Vowel Reduction in Russian: A Unified Account of Standard, Dialectal, and "Dissimilative" Patterns[*]

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Abstract:
This paper provides an Optimality-Theoretic analysis of a number of Russian vowel reduction patterns. In particular, the analysis presented here relies on a non-unitary approach (Crosswhite 1999) to two-pattern vowel reduction systems, such as those typically seen in Russian dialects. Furthermore, a particularly complex dialectal pattern, traditionally referred to as "dissimilative" reduction, is analyzed here without use of direct featural dissimilation. Instead, constraints on sonority, lengthening under stress, and foot form conspire to allow the quality of the stressed vowel of some word to indirectly affect the surface quality of the preceding unstressed vowel.

1. *Introduction: Vowel Reduction in Russian*

Vowel reduction is a prominent characteristic of the phonology of both Contemporary Standard Russian (CSR) and a number of Russian dialects. In this work, I will discuss several different types of vowel reduction found in the Russian language, and provide a formal analysis for them. In particular, the approach presented here allows a wide range of Russian vowel reduction patterns to be accounted for using the same basic theoretical machinery—in particular, no special mechanisms have to be introduced to account for the so-called "dissimlative" patterns of reduction found in some dialects. This contrasts with treatments such as Halle (1965), Nelson (1974), Davis (1970), and Suzuki (1998), where the dissimilative reduction patterns are analyzed as fundamentally different from the non-dissimilative reduction patterns, requiring either rule modifications specific to the dissimilative dialects, or constraints that pertain only to the

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dissimilative environment. In the analysis presented here, the non-dissimilative reduction patterns are seen to be simply special cases of the dissimilative pattern.

The formal approach taken towards vowel reduction in this work is that of Crosswhite (1999), in which two different categories of vowel reduction are posited—one based on the elimination of difficult perceptual categories in unstressed syllables (such as unstressed non-peripheral vowels), and the other based on elimination of unstressed high-sonority vowels. These two tendencies are formalized using Optimality-Theoretic constraints of two different types: licensing constraints and prominence constraints. In this respect, this article can be thought of as the Optimality-Theoretic implementation of the basic insights outlined in Jakobson's 1929 *Remarques sur l'evolution phonologique de russe comparée à celle des autres langues slaves*. In *Remarques*, Jakobson identifies two general characteristics of the reduction patterns seen in Russian. The first is the tendency for "reduction of atonic vowels to three phonemes, the cleanest and most characteristic in terms of timbre, the 3 'points of the vowel triangle.'" This tendency is encoded in the current analysis using licensing constraints that limit non-peripheral vowel qualities to stressed syllables. The second generalization made by Jakobson is that to increase "the contrastiveness between stressed and unstressed vowels, there is a tendency to strengthen the first and weaken the second." This idea of the rich getting richer and the poor getting poorer is represented in Optimality Theory using prominence constraints (McCarthy and Prince 1993).

Use of Optimality Theory as the theoretical framework for this analysis allows these two motivating factors to be expressed as distilled phonological ideals, or constraints—a fact that has several beneficial results. First, vowel reduction constraints based on these two phonological ideals are able to vary diametrically. In some dialects, both will be active and capable of causing surface alternations in vowel quality. In other dialects, one or the other constraint may be inactive. In yet other dialects, one or the other constraint may be blocked *only* in certain evironments, environments where the other constraint is not subject to any circumscription. As we shall see, all three of these situations are played out in Russian vowel reduction patterns, thus providing empirical support for the analysis provided here.

2. *Data*

Before discussing the formal analysis for Russian vowel reduction, I will lay out the basic Russian vowel reduction pattern, as well as provide a brief account of some of the dialectal variants to be accounted for later. This section is

included to provide an overview of the empirical problem. More detailed descriptions will be presented for each of the dialectal patterns when that pattern is analyzed in the subsequent sections. Throughout this work, Russian dialectal reduction patterns will be referred to using Anglicized versions of the traditional Russian dialectological names—for more information, see Note 1 (p. 164).

2.0.1. Similarities in Reduction Patterns: Surface Sub-Inventory

Not all dialects of Russian have vowel reduction. The dialects belonging to the Northern dialect group usually either lack reduction, or have only a weak form of reduction. Dialects in the Central and Southern dialects groups (including Contemporary Standard Russian (CSR), which is technically a member of the Central dialect area) are characterized by vowel reduction. Of those dialects that show vowel reduction processes, the majority show a "two-pattern" reduction process, with a moderate reduction pattern operating in the syllable that immediately precedes the stress, and an extreme reduction pattern operating in (most of) the remaining unstressed syllables.

