "We prune ∼ I prune" and *montámos* ∼ *mónto* "We mount ∼ I mount". The phenomenon has long been studied as an "old chestnut" of exceptionful phonology, with numerous analyses proposed focusing on different ways of encoding the distinction between alternating and non-alternating roots (Harris, 1969; Hooper, 1976; Carlson and Gerfen, 2011:among many others).

This unpredictable alternation is the result of a historical merger between low-mid *[ɛ, ɔ], which exhibited exceptionless alternation between stressed *[je, we] and unstressed *[ɛ, ɔ], and high-mid vowels *[e, o] which did not alternate with stress (Penny, 2002). Because of the markedness-reducing neutralization of diphthongs and mid-vowels in unstressed positions, it was not obvious to speakers which mid-vowels alternate in this way, and which do not. This in turn lead to further remodelling and analogical change in the paradigms, and has given rise to etymologically-informed but synchronically-arbitrary alternation which exhibits type-level variation at the level of variation of the individual root with different affixes (ex., for the base *puébl-o* "town", both *pueblíto* "small town" and *población* "population"), as well as token-level variation within roots (ex., *cientóso* ∼ *centóso* "muddy"). This leads to a situation where both roots and affixes exhibit lexical propensities to alternate when the appropriate phonological conditions are met, yielding a complex landscape of cross-cutting conditioning factors.

A small but intriguing body of experimental work has examined how speakers extend these lexical generalizations to novel words. Eddington (1996, 1998) conducts two experiments in which speakers of Iberian Spanish were asked to attach 10 stress-attracting affixes to novel bases with a stressed diphthong. He recorded the rate at which the affixes induced monophthongization, and found rates of monophthongization varying from 4.7% for the diminutive *-(c)íllo* to 86.2% for adjectivizing *-óso*, indicating that speakers have internalized affix-specific propensity information about the contents of their lexicon. Carlson and Gerfen (2011) examines similar data on lexically-specific affix behavior, and finds evidence for a relation between the productivity of the affix and its propensity to trigger alternation. Further, Albright et al. (2001) advanced evidence demonstrating that speakers use segmental information in the environment of unstressed mid-vowels to predict whether they will alternate with diphthongs under stress.

4.2 Contexts for Lexical Conservatism

Unlike English, the suffixes of Spanish are almost always stress-bearing, and so we cannot examine contexts where affixation moves stress onto an unstressed monophthong that is part of the root. However, there are many cases where stressed diphthongs in roots have stress removed under affixation. Since unstressed diphthongs are generally taken to be phonotactically marked, we can ask whether the phonological grammar shows sensitivity to other paradigm members when determining if a newly-unstressed diphthong should be monophthongized. Words with a stressed diphthong that don't have any morphological relatives with differing stress, like *siniéstro* "sinister" or *ungüénto* "ointment", constitute a control case where the behavior of the phonological grammar can be observed in isolation: any repair in these environments is due to the conflict of markedness and faithfulness, without the interference of paradigm structure.

Local Bases that have morphological relatives with differing stress placement can be further divided into those where the corresponding vowel is monophthongized, which I term *helpful* Remote Bases, as in *niébla* ∼ *neblína* "fog ∼ mist" or *muéble* ∼ *moblár* "furniture ∼ to furnish", which admit classical Lexical Conservatism, or left unrepaired as in *unhelpful* Remote Bases, such as *ambiénte* ∼ *ambientál* "environment ∼ environmental" or *juérga* ∼ *juerguísta* "spree ∼ reveler". Lexical Conservatism predicts that speakers have the option of relying on the stem allomorph of Remote Bases that have an unstressed mononphthong to ease the penalty for monophthongizing the Local Base. The alternation also provides the context for the presence of an unhelpful Remote Base — a paradigm-member having an unstressed diphthong — to influence the odds of repairing the newly-unstressed diphthong; this outcome, however, is not markedness-improving, and not predicted by classical theories of Lexical Conservatism. I summarise the types of Local Bases and the relevant aspects of their paradigm structure in table 12 below.

Local Base	Helpful Remote Base	Unhelpful Remote Base	Derivative
ungüénto, siniéstro	-	-	*ungüentóso* ∼*ungontóso*, *siniestróso* ∼*sinestróso*
muéble, niébla	*moblár, neblína*	-	*mueblóso* ∼*moblóso*, *nieblóso* ∼*neblóso*
juérga, ambiénte	-	*juerguísta, ambientál*	*juergoso* ∼*jorgoso*, *ambientóso* ∼*ambentóso*

Table 12: Demonstration of the paradigmatic structure and relations relevant to the current study of Spanish monophthongization.

4.3 Experiment 4

I carried out an experiment with speakers of Mexican Spanish, wherein speakers were asked to create novel morphologically-complex words by affixing the adjectivizing suffix *-óso* to existing noun.

4.4 Methods

4.4.1 Participants

30 native speakers of Mexican Spanish were recruited using the Prolific online subject pool[2]. Recruitment was subject to the restrictions that participants have no self-reported reading difficulties, were born in and resided in Mexico at the time of the study, and identified Spanish as their first language. Participants were paid approximately $9 for their time.

4.4.2 Materials

90 Local Bases were selected for the study through the use of the dictionary *Diccionario de la Lengua Española (DLE)* and the assistance of a linguistically-trained native speaker. 45 Local Bases contained a stressed front-diphthong *ié*, and 45 contained a stressed back-diphthong *ué*. Within each diphthong set of 45, 15 Local Bases had no Remote Bases, 15 had helpful Remote Bases, and 15 had unhelpful Remote Bases; stimuli are listed in the Appendix. A phonetically-trained female native speaker of Mexican Spanish recorded each of the Local and Remote Bases for use in the experiment.

A single derivational affix *-óso* was chosen for the study, and Local Bases were selected such that none of the Derivatives formed through their combination with *-óso* were listed in the DLE, in an effort to ensure that as many as possible of the Derivatives in the study would be nonce-forms to the participants.

One small further nuance comes from the fact that Spanish is a language that has thematic vowels that generally mark grammatical gender, as in *entierr<u>o</u>* or *tiend<u>a</u>*. These vowels regularly and obligatorily delete before vowel-initial suffixes, so throughout I assume that viable Derivative candidates are, for example, the forms *tiendóso* or *tendóso*,

[2] www.prolific.co

but never **tiendaóso* or **tendaóso*, since such forms are never attested in the literature, and were not observed in the experimental responses reported here.

4.4.3 Procedure

The experiment was conducted over the internet using the Experigen in-browser platform (Becker and Levine, 2020) with instruction, structure, and procedure identical to Experiment 2 and 3.

4.5 Data annotation, exclusion, and analysis

Derivatives produced on each trial of the Lexical Conservatism task were annotated for whether the vowel they contained was an unstressed diphthong or monophthong; there were no cases where participants did not shift stress to the penult of the Derivative, nor any instances where the theme vowel was not truncated. In cases where a participant gave more than one response, I considered the last one produced as their response for that trial. Each Derivative was annotated for whether the speaker knew the Local Base and, if extant, the Remote Base. Data exclusion criteria followed Experiments 1-3, with the additional exclusion of responses to the Local Base *priesa* "(a) rush" due to experimenter error (n = 30).

Responses were analyzed in R (R Core Team, 2021) using Bayesian hierarchical logistic regression models implemented in *brms* (Bürkner, 2017) with specifications similar to the previous models.

4.6 Results

The primary question of interest in this experiment is whether participants were sensitive to the presence of both the helpful and unhelpful Remote Bases in forming Derivatives. Figure 9 plots the proportion of Derivatives containing a monophthong according to the type of Local Base, and examples of each type are given in table 13.

Local Base	Derivative	Remote Base	Remote Base type	Vowel
viérne	*v(i)ernóso*	–	None	
ciérro	*c(i)erróso*	*cerrár*	Helpful	[e/je]
higiéne	*hig(i)enóso*	*higienísta*	Unhelpful	
suélo	*sue/olóso*	–	None	
vuélo	*vue/olóso*	*volár*	Helpful	[o/we]
huévo	*hue/ovóso*	*huevón*	Unhelpful	

Table 13: Examples of stimuli plotted in figure 9.

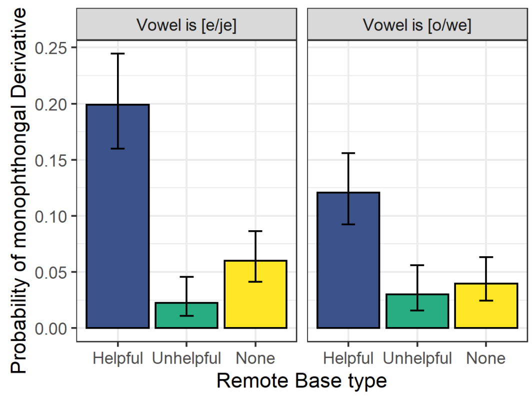

Figure 9: Results of the lexical conservatism task in Experiment 4. Vertical axis plots the proportion (mean and binomial confidence interval) of monophthongal Derivatives formed for each type of Local Base (horizontal axis); panels plot type of diphthong. Examples are in table 13.

Knowing a helpful Remote Base clearly influenced participants' responses, eliciting much more monophthongization such Derivatives compared to those without any Remote Base. This is the canonical Lexical Conservatism effect described by Steriade and others in the literature. Turning to Derivatives with unhelpful Remote Bases, there is less monophthongization than in the Local Bases without Remote Bases. The same pattern obtains across both types of diphthong, with slightly more repair in the front diphthong cases.

One quirk of the results is that overall rate of monophthong production in the study is quite low; for all categories of Local Base below twenty percent, and in most well below ten percent. This finding is puzzling given how extensive the stress-conditioned alternation of diphthongs is throughout the language, but is in line with previous experimental work on the topic, which found that the phenomenon was often difficult to elicit (Bybee and Pardo, 1981; Albright et al., 2001).

These conclusions were verified using a Bayesian mixed-effects logistic regression model fit to the results of Experiment 4. The Derivative vowel type was the dependent variable (*diphthong* = *0, monophthong* = *1*). The model contained a three-level categorical variable of Remote Base type (*none, unhelpful, helpful*), a binary categorical variable of diphthong type ([e/je] or [o/we]), and random intercepts for subject and Local Base, with a random slope of the fixed effects by subject. The results of the model are displayed in table 14.

Parameter	*Mean*	*95% CI*	*P* ($\|\hat{\beta}\| > 0$)
Intercept:			
Diphthong type = [e/je]			
Remote Base = *none*	-3.80	[-4.82, -2.91]	
Diphthong type = [o/we]	-1.28	[-2.46, -0.26]	0.99
Remote Base = *unhelpful*	-1.15	[-2.66, -0.01]	0.96
Remote Base = *helpful*	1.17	[0.24, 2.07]	0.99

Table 14: Model of Experiment 4. Coefficients are in log-odds, with positive signs indicating an increase in probability of diphthongization relative to the intercept.

4.7 Local discussion

Experiment 4 revealed that the opportunity for Lexically-Conservative behavior provided by the lexicon, discussed in section 4.2, is also represented in the grammars of individual speakers. Speakers show an increased willingness of monophthongize a newly-unstressed diphthong if, for that Local Base, there exists a Remote Base in which the corresponding unstressed vowel is a monophthong. Further, we find evidence for unhelpful Remote Base activity: Local Bases with an unstressed diphthong in the corresponding Remote Base vowel are *even less* likely to form monophthongal Derivatives compared to Local Bases with no Remote Bases.

The fact that we find unhelpful Remote Bases exerting a force on the Derivative is unexpected from the traditional point of view of Lexical Conservatism, since it flies in the face of the assumed markedness-reducing goal of the phenomenon, and conflicts with data from English in Experiments 1-3. Because markedness-obeying Lexical Conservatism is observed in English (that is, helpful but *not* harmful Remote Bases influence the Derivative), the markedness of unstressed diphthongs may be somewhat weak in Spanish. In the next section, I propose a phonological model that is able to accommodate (and indeed, in certain contexts *requires*) the coexistence of weak markedness with an attractive effect of the unhelpful Remote Base.

5 A voting-based theory of Base competition

In this section, I lay out a new theory of Lexical Conservatism that is based on the principle that each Base gets a "vote" in how the Derivative is realized. These competing demands are modeled using multiple faithfulness constraints, and I demonstrate that both the English and Spanish data follow from the same principles of the theory under different strengths of markedness and faithfulness. In order to simplify the exposition, I first outline the principles of the theory using schematic examples, then scale up to a full model of first the Spanish, then the English data using Maximum Entropy Harmonic Grammar (Goldwater and Johnson, 2003). I also highlight how the Spanish data in particular allow us to adjudicate between the proposed voting theory and two other theories of Lexical Conservatism in the literature.

5.1 Stage-setting assumptions

Before turning to the core theoretical proposal, I lay out and motivate some assumptions about the nature of the grammar and the lexicon that underpin it.

With regard to phonological formalism, the non-categorical nature of the phenomenon suggests that we must employ a probabilistic framework: Derivative repair is not obligatory, and is attested even in the absence of a Remote Base. Further, the fact that the form of the Derivative is jointly conditioned by multiple phonological factors suggests that a weighted-constraint model which derives constraint cumulativity by default is appropriate. I use the Maximum Entropy Harmonic Grammar framework (Smolensky, 1986; Goldwater and Johnson, 2003) to implement my analysis, although in principle a model using the Noisy Harmonic Grammar framework (Boersma and Pater, 2016) might also be possible.

With regard to the contents and structure of the lexicon, I follow Steriade's position: "[a]ny non-nonce word, any non-hapax form is, I assume, accessible as a base of affixation for the creation of a novel form. In other terms, I assume that any non-nonce form is lexically recorded..." (Steriade, 1997:p. 2). In the decades since her paper, this position has been largely vindicated by psycholinguistic research. Evidence for whole-sale listing comes from the work of Bybee and Pardo (1981); Hay (2003); Hay and Baayen (2005) and others, and there is also evidence that the lexicon contains robust amounts of word-specific phonetic detail (see evidence summarized in Pierrehumbert, 2016). I take this as evidence to support the existence of listed stem allomorphs as available "inputs" to the phonological grammar.

5.2 The core proposal

The model has two basic principles. First, each listed allomorph gets a say in how the Derivative is realized, regardless of its status with respect to markedness (optimizing (helpful), non-optimizing (unhelpful), or anti-optimizing (harmful)). This is operationalized via multiple faithfulness constraints, each enforcing identity between the Derivative and a different listed allomorph, each scaled by the *resting activation* of that lexical item. Second, markedness constraints evaluating candidate Derivatives cross-cut this network of faithfulness constraints.

I use an extended schematic example to illustrate the basic workings of the model. First, let us consider a single Local Base with no Remote Bases, with two candidates, one that undergoes a markedness-improving alternation (the *changed candidate*) and the other which does not (the *faithful candidate*). There are two constraints, Faith-Local, that is violated by the changed candidate, and Markedness, which is violated by the faithful candidate. This scenario is demonstrated in table 15 below.

/Local Base/ Weight:	Faith-Local	Markedness
	1	1
a. *faithful*		1
b. *changed*	1	

Table 15: A tableau illustrating the schematic violation profile of a Derivative to a Local Base with no Remote Bases.

In this scenario, we can note that although there are two constraint weights to set, it is only the difference between the two that is critical (though this will change later on). The graph below in figure 10 demonstrates that as the weight of Markedness changes with Faith-Local held constant, the probability of the changed candidate likewise differs, from low when Markedness is below Faith-Local, to medium when the two weights are equal, to high when the weight of Markedness exceeds that of Faith-Local. The shape that the relationship traces is the well-known *sigmoid* of the logistic curve relating Harmony to probability in a MaxEnt grammar; for an extensive review of the relevance of this shape to phonology specifically and the places it appears in linguistic phenomena more broadly, see Hayes (2022).

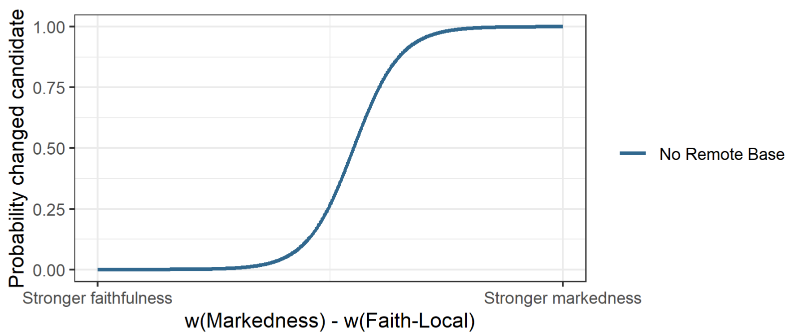

Figure 10: Schematic change in probability of the changed candidate based on the difference between the weight of MARKEDNESS and FAITH-LOCAL.

Consider next a Local Base with a helpful Remote Base as in table 16. We see that the presence of a helpful Remote Base increases the odds of Derivatives resembling it — classical Lexical Conservatism. Here, the faithful candidate violates not only MARKEDNESS, but also FAITH-REMOTE, a constraint enforcing faithfulness to the Remote Base. The degree to which FAITH-REMOTE is less than FAITH-LOCAL governs the strength of attraction of the Remote Base – that is to say, the horizontal displacement of the sigmoids from one another (for the sake of this schematic example, I hold this value constant). This is implemented in the tableau in figure 11.

/Local Base/ Weight:	FAITH-LOCAL 1	MARKEDNESS 1
a. *faithful*		1
b. *changed*	1	

/Local/, /Helpful Remote/ Weight:	FAITH-LOCAL 1	FAITH-REMOTE 1	MARKEDNESS 1
a. *faithful*		1	1
b. *changed*	1		

Table 16: A tableau illustrating the schematic violation profile of a Derivative to a Local Base with no Remote Base (top) and a helpful Remote Base (bottom), for a fixed weight of FAITH-REMOTE.

Adding the new tableau to the visual typology in 11, we see that by design its changed candidate is consistently higher (greater probability) than that of one with no Remote Base.

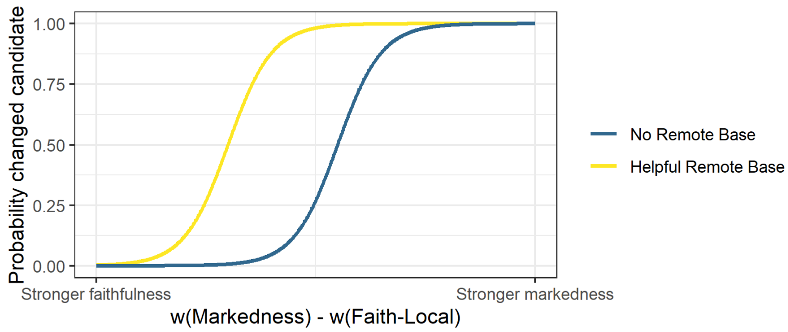

Figure 11: Schematic change in probability of the changed candidate based on the difference between the weight of Markedness and Faith-Local, for a Local Base with a helpful Remote Base and for a Local Base with no Remote Base.

We can also add lines for the different types of non-optimizing Remote Base. First let us consider the unhelpful Remote Base, where the Remote Base has the same markedness as the faithful candidate. This is seen in the tableau below.

/Local Base/	Faith-Local	Markedness
Weight:	1	1
a. *faithful*		1
b. *changed*	1	

/Local/, /Helpful Remote/	Faith-Local	Faith-Remote	Markedness
Weight:	1	1	1
a. *faithful*		1	1
b. *changed*	1		

/Local/, /Unhelpful Remote/	Faith-Local	Faith-Remote	Markedness
Weight:	1	1	1
a. *faithful*			1
b. *changed*	1	1	

Table 17: A tableau illustrating the schematic violation profile of a Derivative to a Local Base with no Remote Base (top), a helpful Remote Base (center), and an unhelpful Remote Base (bottom).

For any vertical position on the horizontal axis, the line for the changed candidate is consistently below (less probable than) the changed candidate for the Local Base with no Remote Base.

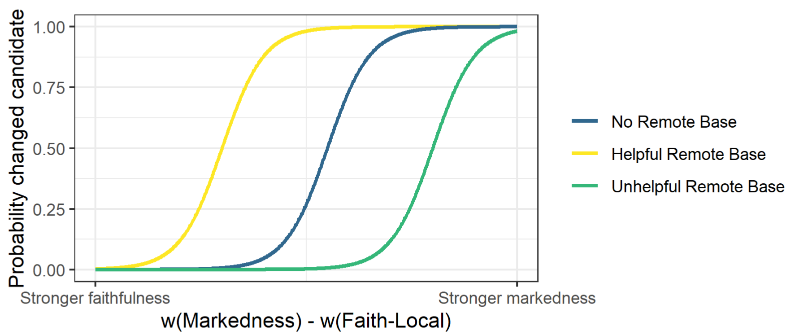

Figure 12: Schematic change in probability of the changed candidate based on the difference between the weight of MARKEDNESS and FAITH-LOCAL at a fixed weight of FAITH-REMOTE, for a Local Base with a helpful Remote Base, a Local Base with no Remote Base, and a Local Base with an unhelpful Remote Base.

We are now in a position to apply the model to the Spanish data from Experiment 4.

5.3 Evaluation on Spanish data

The data to be modeled are the responses from Experiment 4, graphed in figure 9. The constraint set follows the principles of the voting theory outlined above: markedness constraints penalize unstressed diphthongs in candidates, and the influence of each Base is handled by multiple faithfulness constraints. The markedness constraints are the following:

- ***UNSTRESSED *-IE-*:** Assign one violation for each unstressed front diphthong *-ie-* in a candidate.