Before investigating the many and varied patterns of reduction, let us take a moment to look at the ways in which these patterns are similar. Specifically, most of these reduction patterns generate similar surface sub-inventories. In other words, many of these different dialects achieve the same ends by different means.

As just mentioned, the majority of Russian dialects that have vowel reduction display two degrees of reduction. These two different degrees of reduction produce different vowel sub-inventories. Specifically, the first and more moderate degree of reduction usually occurs in the syllable that immediately precedes the stress, and usually produces the vowel sub-inventory [i,u,a]. I will refer to this type of neutralization as moderate reduction. The second and more extreme degree of reduction occurs in the remaining unstressed syllables, and usually produces the vowel sub-inventory [i,u,ə]. I will refer to this type of neutralization as extreme reduction. These vowel sub-inventories are illustrated in the following diagram. (Note: Here and throughout, transcriptions will not reflect subtle and/or gradient changes in vowel quality such as those that can be observed, for example, when comparing stressed and unstressed tokens of /i/ or /u/, or when considering the variants of /i/ that occur after palatalized and non-palatalized consonants.)

(1) Vowel Subinventories in Russian Dialects

Other Pretonic Syllables	Immediately Pretonic Syllable	Stressed Syllable	Post-tonic Syllables
i u	i u	i u	i u
ə		e o	ə
	a	a	
low-sonority V's only	*peripheral V's only*	*all underlying V qualities*	*low-sonority V's only*

As noted above, the patterns of neutralization that generate these sub-inventories differ from dialect to dialect. For example, in CSR, unstressed /e/ reduces to [i] in the immediately pretonic syllable (as well as in the other unstressed syllables). In other dialects, unstressed /e/ reduces to [a] in the immediately pretonic syllable but reduces to [i] in other unstressed syllables. It is fairly constant cross-dialectally, however, that barring interference from palatalized consonants, unstressed /o,a/ neutralize to [a] in the immediately pretonic syllable, but reduce to [ə] in other unstressed syllables.

In the so-called "dissimilative" vowel reduction patterns, which are found predominantly in dialects of the south and south-western regions of the Russian folk-dialect area, the surface sub-inventories differ from the pattern already described. In these dialects, the two-pattern reduction system utilizing both moderate and extreme neutralizations holds only for certain words. In the remaining words, only extreme reduction is found—that is, the immediately pretonic syllable in such words is subject to extreme rather than moderate reduction. Any given word will predictably fall into either one group or the other based on the quality of the stressed vowel. If the stressed vowel is relatively low in sonority, the two-pattern system will hold. If the stressed vowel is realtively high in sonority, the modete neutralization pattern that would otherwise be expected in the immediately pretonic syllable will not show up. There are several variations on this pattern. The main parameter for variation concerns precisely which vowels are considered "high in sonority" and which "low in sonority." One of the attested patterns is illustrated below. (As illustrated, many of these dialects have 6- or 7-vowel systems under stress.)[1]

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[1] Fans of Russian dialectology will note that I do not provide a treatment here of either assimilative or assimilative-dissimilative Russian vowel reduction. Based on the instrumental observations of Kasatkina and Shchigel' (1995), it seems as though the "assimilative" part of assimilative-dissimilative vowel reduction is truly featural assimilation. Since I do not analyze dissimilative reduction using

(2) **Vowel Sub-Inventories: dissimilative Russian Dialects**

	Other Pretonic Syllables	Immediately Pretonic σ	Stressed Syllable	Post-tonic Syllables
words with a stressed high vowel	i u ə *low-sonority V's only*	i u a *peripheral V's only*	i u *high V's only (by definition)*	i u ə *low-sonority V's only*
words with a stressed non-high vowel	i u ə *low-sonority V's only*	i u ə *low-sonority V's only*	e,ɛ o,ɔ a *non-high V's only (by def.)*	i u ə *low-sonority V's only*

The name "dissimilative" comes from the observation that the reduction vowel [a] cannot be used in the immediately pretonic syllable if the vowel under stress is also [a]. Currency of the term "dissimilative" may have been enhanced by the existence of assimilative vowel reduction patterns in other dialects (which will not be analyzed here--see fn. 1). The existence of both assimilatory and dissimilatory variants of a given phenomenon makes for an appealingly symmetrical classificatory system. I will argue, however, that dissimilative vowel reduction does not in fact involve any direct interaction between the vowels of the tonic and immediately pretonic syllables. This being the case, the name dissimilative is perhaps misleading, since the formal analysis does not make use of featural dissimilation.   I will continue to use the traditional dialectological name Dissimilative—capitalization of the term indicates that it is simply a name, not a description. It should not be taken as indicative of the formal analysis of that pattern any more so than would the other traditional dialectological names used in this work (i.e., Obojan, Don, Sudzha, *okan'e*, etc.).