This constraint is violated in forms *ambientál* "environmental" and *dietético* "dietitian". This constraint is motivated by the literature documenting avoidance of unstressed diphthongs in static lexical patterns and pathways of diachronic change, and also corroborated by the phonotactic markedness task described in (Breiss, 2021:ch. 3).

- ***UNSTRESSED *-UE-*:** Assign one violation for each unstressed front diphthong *-ue-* in a candidate.

This constraint is the back counterpart of *UNSTRESSED *-IE-*, and is violated in forms such as *crueldád* "cruelty" and *suegrástra* "stepmother-in-law".

As discussed in section 5.2, faithfulness constraints play a special role in the voting model of Lexical Conservatism: rather than a single constraint enforcing identity between a single UR and corresponding segments in a range of candidates, multiple constraints serve this same function, embodying the pull of each paradigm member on each candidate. Faithfulness constraints used in this analysis are the following:

- **Id-V-Local:** Assign one violation for each vowel in the Local Base that is not identical to its corresponding vowel in the candidate

Violations of this constraint are found in the UR-SR pairs /mwebloso/ → [moblóso] meaning "full of furniture", where the Local Base is *muéble* "furniture", and /djetoso/ → [detóso] "pertaining to a diet" where the Local Base is *diéta* "diet".

- **Id-V-Remote:** Assign one violation for each vowel in a Remote Base that is not identical to its corresponding vowel in the candidate.

Violations of this constraint are found in the UR-SR pairs /apwestoso/ → [apwestóso] "dashing, daring" with the Remote Base *apostár* "to bet", and /wevoso/ → [ovóso] "eggy" with the Remote Base *huevón* "a lazy person" (slang, literally "a big egg").

5.3.1 Model fitting and evaluation

I fit a MaxEnt model to counts of Derivative productions with monophthongal vs. diphthongal unstressed vowels using Excel's *Solver* utility (Fylstra et al., 1998), with a Gaussian prior on weights with a mean of 0 and standard deviation of 100. The goal of using a prior was to endow the model with a mild preference for lower constraint weights, which can be overcome with a sufficient amount of data; for precedence see Wilson (2006); White (2017). For each Local Base there are two candidates, one having one having an unstressed diphthong and the other an unstressed monophthong. The fitted weights are displayed in table 18.

Constraint	Weight
*UNSTRESSED -*IE*-	0.45
*UNSTRESSED -*UE*-	0.00
ID-V-LOCAL	3.04
ID-V-REMOTE	1.09

Table 18: Constraint weights of model fit to data from Experiment 4, on Spanish.

I test the model against one that does not involve Remote Bases (forcing weights for faithfulness constraints referring to them to be zero), and one that does not distinguish between Local and Remote Bases (forcing weights to be equal for all faithfulness constraints). Both significantly underperform my proposed model on a likelihood ratio test (ΔLoglikelihood $= 46$, $p < 0.001$, with two degrees of freedom; and ΔLoglikelihood $=$ 211.5, $p < 0.001$, with two degrees of freedom, respectively).

Turning to the weights themselves, we can see that Local Bases have a stronger role in influencing the Derivative than Remote ones, and that the weight of markedness is nonzero but mild. Quantitatively, the R^2 was 0.25, and the fit between predicted and observed data is displayed in figure 13 below. Since the phonological model is not missing obvious grammar-wide constraints that could explain the low R^2 value, I speculate that this is due to the high amount of within-word variability or idiosyncrasy, a property of the alternation also observed by Eddington (1996); Albright et al. (2001); Carlson and Gerfen (2011).

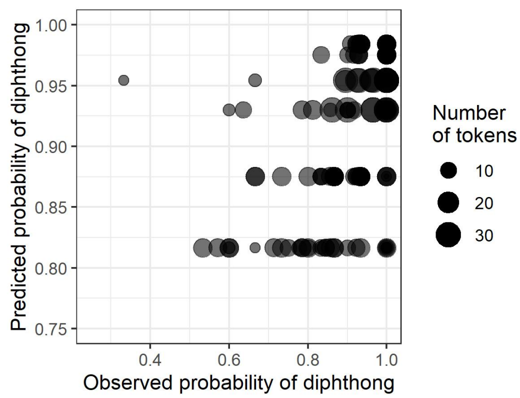

Figure 13: Predicted vs. observed fit to data from Experiment 4 on Spanish.

We can see where the Spanish data fit into the predicted typology of the model, in figure 14. Note that the finding that the helpful Remote Base exerts a stronger effect in probability space than the unhelpful Remote Base does falls out automatically as a consequence of the model; the difference between the blue line and the yellow line is greater than between the blue line and the green line, even though the difference in weight between FAITH-LOCAL and FAITH-REMOTE is identical in the model.

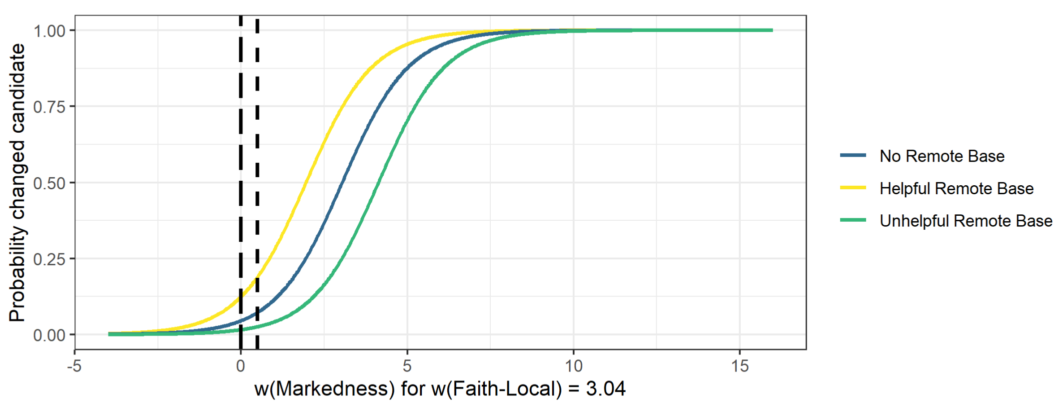

Figure 14: Schematic place of the Spanish data in the predicted typology of my model. The left, long-dashed vertical line is the typological place of Derivatives to Local Bases with a back diphthong, and the right short-dashed line represents the place of Derivatives to Local Bases with a front diphthong.

5.4 Comparison to alternative models

The Spanish data allow us to distinguish the voting model of Lexical Conservatism from two other formal analyses; I continue the main thread of modeling with the English data below in section 5.6. Here, however, I demonstrate that neither Steriade's original method of analysis from her 1997 work, nor the more recent proposal by Steriade and Stanton (2020), is able to capture the activity of the unhelpful Remote Base in Experiment 4.

5.4.1 Steriade (1997)'s analysis: quantifying over bases

The original model proposed to account for the data from English Level Two affixation in *-able* and for French liaison in Steriade (1997) uses a mechanism that differs from the one I propose in that it puts the emphasis on the role of the lexicon in *licensing* candidates that do not resemble the Local Base, rather than enforcing faithfulness between specific Bases and candidates. The style of analysis can be thought of as involving a quantification over Bases: as long as there is *some* Base in the lexicon that the Derivative can resemble, there is no penalty. The Lex-X family of constraints she used is defined here, in reference to the primarily-stressed vowel of the Local Base.

- **Lex-Vowel**: Assign one violation if there is no Base in the input that matches the vowel in the candidate in quality.

This model is unable to distinguish rates of monophthongization in Derivatives that show an influence of an unhelpful Remote Base from those that have no Remote Base, as demonstrated in table 5.4.1 below.

/wéko/ Weight:	LEX-VOWEL 1	*UNSTRESSED -*UE*- 1
a. [wekóso]		1
b. [okóso]	1	

/mwéble/, /mobl-/ Weight:	LEX-VOWEL 1	*UNSTRESSED -*UE*- 1
a. [mweblóso]		
b. [moblóso]		

/xwérga/, /xwerg-/ Weight:	LEX-VOWEL 1	*UNSTRESSED -*UE*- 1
a. [xwergóso]		1
b. [xorgóso]	1	

Table 19: A schematic example demonstrating that an analysis in the style of Steriade (1997) fails to capture the influence of the unhelpful Remote Base. LEX-VOWEL is violated if, a for a given syllable in the candidate, the corresponding syllable in *some* base does not also have the same vowel quality.

Since the LEX-VOWEL constraint does not encourage identity between Bases and candidates, and instead simply licenses the possible existence of candidates that resemble any Base in the lexicon, the fact that the Remote Base resembles the Local Base makes no difference in how probability is allotted to forms. This stands in contrast to the voting model's violation profile for these cases in table 17, which does distinguish these cases.

5.4.2 Steriade and Stanton (2020)'s analysis: one Base per candidate

The model of Lexical Conservatism proposed in Steriade and Stanton (2020); Steriade (2018) is very similar to the one I propose in section 5.2, with a small difference: they assume that each candidate Derivative stands in correspondence to a single Base – Local or Remote – that is in the input to the tableau.

In the figure below, the constraint BD-IDSTRESS – referencing the Base-Dependent relationship defined by the indexation of the candidates to the Bases in the input (L(ocal) or R(emote)) – is violated if the stressed syllable in the candidate does not correspond to the stressed syllable in the Base it depends on. *LAPSE$_{LAT}$ is the motivating markedness constraint, doing the job of *EXTENDEDLAPSE in the model I propose in section 5.6, except that it is indexed to the Latinate stratum of Bases; this detail doesn't bear on the suitability of this style of analysis to model the Spanish data, but I return to a discussion of lexical strata in section 6.1. Their constraint C-CONTAINMENT is violated if the candidate is in correspondence to a non-Local base (that is, one which would force a candidate to violate the cyclic containment of the Local Base within the Derivative). In this model, satisfaction of the markedness constraint *$\text{L}\textsc{apse}_{\textsc{lat}}$ is achieved by candidate (a), which is faithful to the Remote Base at the expense of faithfulness to the Local Base. Candidate (b) satisfies faithfulness to the Base it depends on (the Local one), but violates markedness in doing so, and thus is ruled out. Candidate (c) is in correspondence with the Local Base but violates faithfulness to it.

However, like the model put forward by Steriade (1997), the model cannot account for cases where an unhelpful Remote Base exerts a role in shaping the Derivative: there is no weight of faithfulness and markedness that allows for the Local Base with an unhelpful Remote Base, here *juérga* "spree" ∼ *juerguísta* "reveller", to have a rate of monophthongization which differs from that of the Local Base without any Remote Base, like *huéco* "gap". This follows from Steriade's original assumption about the markedness-improving role of the Remote Base, and is evident in the example in table 20 below.