The variant illustrated above is referred to as Don or Belgorod Dissimilative reduction. In other variants of the Dissimilative pattern, the stressed vowels group differently with respect to either triggering of blocking the two-pattern reduction system—but the groupings are always based on sonority. Additionally, the Dissimilative pattern can be affected by the palatality of the consonants surrounding a given unstressed vowel, generating Dissimilative

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featural dissimilation (cf. section 3.), this does not make for a contradictory state of affairs.

dialects where the two-pattern system is blocked in contexts containing a palatalized consonant, or where two different variants of the Dissimilative pattern occur—one in contexts that have palatalized consonants, and the second in contexts lacking them. These variants will be discussed and analyzed in more detail in section 3.1.

In the following section, I will give a brief overview of the methods of neutralization that actually generate the sub-inventories presented above.

2.0.2. Vowel Neutralization in Non-Immediately-Pretonic Unstressed Syllables

The neutralization processes found in the non-immediately-pretonic syllable (i.e., extreme reduction) show little variation, compared to the variety of neutralizations that are seen in the immediately-pretonic syllable. One question surrounding the neutralization processes seen in Russian extreme reduction, however, surrounds the status of unstressed /e/. Namely, it is sometimes supposed that the reduction of unstressed /e/ to [i] is due to the influence of palatalized consonants, since /e/ is almost exclusively found after a palatalized consonant. This does not seem to be the case for at least those dialects where relevant data is available. Therefore, I will treat the reduction of Russian /e/ to [i] as an independent reduction pattern (i.e., not due to surrounding consonantal environment). For more detailed discussion of this point, please see Note 2 (p. 165).

With this in mind, we can summarize vowel neutralization patterns in the non-immediately-pretonic syllables as illustrated below. Example forms from CSR are provided.

(3) Extreme Neutralizations, common to most dialects with reduction
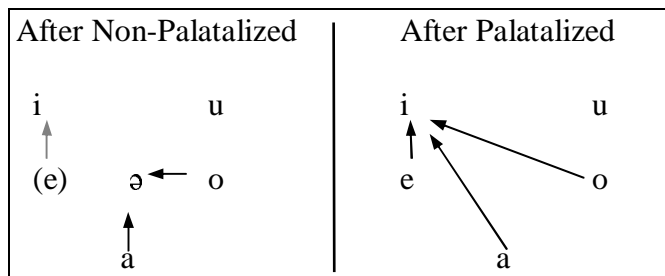
After Non-Palatalized		After Palatalized	
/tsexovój/	[t͡sixavój] 'shop' (adj.) cf. [t͡séx] 'shop'	/rʲet͡ʃʲovój/	[rʲit͡ʃʲivój] 'speech' (adj.) cf. [rʲé t͡ʃʲ] 'speech' (n.)
/sadovód/	[sədavót] 'gardener' cf. [sát] 'garden'	/pʲatot͡ʃʲók/	[pʲitat͡ʃʲók] 'five kopeck coin' cf. [pʲátʲ] 'five'
/gorodók/	[gəradok] 'little city' cf. [górət] 'city'	/tʲoplotá/	[tʲiplatá] 'warmth' cf. [tʲóplij] 'warm'

The vowel /e/ is shown in parentheses in the illustration above (in the context representing reduction after a non-palatalized consonant) since it is not clear if this portion of the process can be generalized to all dialects.   On the question of reduction of unstressed /e/ after non-palatalized consonants, as well as after palatalized consonants, see Note 2 (p. 165).

In summary, the vowel neutralization patterns seen in the non-immediately-pretonic unstressed syllables in Russian dialects characteristically avoid the occurrence of high-sonority mid and low vowels, which typically surface as low-sonority [ə] (after non-palatalized consonants) or [i] (after palatalized consonants or for underlying /e/).