/wéko/$_L$ Weight:	BD Id-V 1	*Unstressed -*ue*- 1	C-Containment 1	H	*p*
a. [wekóso]$_L$		1		1	.5
b. [okóso]$_L$	1			1	.5

/mwéble/$_L$, /mobl-/$_R$ Weight:	BD Id-V 1	*Unstressed -*ue*- 1	C-Containment 1	H	*p*	sum *p*
a. [mweblóso]$_L$		1		1	.31	.36
b. [mweblóso]$_R$	1	1	1	3	.04	
c. [moblóso]$_L$	1			1	.31	.63
d. [moblóso]$_R$			1	1	.31	

/xwérga/$_L$, /xwerg-/$_R$ Weight:	BD Id-V 1	*Unstressed -*ue*- 1	C-Containment 1	H	*p*	sum *p*
a. [xwergóso]$_L$		1		1	.36	.5
b. [xwergóso]$_R$		1	1	2	.13	
c. [xorgóso]$_L$	1			1	.36	.5
d. [xorgóso]$_R$	1		1	2	.13	

Table 20: A schematic example demonstrating that an analysis in the style of Steriade and Stanton (2020) fails to capture the influence of the unhelpful Remote Base.

Because there is no markedness-improving reason for the Derivative to be more faithful to the unhelpful Remote Base, the model cannot distinguish the rates of repair for Local Bases with no Remote Base, and those with unhelpful Remote Bases.

To quantify the degree of misfit induced by the inability to capture the effect of unhelpful Remote Bases in Spanish, I fit them both to the data from Experiment 4 treated in section 5.3, and examined the evidence ratio (Burnham and Anderson, 2002; Anderson and Burnham, 2002; Burnham and Anderson, 2004) for each of the two alternative analyses to the one I proposed in section 5.2; this is displayed in table 21 below.

Model	*LL*	*ΔAICc*	*Evidence ratio favoring the first model*
Voting model (this paper)	-562.24		
Steriade (1997)	-567.08	7.68	46 : 1
Steriade & Stanton (2020)	-567.08	9.68	126 : 1

Table 21: Statistical measures of model fit and comparison for the voting theory of Remote Bases proposed in section 5.2, the quantification-based theory of Steriade (1997), and the one-Base-at-a-time theory of Steriade and Stanton (2020).

We can see that the inability to distinguish between Derivatives with and without a non-optimizing Remote Base leads for the weight of evidence to favor the voting theory.

5.5 On harmful Remote Bases

So far, we have examined the interaction of Local Bases with no Remote Base, helpful Remote Bases, and unhelpful Remote Bases – at first in schematic form, then applied to experimental data from Spanish. Here, we take up harmful Remote Bases — cases where, if the Remote Base were adopted in the Derivative, the changed candidate would actually be *more* marked than the faithful candidate. Again, first I lay out the pattern schematically, then apply it to the English data.

/Local Base/ Weight:	FAITH-LOCAL 1	MARKEDNESS 1
a. *faithful*		1
b. *changed*	1	

/Local/, /Helpful Remote/ Weight:	FAITH-LOCAL 1	FAITH-REMOTE 1	MARKEDNESS 1
a. *faithful*		1	1
b. *changed*	1		

/Local/, /Harmful Remote/ Weight:	FAITH-LOCAL 1	FAITH-REMOTE 1	MARKEDNESS 1
a. *faithful*		1	
b. *changed*	1		1

Table 22: A tableau illustrating the schematic violation profile of a Derivative to a Local Base with no Remote Base (top), a helpful Remote Base (center), and a harmful Remote Base (bottom).

Adding the probability of the changed candidate to yield the graph in figure 15, we can see that the changed candidate for the Derivative of a Local Base with a harmful Remote Base is only likely when the weight of FAITH-LOCAL is high relative to MARKEDNESS, and even then is somewhat marginal.

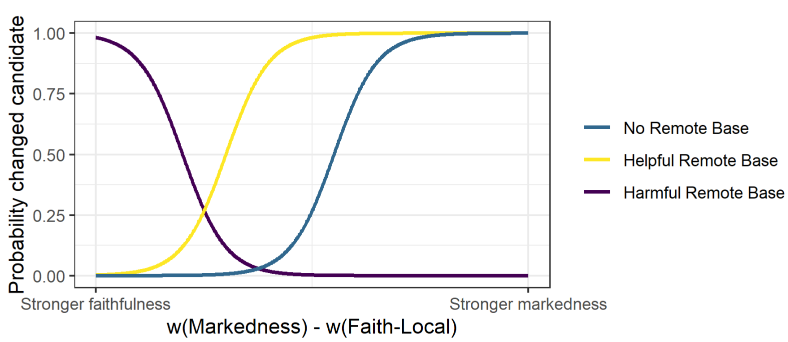

Figure 15: Schematic change in probability of the changed candidate based on the difference between the weight of MARKEDNESS and FAITH-LOCAL, for a Local Base with a helpful Remote Base, a Local Base with no Remote Base, and a Local Base with a harmful Remote Base.

5.6 Evaluation on English data

We are now in the position to fit a model based on the voting theory of Remote Bases to the English data. To aid in a unified phonological analysis, I aggregate the data across experiments; I do not include data from Experiment 1 because it used written stimuli, and in Steriade's original stimuli the *-ate* suffix was pre-removed in the presentation of the Derivative, making direct between-experiment comparison impossible for these stimuli.

5.6.1 Constraints used in analyzing data from Experiments 2 and 3

The constraints employed in this analysis are quite traditional in the context of the literature on English stress, with the exception that faithfulness constraints are differentiated based on the status of the Base that they are enforcing faithfulness to. The markedness constraints employed in the analysis are the following:

- ***ExtendedLapse**: Assign one violation for each string of three unstressed syllables in the Derivative.

This constraint is violated in forms such as *bállotable* and *láborable*, and obeyed in shifted candidates like *ballótable* and *labórable*. This constraint drives use of phonologically-advantageous Remote Bases, and its strength suppresses analogical influence of faithfulness to harmful Remote Bases in English. For precedents, see Gordon (2002); Stanton (2016); see also Steriade and Stanton (2020) for use in the analysis of cases of Lexical Conservatism in English stress.

- ***WeakFinalTernary:** Assign one violation for each sequence of two unstressed, word-final syllables directly preceded by a syllable bearing secondary stress.

This constraint is violated in forms such as *bánkrùptable* and *cúckòldable*. Speaking in terms of SPE stress numbering (Chomsky and Halle, 1968), it forbids the sequence *200#*, where *2* indicates secondary stress. This principle of English metrical structure can be found described in Pater (2000), where it was cast as a ban on non-right-aligned main stress (assuming final-syllable extrametricality), and much work before and since has found this principle emergent from comprehensive analyses of English stress.

- **Pre-stress *-ic*:** Assign one violation if syllable directly preceding the suffix *-ic* does not bear primary stress.

This constraint is violated in forms such as *lúmberic* and *résinic*. Although analyses of the stress preferences of English affixes broadly construed generally make use of a distinction between Level 1 and Level 2 affixes to regulate this behavior, for the simpler present case I use a "brute force" constraint like this one to model the degree to which *-ic* prefers to be pre-stressed (cf., for instance, Chomsky and Halle, 1968:who posit an affix-specific rule).

- ***WeakHeavy:** Assign one violation when a post-tonic heavy syllable in the Derivative does not also bear stress (primary or secondary).

This constraint is violated in forms such as *séquencable.* This constraint enforces one aspect of the stress-to-weight principle, a typological propensity for heavy syllables to attract stress (see Ryan, 2016:for an overview of the literature), and of the Latin Stress Rule of English (Chomsky and Halle, 1968; Liberman and Prince, 1977:et seq.).

The faithfulness constraints included in the analysis are listed below. Note that the faithfulness constraints are split into primed and non-primed versions; this is a mere notational variant for a scaling factor. For local purposes, it acts just like any other faithfulness constraint.

- **Id-[stress]-Local:** Assign one violation if the primary stressed syllable in the Local Base does not correspond to the primary stressed syllable in the candidate.

Violating UR-SR pairs include /sénator/ → [senátorist] and /sénator/ → [sènatórist].

- **Id-[stress]-Remote-primed:** Assign one violation if the primary stressed syllable in a primed Remote Base does not correspond to the primary stressed syllable in the candidate.

Violating UR-SR pairs include /túmult/→ [túmultist] if *tumúltuous* is primed, and /próverb/ → [próverbist] if *provérbial* is primed.

- **Id-[stress]-Remote-unprimed:** Assign one violation if the primary stressed syllable in an unprimed Remote Base does not correspond to the primary stressed syllable in the candidate.

Violating UR-SR pairs include /túmult/→ [túmultist] if *tumúltuous* is not primed, and /próverb/ → [próverbist] if *provérbial* is not primed.

5.6.2 Model fitting and evaluation

Model fitting followed the same procedure as with the Spanish model. An example of the Local Base *lábor* with Remote Base *labórious* is below in table 23.

The weights allotted to the above constraints are listed in table 24.

/ˈle͡ɪbɚ/$_L$, /ləˈbɔɹ-/$_R$	*ExtendedLapse	*WeakFinalTernary	Pre-stress -*ic*	*WeakHeavy	Id-[stress]-Local	Id-[stress]-Remote-primed	Id-[stress]-Remote-unprimed
a. [ˈle͡ɪbɚəbl̩]	1					1	
b. [ləˈbɔrəbl̩]					1		

Table 23: A sample candidate and violation set from a tableau where the Remote Base *laborious* is known and primed.

Constraint	Weight
*ExtendedLapse	1.17
*WeakFinalTernary	2.65
Pre-stress -*ic*	3.13
*WeakHeavy	0.23
Id-[stress]-Local	2.48
Id-[stress]-Remote-primed	1.23
Id-[stress]-Remote-unprimed	0.75

Table 24: Constraint weights for model fit to data from Experiments 2 and 3, on English.

I do not carry out significance testing on a constraint-by-constraint basis, because many of the narrower effects have been more rigorously assessed in section 3 using inferential statistics. However, I do test the model against two alternative models that embody different theoretical claims, which do not correspond to any previous statistical test done on the data. First, I compare the full model to one where the lexicon plays no role in scaling accessibility of Bases cashed out as differing weights of Faithfulness constraints. This model does not allow faithfulness constraints to have different weights based on whether they refer to Local and Remote Bases; it significantly underperforms my proposed model (ΔLoglikelihood $= 6.4$, $p = 0.002$, with two degrees of freedom). The second model is one that denies a role for Remote bases to play in generating the data all together, so the weights of faithfulness to Remote Bases are forced to zero; this model also significantly underperforms (ΔLoglikelihood $= 63.1$, $p < 0.001$, with two degrees of freedom). I take these findings as points in favor of a general model of Lexical Conservatism that relies on Remote Bases, and further allows the lexicon to scale access to them (discussed below).

5.6.3 Discussion

Qualitatively examining the weights given to the constraints in table 24 above, it seems that the markedness constraints generally are in line with what one might expect from an experimental test of the principles of English metrical phonology: there is a strong effect of matching weight to stress, as well as the avoidance of long lapses. Turning to faithfulness constraints, we find that the status of the Base in the lexicon is reflected directly in the weights. Most prominent is the Local Base, which exerts a powerful influence on the Derivative; Remote Bases have lower weights of faithfulness, and reflect a distinction of priming such that primed Remote Bases are more influential on the Derivative than unprimed ones. In quantitative terms, the model achieves a reasonable fit to the data, with an R^2 of 0.67; the model predictions are plotted below in figure 16.

Finally, we can approximately locate the effects observed in English on the typology graph, as in figure 17 below. Note that this is not a quantitative estimate (doing so would involve converting the more articulated markedness constraint structure summarized in table 24 to a three-parameter scenario), but simply a visual aid to the intuition about where the English data lie in the typology of Base effects that the voting model predicts. In English, we find that there is some rightward stress shift in Local Bases without Remote Bases, and more if there is a helpful Remote Base. However, we see hardly any leftward stress shift (two productions total, out of several thousand in Experiment 3), which would exhibit an influence of the the harmful Remote Base.

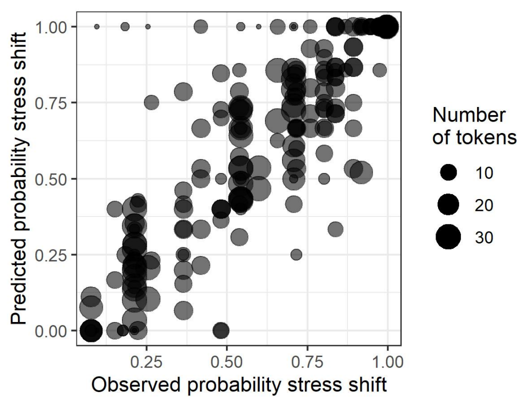

Figure 16: Predicted vs. observed fit to data from Experiments 2 and 3, on English.

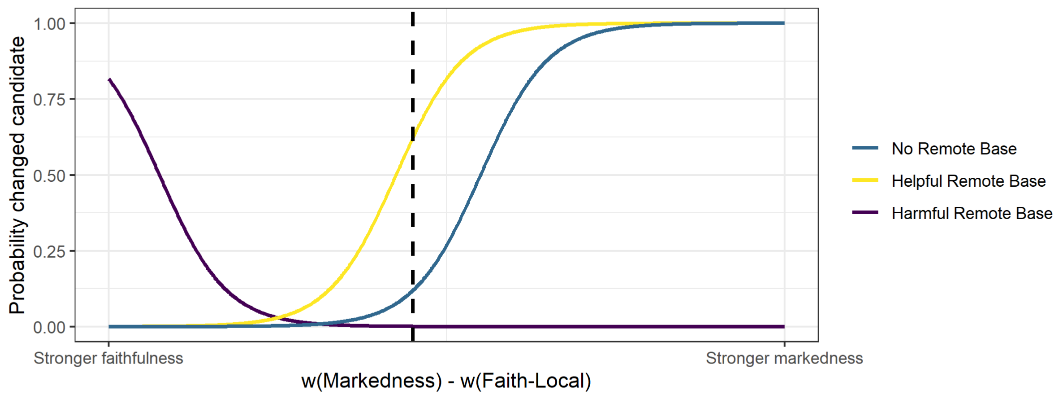

Figure 17: Schematic place of the English data in the predicted typology of my model.

6 Discussion

6.1 Why is Lexical Conservatism not ubiquitous?

The proposed voting theory of Bases relies on a language-general proposal about the way Base competition in the lexicon interacts with the phonological grammar. Therefore it is important to discuss why Lexical Conservatism and other Base effects are not attested in all languages. Aside from the reasonable possibility that such effects might be more widespread than generally assumed and phonological description has not caught up with this reality yet, I suggest here that the voting mechanism will allow Remote Bases to yield noticeable effects on Derivative formation only when specific morphological and phonological conditions are satisfied.

As a concrete example of this point, let us consider other English affixes: why do we not see Lexical Conservatism behavior for other affixes in English, like *-ness*? I argue this is because the voting mechanism crucially depends on the degree to which stress shift is required in these affixes. In this reasoning, I follow Steriade and Stanton (2020) who use lexical-stratum-specific versions of *Lapse with different rankings to accommodate this difference. The Latinate-stratum-specific *Lapse constraint is not violated by *-ness* and therefore the speaker gleans no reduction in markedness by violating faithfulness to the Local Base.

Thus I argue that whether a specific affix will evoke lexically-conservative behavior in its stem allomorphs is a matter of the broader markedness structure of the language, rather than anything to do with the actual mechanisms underpinning Lexical Conservatism itself.[3] The regions where the voting model predicts vanishingly small effects of the Remote Base is illustrated by the vertical dashed lines on the graph in figure 18 below.

More broadly, the paradigm of the Local Base must contain Remote Bases whose stem allomorphs differ from it in surface-detectable ways.

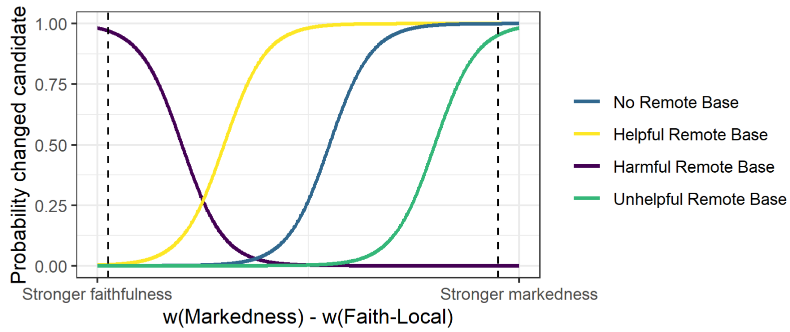

Figure 18: Schematic example where Remote Base activity is suppressed at extreme values of markedness or faithfulness; strong local faithfulness to the left, and strong markedness to the right.

Finally, if the weight of FAITH-REMOTE is near-zero, even given the appropriate balance between the weights of MARKEDNESS and FAITH-LOCAL the Remote Base will hardly have any detectable effect on the distribution of Derivatives.

6.2 Learning

What role might learning play in enabling speakers to exhibit Lexical Conservatism? There are (at least) three parts to this question. First, starting narrowly, we can ask whether there is evidence in the learners' input to set the weight of FAITH-REMOTE on a language-specific basis. On the one hand, it could be the case that the weight of FAITH-REMOTE is learned independently from that of FAITH-LOCAL from the learning data in the lexicon. In this scenario, the learner effectively notices how analogically-driven her language's morphophonological alternations are based on lexical data; Breiss (2021) pursues a pilot analysis along these lines. In this world, the real-time influence of the lexicon comes only in scaling the violations of those already-weighted constraints.

[3]The same effect could be achieved with high Output-Output faithfulness (Benua, 2000) invoked by the affix on its Base; either way, the absolute value of the difference between markedness and faithfulness is high, and so the effect of the Remote Base predicted by the model is minuscule.

On the other hand, it could be that the weight of FAITH-REMOTE is actually identical to that of FAITH-LOCAL — implying that there is only one relevant notion of Base faithfulness in a language — and that any observed differences between the influence of Local and Remote Bases in experimental data is due to the the scaling of the influence of the Remote Base by lexical characteristics via resting activation, with the majority of real-life scenarios where novel Derivatives might be coined being those where the Local Base has higher resting activation than the Remote Base.

More broadly, there is the question of whether the architecture assumed by the voting Bases theory might be itself learned, or whether it is better thought of as being "always on", a manifestation of independently-motivated lexical or cognitive structures. Further more rigorous analysis of corpus data paired with experimental investigation is required to come to firm conclusions about the points raised here.

6.3 Processing

Turning now to the effects of processing factors on Derivative formation, I do not propose that it is necessary to learn the way in which the phonological grammar can be influenced by the lexical characteristics of the stem allomorphs in the input. Instead, I suggest that the influence of the lexical characteristics observed in Experiments 1-3 form part of a broader emerging body of literature documenting cases where non-phonological characteristics of a lexical item influence phonological outcomes in the grammar. In his paper, we saw in English that priming the Remote Base increased its influence on the Derivative. We also observed that semantic similarity of the Local and Remote Bases played a role in influencing whether the Remote Base had an effect on the Derivative in question, albeit one in a direction opposite to the one Steriade anticipated (Steriade, 1997:p. 19). Further afield, Eddington (2006); Kim (2021); Breiss et al. (2021) have observed that the token frequency of non-local surface forms of paradigm members conditions variability in Paradigm Uniformity, and Baroni (2001); Zuraw (2007); Zuraw and Peperkamp (2015); Zuraw et al. (2020); Wurm (1997); Caramazza et al. (1988) have demonstrated that token frequency can interact with lexical retrieval to bias phonological behavior. Work by Wagner (2012); Kilbourn-Ceron et al. (2016); Lamontagne and Torreira (2017); Kilbourn-Ceron and Sonderegger (2018); Tamminga (2018); Kilbourn-Ceron and Goldrick (2021:among others) under the banner of the Production Planning Hypothesis has also demonstrated that the lexical characteristics of morphemes can influence phonological behavior via their impact on ease of planning in speech production. Thus in general there is robust evidence that the relative salience or prominence of a lexical item can influence how this item is treated by the phonological grammar; we take this as a fact about the way domain-general cognitive resource allocation interact with language-specific phenomena, and therefore do not motivate it based on language-specific knowledge, learned or innate.

6.3.1 Resting activation

The question remains, however, of how our *phonological* theories should be set up to interact with these cognition-general factors. I suggest that the intuitive notion of salience motivated above can be captured using the psycholinguistic construct of *resting activation* (see, for example, Morton, 1970: and a multitude of others since). Resting activation is influenced by static and dynamic lexical factors, and is thought to be a largely unconscious quantity, computed by the language processing system quasi-deterministically on the basis of the speakers' local and global language experience. For present purposes, I suggest that priming the Remote Base can raise the resting activation of the stem allomorph that it contains, and that high-frequency Remote Bases have long-run higher resting activations than low-frequency ones.

We can model the influence of resting activation on the phonological grammar by treating it as a scaling factor that can change the impact of violating faithfulness to a Base. This leads to a scenario where there is a grammar-wide weight of FAITH-REMOTE, and on each occasion of Derivative formation the violations of that constraint for a given candidate are multiplied by the scaling factor associated with the resting activation of the corresponding Base allomorph to yield a modified, lexically-scaled penalty for being unfaithful to that Remote Base. This scenario is mathematically equivalent to treating each individual Remote Base as having its own indexed FAITH-REMOTE constraint, but allows for a simpler phonological grammar with one weight of FAITH-REMOTE that is influenced by processing at an unconscious level. It also opens the door to explicitly modeling resting activation jointly with data from a phonological experiment, allowing us to compare theories of lexical influence.