Althought this pattern of extreme reduction apprears to be very widespread, a variant pattern for has been described by Avanesov (1984) in which unstressed /e/ surfaces unreduced. This is described as characteristic of certain speakers of the "Old Muscovite" dialect. See section 3.1.4 for further discussion.

### 2.0.3. Vowel Neutralization Patterns in Immediately-Pretonic Syllables— NonDissimilative variants

The vowel neutralization patterns found in the immediately pretonic syllables in Russian dialects show more variety than the pattern discussed above. Generally, the vowel reduction patterns found in immediately pretonic syllables can use more sonorous reduction vowels than those found in other unstressed syllables.

2.0.3.1. The *[a]-reduction* Pattern of Moderate Neutralization

The pattern that is generally taken to be the most basic or "default" pattern is one in which all non-high vowels reduce to [a] in the immediately pretonic

syllable, regardless of the palatality of the preceding or following consonant. Traditionally, this pattern is referred to as *akan'e* (roughly, "saying [a]"); I shall refer to this pattern as [a]-reduction. This pattern is illustrated below, along with some example forms illustrating the appropriate alternations. (Here, /e/ is not listed in the environment after a non-palatalized consonant since data establishing the occurrence of /e/ in that context is not available for these dialects.)

(4) Moderate Neutralization via [a]-reduction

Immediately Pretonic After Non-Palatalized		Immediately Pretonic After Palatalized	
i	u	i	u
	o	e	o
a		a	
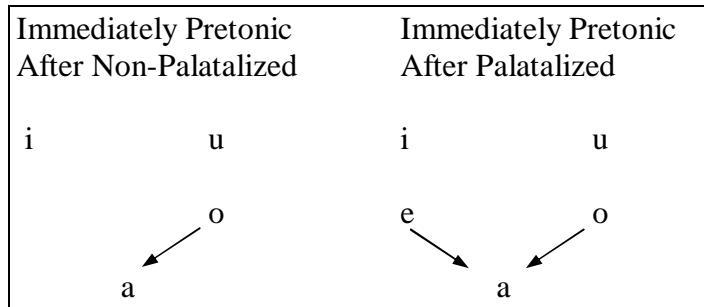
/rʲeká/	[rʲaká] 'river'	cf. [rʲétʃkə] 'little river'
/pʲatí/	[pʲatí] 'five' (gen. sg.)	cf. [pʲátʲ] 'five' (nom. sg.)
/nʲosú/	[nʲasú] 'I carry'	cf. [nʲós] 'he carried'

2.0.3.2. Other Forms of Moderate Reduction

Although [a]-reduction is usually taken as the original moderate reduction pattern in Russian, it should be pointed out that a number of other moderate reduction patterns are widely attested. In particular, additional patterns of moderate reduction might use additional reduction vowels (such as [e]), and might be sensitive to the presence of palatalized consonants on one or both sides of the vowel in the immediately pretonic syllable. Each of the moderate reduction patterns that will be addressed in this work is listed below, along with a brief description.

- **[i]-reduction:** In the immediately pretonic syllable, /a,o/ reduce to [i] if the preceding consonant is palatalized. (/e/ always reduces to [i])
- **[e]-reduction:** In the immediately pretonic syllable, /e/ does not reduce and instead surfaces as [e]. Additionally, /o,a/ in the immediately pretonic syllable reduce to [e] if there is a preceding palatalized consonant.
- **attenuated [a]-reduction:** In the immediately pretonic syllable, /o,a,e/ reduce to [a], unless flanked *on both sides* by palatalized consonants. In the doubly-flanked environment C^j__C^j, the vowels /o,a,e/ reduce to [i]. (Does not affect contexts of extreme reduction, where reduction to [i] does not require the double-sided environment.)
- **incomplete reduction:**[2] The vowel in the immediately pretonic syllable does not reduce. (Does not affect contexts of extreme reduction.)

3. *Analysis*

In Crosswhite (1999), the general approach towards two-pattern vowel reduction phenomena is as follows: Moderate reduction occurs in all unstressed syllables, and is motivated by licensing constraints. Extreme reduction occurs in a subset of unstressed syllables, and is caused by prominence constraints. The context in which extreme reduction pertains is represented moraically—extreme reduction affects those unstressed syllables which are *nonmoraic*. Since stressed syllables are obligated to be moraic, these environments constitute a set~subset relation, and a two-pattern reduction system will only occur if the subset constraint (prominence reduction, causing the "extreme" neutralizations) outranks the more general constraint (contrast enhancement, causing the "moderate" neutralizations). This also predicts, correctly, that extreme reduction will occur in the intersection of these two sets (the subset), while only moderate reduction will occur in the complement.