With this connection in hand, I now turn to the puzzling finding that increased semantic similarity between the Local and Remote Bases inhibits, rather than facilitates, the creation of Derivatives which resemble the Remote Base. For a tentative explanation, following Wheeldon and Monsell (1994); Wheeldon (2003), I argue that we can understand the role of semantic similarity as one that does not influence resting activation itself, but rather modulates connections between lexical representations (here, of allomorphs of a Base), and thus how much "spill-over" in resting activation there is from one high-activation form to another, lower-activation one. Further, Harley (1993) demonstrates that in the on-line production of a given target word, highly activated related words undergo "suppression" of their resting activation to minimize competition and allow the correct word to be uttered (Rahman and Aristei, 2010). This provides a possible mechanism for the findings for semantic similarity discussed in section 3.12. For a given Local and Remote Base in the same paradigm, a Remote Base that is very semantically similar to the Local one would be a source of interference for a participant seeking to utter a Derivative built to the Local Base, and so their language processing system might require more suppression to access the Local Base in producing the Derivative. A less semantically-similar Remote Base would not be as strong a source of interference and so would not be suppressed as much, allowing it to have an influence on the Derivative-formation process. This account as presented here is somewhat speculative, but is in line with established psycholinguistic findings about the nature of semantic interference and resting activation suppression in speech production. More work is required to further probe the role of semantic similarity between the Local and Remote Bases.

6.4 Theoretical implications

This paper is hardly the first to suggest that non-phonological characteristics of stored lexical items beyond what we have termed the Local Base influence outcomes of the phonological grammar. The proposed voting theory joins (at minimum) Output-Output faithfulness (Benua, 2000), Gradient Symbolic Representation Smolensky and Goldrick (2016), Representational Strength Theory (Moore-Cantwell, *in progress*), the UseListed-based theory of Zuraw (2000), and UR Constraints (Pater et al., 2012). The distinguishing feature of the voting theory is the predictive relationship it posits between a lexical entry's resting activation and its influence on the phonological grammar. Further work is required to see whether this restriction is able to model the attested data, or whether a modified version of one of the other frameworks mentioned above that takes into account resting activation as one of its tenets will ultimately have better descriptive coverage and predictive power.

The data presented here also motivate some rethinking of other assumptions about the roots of alleged universals in word-formation and other domains of the grammar, as long acknowledged by Steriade (Steriade, 1997, 2018; Steriade and Stanton, 2020, 2021). Specifically, cases like Lexical Conservatism where surface forms make reference to non-local members of the morphological paradigm pose difficulties for theories that make cyclic inheritance a core, automatic, or "universal" aspect of their process of word-formation. These include most contemporary syntax-based theories of word-formation like Distributed Morphology (see the overview in Bobaljik, 2017) and Nanosyntax (see the overview in Baunaz et al., 2018), as well as theories like Stratal Optimality Theory which are also based on a notion of (phonological) cyclicity (Bermúdez-Otero, 2017). The facts about Lexical Conservatism, rather, support model of word-formation where the structure of the morphological paradigm, combined with language-specific strength of markedness and lexical characteristics, are the driving factors in novel word formation, such as the one advanced here, in which "cyclic" inheritance of features of the Local Base by Derivatives is the norm, but also allowing the emergence of non-cyclic behavior — typologically rare but not at all unattested — as an automatic outcome of specific relations between the structure of the lexicon and markedness.

Finally, the data presented here are not compatible with an account of Lexical Conservatism that relies on abstract or "cobbled" URs, where a single UR which is not present in any surface cell in a paradigm underlies multiple members of the paradigm derived from it by regular phonology (Bermúdez-Otero, 2017). One way to see this is by looking at the Spanish data: although Derivatives to Local Bases with no Remote Bases (such as *Viena*), and those to Local Bases with unhelpful Remote Bases (such as *ciéncia* ∼ *cienciólogo*) have the same distribution of vowel qualities in their allomorphs, nevertheless Derivatives that have the unhelpful Remote Base exhibit less diphthongization than those with no Remote Base. Such effects cannot be attributed to a more abstract UR that underlies both Local and Remote Bases, as Bermúdez-Otero (2017) suggests for English.

7 Conclusion

This paper has presented evidence for synchronic robustness of Lexical Conservatism, a dependency between paradigm shape and phonological process application in novel words laid out in Steriade (1997). Further, it demonstrated that the phenomenon is probabilistic, with Derivative formation influenced by phonological and lexical factors. It used a comparison of the English case from Steriade (1997) with novel data from Mexican Spanish to demonstrate that the dependencies characteristic of Lexical Conservatism arise from competitive voting between listed Base allomorphs, cross-cut by phonological markedness.

I modeled these data by proposing a framework of "voting" Bases that predicts the influence of Remote Bases for any language, dependent on its paradigm shape and the relative weight of faithfulness and markedness constraints. The model uses using traditional markedness constraints, and proposed that faithfulness scaled based on resting activation allow the lexical characteristics of different Bases in the lexicon to exert an influence on the phonological computation of the Derivative. This model also fits in well into a consensus model of speech production, linking phonological theory and psycholinguistic data. Much work remains to be done in implementing the proposal computationally and testing it experimentally with data from a wide range of languages.

Appendix

8 Materials for Experiment 1

Local Base	Remote Base	Affixes	Source
carrot	—	*-ify, -ity*	Novel
cotton	—	*-ify, -ity*	Novel
denim	—	*-ify, -ity*	Novel
diamond	—	*-ify, -ity*	Novel
fennel	—	*-ify, -ity*	Novel
flannel	—	*-ify, -ity*	Novel
fungus	—	*-ify, -ity*	Novel
garlic	—	*-ify, -ity*	Novel
granite	—	*-ify, -ity*	Novel
leather	—	*-ify, -ity*	Novel
lettuce	—	*-ify, -ity*	Novel
lumber	—	*-ify, -ity*	Novel
marble	—	*-ify, -ity*	Novel
mushroom	—	*-ify, -ity*	Novel
muslin	—	*-ify, -ity*	Novel
nylon	—	*-ify, -ity*	Novel
onion	—	*-ify, -ity*	Novel
pepper	—	*-ify, -ity*	Novel
plaster	—	*-ify, -ity*	Novel
protein	—	*-ify, -ity*	Novel
pumice	—	*-ify, -ity*	Novel
resin	—	*-ify, -ity*	Novel
rubber	—	*-ify, -ity*	Novel
rubric	—	*-ify, -ity*	Novel
silver	—	*-ify, -ity*	Novel
spandex	—	*-ify, -ity*	Novel
spinach	—	*-ify, -ity*	Novel
tartan	—	*-ify, -ity*	Novel
turnip	—	*-ify, -ity*	Novel
velvet	—	*-ify, -ity*	Novel
acid	acidic	*-ify, -ity*	Novel
agent	agentive	*-ify, -ity*	Novel
angel	angelic	*-ify, -ity*	Novel

Table 25 continued from previous page

Local Base	Remote Base	Affixes	Source
artist	artistic	*-ify, -ity*	Novel
atom	atomic	*-ify, -ity*	Novel
autumn	autumnal	*-ify, -ity*	Novel
carbon	carbonic	*-ify, -ity*	Novel
cherub	cherubic	*-ify, -ity*	Novel
courage	courageous	*-ify, -ity*	Novel
demon	demonic	*-ify, -ity*	Novel
ether	ethereal	*-ify, -ity*	Novel
habit	habitual	*-ify, -ity*	Novel
icon	iconic	*-ify, -ity*	Novel
insect	insecticide	*-ify, -ity*	Novel
justice	justiciable	*-ify, -ity*	Novel
logic	logician	*-ify, -ity*	Novel
magic	magician	*-ify, -ity*	Novel
metal	metallic	*-ify, -ity*	Novel
moment	momentous	*-ify, -ity*	Novel
moron	moronic	*-ify, -ity*	Novel
music	musician	*-ify, -ity*	Novel
novice	novitiate	*-ify, -ity*	Novel
office	official	*-ify, -ity*	Novel
organ	organic	*-ify, -ity*	Novel
parent	parental	*-ify, -ity*	Novel
person	personification	*-ify, -ity*	Novel
pirate	piratical	*-ify, -ity*	Novel
program	programmable	*-ify, -ity*	Novel
sentence	sentential	*-ify, -ity*	Novel
super	superfluous	*-ify, -ity*	Novel
abdicate	—	*-able, -ism*	Steriade
accelerate	—	*-able, -ism*	Steriade
agitate	—	*-able, -ism*	Steriade
allocate	—	*-able, -ism*	Steriade
ameliorate	—	*-able, -ism*	Steriade
annihilate	—	*-able, -ism*	Steriade
communicate	—	*-able, -ism*	Steriade
dedicate	—	*-able, -ism*	Steriade
educate	—	*-able, -ism*	Steriade
eradicate	—	*-able, -ism*	Steriade

Table 25 continued from previous page

Local Base	Remote Base	Affixes	Source
examine	—	*-able, -ism*	Steriade
exterminate	—	*-able, -ism*	Steriade
generate	—	*-able, -ism*	Steriade
illuminate	—	*-able, -ism*	Steriade
investigate	—	*-able, -ism*	Steriade
irrigate	—	*-able, -ism*	Steriade
nominate	—	*-able, -ism*	Steriade
penetrate	—	*-able, -ism*	Steriade
pollinate	—	*-able, -ism*	Steriade
precipitate	—	*-able, -ism*	Steriade
predicate	—	*-able, -ism*	Steriade
procrastinate	—	*-able, -ism*	Steriade
prognosticate	—	*-able, -ism*	Steriade
propagate	—	*-able, -ism*	Steriade
relegate	—	*-able, -ism*	Steriade
remunerate	—	*-able, -ism*	Steriade
resuscitate	—	*-able, -ism*	Steriade
segregate	—	*-able, -ism*	Steriade
tolerate	—	*-able, -ism*	Steriade
venerate	—	*-able, -ism*	Steriade
attribute	attribution	*-able, -ism*	Steriade
compensate	compensatory	*-able, -ism*	Steriade
concentrate	concentric	*-able, -ism*	Steriade
confiscate	confiscatory	*-able, -ism*	Steriade
contemplate	contemplative	*-able, -ism*	Steriade
contribute	contribution	*-able, -ism*	Steriade
(take) custody	custodian	*-able, -ism*	Steriade
demonstrate	demonstrative	*-able, -ism*	Steriade
domesticate	domesticity	*-able, -ism*	Steriade
equilibrate	equilibrium	*-able, -ism*	Steriade
infiltrate	filter	*-able, -ism*	Steriade
illustrate	illustrative	*-able, -ism*	Steriade
impregnate	pregnant	*-able, -ism*	Steriade
incorporate	incorporeal	*-able, -ism*	Steriade
inculpate	inculpable	*-able, -ism*	Steriade
indicate	indicative	*-able, -ism*	Steriade
influence	influential	*-able, -ism*	Steriade

Table 25 continued from previous page

Local Base	Remote Base	Affixes	Source
integrate	integrative	*-able, -ism*	Steriade
interrogate	interrogative	*-able, -ism*	Steriade
intuit	intuition	*-able, -ism*	Steriade
obfuscate	obfuscatory	*-able, -ism*	Steriade
oblige	obligate	*-able, -ism*	Steriade
expurgate	purgatory	*-able, -ism*	Steriade
reciprocate	reciprocity	*-able, -ism*	Steriade
remediate	remedial	*-able, -ism*	Steriade
remonstrate	remonstrance	*-able, -ism*	Steriade
sequester	sequestrate	*-able, -ism*	Steriade
designate	signatory	*-able, -ism*	Steriade
assimilate	similitude	*-able, -ism*	Steriade

Table 25: Local Bases for the Lexical Conservatism task in Experiment 1, listed with Remote Base (if any), the affixes they were combined with, and the source (novel in this experiment, or from Steriade (1997)).

9 Materials for Experiment 2

Local Base	Remote Base
ballot	—
bankrupt	—
blizzard	—
buzzard	—
carrot	—
cuckold	—
denim	—
diamond	—
fungus	—
granite	—
lumber	—
nylon	—
orange	—
plaster	—
resin	—

Table 26 continued from previous page

Local Base	Remote Base
scaffold	—
spandex	—
spinach	—
thermos	—
velvet	—
autumn	autumnal
commerce	commercial
courage	courageous
essence	essential
ether	ethereal
finance	financial
habit	habitual
insect	insecticide
labor	laborious
major	majority
mammal	mammalian
modern	modernity
moment	momentous
office	official
parent	parental
person	personify
proverb	proverbial
sequence	sequential
substance	substantial
tumult	tumultuous

Table 26: Local Bases for the Lexical Conservatism task in Experiment 2, with the Remote Base if any.

10 Materials for Experiment 3

Local Base	Remote Base	Affix	Sylls in Local Base	Local Base stress	Remote Base stress	Remote Base Type
abuse	—	able	2	final	—	—

Table 27 continued from previous page

Local Base	Remote Base	Affix	Sylls in Local Base	Local Base stress	Remote Base stress	Remote Base Type
achieve	—	able	2	final	—	—
alert	—	able	2	final	—	—
appraise	—	able	2	final	—	—
approve	—	able	2	final	—	—
behave	—	able	2	final	—	—
bequeath	—	able	2	final	—	—
demote	—	able	2	final	—	—
diffuse	—	able	2	final	—	—
enclose	—	able	2	final	—	—
finesse	—	able	2	final	—	—
infuse	—	able	2	final	—	—
peruse	—	able	2	final	—	—
secede	—	able	2	final	—	—
traverse	—	able	2	final	—	—
accuse	accusation	able	2	final	initial	harmful
compose	composition	able	2	final	initial	harmful
confide	confidant	able	2	final	initial	harmful
conserve	conservation	able	2	final	initial	harmful
dispose	disposition	able	2	final	initial	harmful
divide	dividend	able	2	final	initial	harmful
expose	exposition	able	2	final	initial	harmful
impose	imposition	able	2	final	initial	harmful
oppose	opposition	able	2	final	initial	harmful
precede	precedence	able	2	final	initial	harmful
preserve	preservation	able	2	final	initial	harmful
propose	proposition	able	2	final	initial	harmful
provide	providence	able	2	final	initial	harmful
reserve	reservation	able	2	final	initial	harmful
reside	residence	able	2	final	initial	harmful
bankrupt	—	able	2	initial	—	—
cuckold	—	able	2	initial	—	—
plaster	—	able	2	initial	—	—
scaffold	—	able	2	initial	—	—
ballot	—	ist	2	initial	—	—
blizzard	—	ist	2	initial	—	—
buzzard	—	ist	2	initial	—	—

Table 27 continued from previous page

Local Base	Remote Base	Affix	Sylls in Local Base	Local Base stress	Remote Base stress	Remote Base Type
denim	—	ist	2	initial	—	—
granite	—	ist	2	initial	—	—
velvet	—	ist	2	initial	—	—
courage	courageous	ist	2	initial	final	helpful
habit	habitual	ist	2	initial	final	helpful
moment	momentous	ist	2	initial	final	helpful
proverb	proverbial	ist	2	initial	final	helpful
tumult	tumultuous	ist	2	initial	final	helpful
finance	financial	able	2	initial	final	helpful
labor	laborious	able	2	initial	final	helpful
major	majority	able	2	initial	final	helpful
parent	parental	able	2	initial	final	helpful
sequence	sequential	able	2	initial	final	helpful

Table 27: Stimuli for the Lexical Conservatism task in Experiment 3, listed with the affix they took in the experiment, their Remote Base (if any), as well as the stress placement in the Local and Remote bases, the number of syllables in the Local Base, and the type of Remote Base.

11 Materials for Experiment 4

Local Base (ie)	Remote Base (ie)	Local Base (ue)	Remote Base (ue)	Class
audiencia	—	ungüento	—	*(none)*
sapiencia	—	güecho	—	*(none)*
pierna	—	güemul	—	*(none)*
biela	—	atuendo	—	*(none)*
adviento	—	duende	—	*(none)*
priesa	—	elocuencia	—	*(none)*
siesta	—	hueco	—	*(none)*
nieto	—	pirueta	—	*(none)*
mies	—	buega	—	*(none)*
siniestro	—	sabueso	—	*(none)*
aliciente	—	silueta	—	*(none)*
Viena	—	suela	—	*(none)*

Table 28 continued from previous page

Local Base (ie)	Remote Base (ie)	Local Base (ue)	Remote Base (ue)	Remote Base type
noviembre	—	cruento	—	*(none)*
vieira	—	güeña	—	*(none)*
viernes	—	sueco	—	*(none)*
ariete	arietar	dueño	adueñarse	*unhelpful*
lienzo	liencillo	consecuente	consecuentemente	*unhelpful*
ambiente	ambiental	cruel	crueldad	*unhelpful*
cielo	cielito	deshueso	deshuesadao	*unhelpful*
ciencia	cienciólogo	juete	juetazo	*unhelpful*
experiencia	experiencial	encuesta	encuestada	*unhelpful*
cliente	clientela	juerga	juergista	*unhelpful*
conciencia	concienciar	huevo	huevón	*unhelpful*
oriente	oriental	secuencia	secuencial	*unhelpful*
paciencia	impacientar	secuestro	secuestrador	*unhelpful*
dieta	dietético	suegra	suegrastro	*unhelpful*
higiene	higienista	güero	güerito	*unhelpful*
riel	rielero	delincuente	delincuentemente	*unhelpful*
ciemo	aciemar	huebra	huebrero	*unhelpful*
rienda	riendazo	buey	bueyero	*unhelpful*
acierto	acertar	compuesta	compostura	*helpful*
fiebre	febril	mueble	moblar	*helpful*
asiento	asentar	escuela	escolar	*helpful*
niebla	neblar	grueso	grosor	*helpful*
cierna	cerner	muerte	mortero	*helpful*
obediencia	obedecer	rueda	rodar	*helpful*
sosiego	sosegar	apuesta	apostar	*helpful*
tienda	tender	ruego	rogar	*helpful*
viejo	vejez	cuento	contar	*helpful*
incienso	incensar	almuerzo	almorzar	*helpful*
cierre	cerrar	encuentro	encontrar	*helpful*
ciego	cegar	acuerdo	accordar	*helpful*
aprieto	apretar	vuelo	volar	*helpful*
entierro	enterrar	trueno	tronar	*helpful*
friega	fregar	consuelo	consolar	*helpful*

Table 28: Local Bases for the Lexical Conservatism task in Experiment 4, listed with Remote Base (if any).

References

Albright, A., Andrade, A., and Hayes, B. (2001). Segmental environments of spanish diphthongization. *UCLA Working Papers in Linguistics*, 7:117–151.

Albright, A. C. (2002). *The identification of bases in morphological paradigms.* PhD thesis, University of California, Los Angeles.

Anderson, D. R. and Burnham, K. P. (2002). Avoiding pitfalls when using information-theoretic methods. *The Journal of wildlife management*, pages 912–918.

Aronoff, M. (1976). Word formation in generative grammar. *Linguistic Inquiry Monographs Cambridge, Mass*, (1):1–134.

Asherov, D. and Bat-El, O. (2016). Multiple defaults: feminine-et and-a in hebrew present tense. *Morphology*, 26(3-4):399–423.

Baroni, M. (2001). The representation of prefixed forms in the italian lexicon: Evidence from the distribution of intervocalic [s] and [z] in northern italian. In *Yearbook of morphology 1999*, pages 121–152. Springer.

Bat-El, O. (2002). True truncation in colloquial hebrew imperatives. *Language*, pages 651–683.

Baunaz, L., Lander, E., De Clercq, K., and Haegeman, L. (2018). Nanosyntax: the basics. *Oxford Studies in Comparative Syntax*, pages 3–56.

Becker, M. and Levine, J. (2020). Experigen: an online experiment platform.

Benua, L. (2000). *Phonological relations between words.* Psychology Press.

Bermádez-Otero, R. (2011). Cyclicity. *The Blackwell companion to phonology*, pages 1–30.

Bermúdez-Otero, R. (2017). Stratal phonology. In *The Routledge handbook of phonological theory*, pages 100–134. Routledge.

Bobaljik, J. D. (2017). Distributed morphology. In *Oxford Research Encyclopedia of Linguistics.*

Boersma, P. and Pater, J. (2016). Convergence properties of a gradual learning algorithm for harmonic grammar.

Bonet, E. and Torres-Tamarit, F. (2010). Allomorphy in pre-clitic imperatives in formenteran catalan: An output-based analysis. In *Romance Linguistics 2009*, pages 337–352. John Benjamins.

Breiss, C., Katsuda, H., and Kawahara, S. (2021). Paradigm uniformity is probabilistic: Evidence from velar nasalization in Japanese. In *Proceedings of WCCFL 39*. Cascadilla Press.

Breiss, C. M. (2021). *Lexical Conservatism in phonology: Theory, experiments, and computational modeling*. PhD thesis, University of California, Los Angeles.

Bürkner, P.-C. (2017). brms: An R package for Bayesian multilevel models using Stan. *Journal of statistical software*, 80(1):1–28.

Burnham, K. P. and Anderson, D. R. (2002). *Model selection and multimodel inference: A practical information-theoretic approach*. Springer New York, 2 edition.

Burnham, K. P. and Anderson, D. R. (2004). Multimodel inference: understanding aic and bic in model selection. *Sociological methods & research*, 33(2):261–304.

Burzio, L. (1994). *Principles of English stress*. Number 72. Cambridge University Press.

Burzio, L. (1998). Multiple correspondence. *Lingua*, 104(1-2):79–109.

Burzio, L. (2002). Missing players: Phonology and the past-tense debate. *Lingua*, 112(3):157–199.

Bybee, J. L. and Pardo, E. (1981). On lexical and morphological conditioning of alternations: A nonce-probe experiment with spanish verbs. *Linguistics*, 19(9-10):937–968.

Caramazza, A., Laudanna, A., and Romani, C. (1988). Lexical access and inflectional morphology. *Cognition*, 28(3):297–332.

Carlson, M. T. and Gerfen, C. (2011). Productivity is the key: Morphophonology and the riddle of alternating diphthongs in spanish. *Language*, pages 510–538.

Chomsky, N. and Halle, M. (1968). The sound pattern of English.

Eddington, D. (1996). Diphthongization in spanish derivational morphology: an empirical investigation. *Hispanic Linguistics*, 8(1):1–13.

Eddington, D. (1998). Spanish diphthongization as a non-derivational phenomenon. *Rivista di Linguistica*, 10:335–354.

Eddington, D. (2006). Paradigm uniformity and analogy: The capitalistic versus militaristic debate. *International Journal of English Studies*, 6(2):1–18.

Finger, H., Goeke, C., Diekamp, D., Standvoß, K., and König, P. (2017). Labvanced: a unified javascript framework for online studies. In *International Conference on Computational Social Science (Cologne)*.

Fylstra, D., Lasdon, L., Watson, J., and Waren, A. (1998). Design and use of the microsoft excel solver. *Interfaces*, 28(5):29–55.

Goldwater, S. and Johnson, M. (2003). Learning OT constraint rankings using a maximum entropy model. In *Proceedings of the Stockholm workshop on variation within Optimality Theory*, volume 111120.

Gordon, M. (2002). A factorial typology of quantity-insensitive stress. *Natural Language & Linguistic Theory*, 20(3):491–552.

Guekguezian, P. and Jesney, K. (2021). "epenthetic" vowels are not all equal: Gradient representation in yokuts roots and suffixes. In *38th West Coast Conference on Formal Linguistics*, pages 221–230. Cascadilla Proceedings Project.

Gunkel, D. (2010). *Studies in Greek and Vedic Prosody, Morphology, and Meter*. PhD thesis, University of California, Los Angeles.

Gunkel, D. C. (2011). The emergence of foot structure as a factor in the formation of greek verbal nouns in-$\mu\alpha$ (τ)-. *Münchener Studien zur Sprachwissenschaft*, 65:77.

Harley, T. A. (1993). Phonological activation of semantic competitors during lexical access in speech production. *Language and Cognitive Processes*, 8(3):291–309.

Harris, J. W. (1969). *Spanish Phonology*. MIT Press.

Hay, J. (2003). *Causes and consequences of word structure*. Psychology Press.

Hay, J. B. and Baayen, R. H. (2005). Shifting paradigms: Gradient structure in morphology. *Trends in cognitive sciences*, 9(7):342–348.

Hayes, B. (1982). Extrametricality and English stress. *Linguistic inquiry*, 13(2):227–276.

Hayes, B. (2022). Deriving the wug-shaped curve: A criterion for assessing formal theories of linguistic variation. *Annual Review of Linguistics*, 8:473–494.

Hooper, J. B. (1976). *An introduction to natural generative phonology*. Academic Press.

Kilbourn-Ceron, O. and Goldrick, M. (2021). Variable pronunciations reveal dynamic intra-speaker variation in speech planning. *Psychonomic Bulletin & Review*, pages 1–16.

Kilbourn-Ceron, O. and Sonderegger, M. (2018). Boundary phenomena and variability in Japanese high vowel devoicing. *Natural Language & Linguistic Theory*, 36(1):175–217.

Kilbourn-Ceron, O., Wagner, M., and Clayards, M. (2016). The effect of production planning locality on external sandhi: A study in/t. In *The Proceedings of the 52nd Meeting of the Chicago Linguistics Society, lingbuzz/003119*.

Kim, J. (2021). The capitalistic versus militaristic debate: Paradigm uniformity revisited. *Korean Journal of English Language and Linguistics*, 21:636–655.

Kruschke, J. (2014). *Doing Bayesian data analysis: A tutorial with R, JAGS, and Stan*. Academic Press.

Lamontagne, J. and Torreira, F. (2017). Directionality in production planning: Cross-word hiatus resolution in spanish. In *Meeting of the Canadian Linguistics Association*.

Liberman and Prince (1977). On stress & linguistic rhythm. *LI*, 8(2):249–336.

Marchand, H. (1960). *The categories and types of present-day word formation*. Harassowitz, Weissbaden.

Morton, J. (1970). A functional model for memory. *Models of human memory*, pages 203–254.

Nalborczyk, L., Batailler, C., Lœvenbruck, H., Vilain, A., and Bürkner, P.-C. (2019). An introduction to Bayesian multilevel models using brms: A case study of gender effects on vowel variability in standard Indonesian. *Journal of Speech, Language, and Hearing Research*, 62(5):1225–1242.

Nicenboim, B. and Vasishth, S. (2016). Statistical methods for linguistic research: Foundational Ideas — Part II. *Language and Linguistics Compass*, 10(11):591–613.

O'Brien, J. (2007). Lexical conservatism in irish prepositions. *Ms., University of California, Santa Cruz.[Available online at http://people. ucsc. edu/~ jpobrien/papers/obrien_irish_prep. pdf]*.

Pater, J. (2000). Non-uniformity in English secondary stress: the role of ranked and lexically specific constraints. *Phonology*, pages 237–274.

Pater, J., Jesney, K., Staubs, R., and Smith, B. (2012). Learning probabilities over underlying representations. In *Proceedings of the twelfth meeting of the Special Interest Group on Computational Morphology and Phonology*, pages 62–71. Association for Computational Linguistics.

Penny, R. J. (2002). *A history of the Spanish language.* Cambridge University Press.

Pertsova, K. (2005). How lexical conservatism can lead to paradigm gaps. *UCLA working papers in phonology*, 11.

Pertsova, K. and Kuznetsova, J. (2015). Experimental evidence for lexical conservatism in russian: Defective verbs revisited. In *Proceedings of FASL*, volume 24.

Pierrehumbert, J. B. (2016). Phonological representation: Beyond abstract versus episodic. *Annual Review of Linguistics*, 2:33–52.

R Core Team (2021). *R: A Language and Environment for Statistical Computing.* R Foundation for Statistical Computing, Vienna, Austria.

Rahman, R. A. and Aristei, S. (2010). Now you see it... and now again: Semantic interference reflects lexical competition in speech production with and without articulation. *Psychonomic Bulletin & Review*, 17(5):657–661.

Rolle, N. R. (2018). Transparadigmatic output-output correspondence: A case study from ese ejja. In *Proceedings of the Annual Meetings on Phonology*, volume 5.

Ryan, K. M. (2016). Phonological weight. *Language and Linguistics Compass*, 10(12):720–733.

Shih, S. (2018). Learning lexical classes from variable phonology. In *Selected Papers from Asian Junior Linguists Conference*, volume 2, pages 1–15. ICUWPL.

Siegel, D. C. (1974). *Topics in English morphology.* PhD thesis, Massachusetts Institute of Technology.

Simonović, M. (2012). The emergence of postcyclic prosody in loanword integration: Toneless latinate adjectives in serbo-croatian. *Acta Linguistica Hungarica*, 59(1-2):221–243.

Simonović, M. and Baroni, A. (2014). Lexicon, markedness and grammar in the serbo-croatian wobbly a. *U B. Arsenijević, A. Janić & B. Stanković (ur.), SinFoniJA*, 7.

Smolensky, P. (1986). Information processing in dynamical systems: Foundations of harmony theory. Technical report, Colorado Univ at Boulder Dept of Computer Science.

Smolensky, P. and Goldrick, M. (2016). Gradient symbolic representations in grammar: The case of French liaison. *Rutgers Optimality Archive*, 1552.

Stanton, J. (2016). Learnability shapes typology: the case of the midpoint pathology. *Language*, 92(4):753–791.

Steriade, D. (1997). Lexical conservatism. *Linguistics in the morning calm*, pages 157–179.

Steriade, D. (2008). A pseudo-cyclic effect in romanian morphophonology. *Inflectional identity*, 18:313–360.

Steriade, D. (2012). The cycle without containment: Latin perfect stems. *Unpublished ms.*

Steriade, D. (2018). Cyclic inheritance, generalized. Colloquium at NYU.

Steriade, D. and Stanton, J. (2020). Productive pseudo-cyclicity and its significance. Talk at LabPhon 17.

Steriade, D. and Stanton, J. (2021). Stress and the cycle, in English and elsewhere. in progress manuscript, MIT NYU.

Steriade, D. and Yanovich, I. (2015). Accentual allomorphs in east slavic: an argument for inflection dependence. *Understanding Allomorphy*, pages 254–314.

Tamminga, M. (2018). Modulation of the following segment effect on English coronal stop deletion by syntactic boundaries. *Glossa: a journal of general linguistics*, 3(1).

Vasishth, S., Nicenboim, B., Beckman, M. E., Li, F., and Kong, E. J. (2018). Bayesian data analysis in the phonetic sciences: A tutorial introduction. *Journal of phonetics*, 71:147–161.

Wagner, M. (2012). Locality in phonology and production planning. *McGill working papers in linguistics*, 22(1):1–18.

Wheeldon, L. (2003). Inhibitory form priming of spoken word production. *Language and cognitive processes*, 18(1):81–109.

Wheeldon, L. R. and Monsell, S. (1994). Inhibition of spoken word production by priming a semantic competitor. *Journal of memory and language*, 33(3):332–356.

White, J. (2017). Accounting for the learnability of saltation in phonological theory: A maximum entropy model with a P-Map bias. *Language*, 93(1):1–36.

Wilson, C. (2006). Learning phonology with substantive bias: An experimental and computational study of velar palatalization. *Cognitive science*, 30(5):945–982.

Wurm, L. H. (1997). Auditory processing of prefixed English words is both continuous and decompositional. *Journal of memory and language*, 37(3):438–461.

Zuraw, K. (2007). Frequency influences on rule application within and across words. In *Proceedings from the Annual Meeting of the Chicago Linguistic Society*, volume 43, pages 283–309. Chicago Linguistic Society.

Zuraw, K. and Hayes, B. (2017). Intersecting constraint families: an argument for harmonic grammar. *Language*, 93(3):497–548.

Zuraw, K., Lin, I., Yang, M., and Pepperkamp, S. (2020). Competition between whole-word and decomposed representations of English prefixed words. *Morphology*.

Zuraw, K. and Peperkamp, S. (2015). Aspiration and the gradient structure of English prefixed words. In *ICPhS*.

Zuraw, K. R. (2000). *Patterned exceptions in phonology*. PhD thesis, University of California, Los Angeles.

Zymet, J. (2018). *Lexical propensities in phonology: corpus and experimental evidence, grammar, and learning*. University of California, Los Angeles.