When applied to the Russian vowel reduction patterns sketched above, this approach provides a good fit to the data, capturing all the necessary empirical facts. In addition, some of the dialectal variants offer empirical support for this sort of two-pronged approach. Namely, certain dialects are aptly described as resulting from grammars where some constraint(s) must intervene between the

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[2] Traditionally referred to as incomplete *okan'e*. The term *okan'e* refers to the lack of reduction ("saying [o]" in unstressed position). *Incomplete* okan'e therefore refers to a partial lack of reduction: reduction does not affect the immediately pretonic syllable.

two vowel reduction constraints, or where one of the vowel reduction constraints is absent—a result that is only possible if there are two orthogonal vowel reduction constraints in the grammar.

I will start by discussing extreme reduction, which is caused in this analysis by a prominence reduction constraint. The first step in analyzing this pattern is to isolate the environment in which extreme reduction occurs. I will argue that in Russian, extreme reduction strikes unfooted, nonmoraic syllables.

3.0.1. Extreme Reduction and Russian Foot Form

As laid out above, Russian vowel reduction shows a moderate neutralization pattern in the immediately pretonic syllable, and an extreme neutralization pattern in other unstressed syllables. In the analysis provided here, I will account for this fact by analyzing these two syllables as constituting a prosodic domain—a foot. This foot structure has previously been proposed for Russian by Halle and Vergnaud (1987) and Alderete (1995). The proposed foot structure is right-prominent: (σσ́), suggesting that Russian is an iambic language. In accordance with Prince and Smolensky (1993), I will conclude that Russian uses the constraint RHTYPE=IAMB.

It is important to note that distinguishing between the immediately pretonic syllable and the other unstressed syllables is necessary not only for Russian vowel reduction, but for Russian word prosody as well. For example, the unstressed vowel in the immediately pretonic syllable in many Russian dialects is durationally distinct from other unstressed vowels of the same quality. Furthermore, although unstressed vowels in Russian are frequently devoiced or deleted in fast speech, the vowel of the immeidately pretonic syllable is not—according to Zemskaja (1987, p. 201), vowel deletion is most common for the unstressed vowel immediately following the stressed syllable, and next most common for the vowel in the 2nd pretonic syllable. In other words, effacement of unstressed vowels is most likely in those unstressed syllables immediately adjacent to the proposed iambic foot.

It should be noted, however, that this foot form is not common to all the Russian dialects. Research by Vysotskii (1973) and Almukhamedova and Kul'sharipova (1980) reveal the existence of various dialectal rhythmical variants. As pointed out by Kasatkina (1996), all of these variants can be grouped into two large categories: the "strong center and weak periphery" group and the "wave contour" group. As suggested by the names, the "strong center and weak periphery" rhythmic pattern is characterized by increased duration of the tonic and immediately pretonic syllables (which constitute the "strong center") and

decreased duration for all remaining syllables (the "weak periphery"). Kasatkina (1996) suggests that this prosodic pattern is a defining characteristic of the central Russian dialect area, to which Contemporary Standard Russian (CSR) belongs. The "wave" rhythmical pattern is characterized by increased duration for the stressed vowel, with lengthening also occurring for syllables removed by one syllable from the stress; the syllables immediately adjacent to the stress are short. Almukhamedova and Kul'sharipova (1980, p. 47) observe this rhythmic lengthening pattern in north Russian dialects without vowel reduction, and note that this sort of rhythmic organization is similar to that of Ukrainian and may be a remnant of a previous prosodic system. Importantly, these different rhythmical patterns are found in areas with different vowel reduction behaviors: the strong center and weak periphery pattern predominates in the central Russian dialect area, whose members usually show moderate or no reduction in the immediately pretonic syllable, but extreme reduction in the remaining unstressed syllables; the wave pattern is found in the north Russian dialect area, whose members typically lack significant vowel reduction. It seems reasonable to suppose, therefore, that the conditioning environment for moderate vowel reduction is tied to foot form: dialects with moderate reduction in the immediately pretonic syllable use the foot form (σσ́).

To account for the fact that the foot form of the central Russian dialects has such a profound effect of the duration of unfooted vowels, I will make the following claim: the footed syllables of Russian are *moraic*, while the unfooted syllables are *nonmoraic*. We can say, for example, that the moraic (footed) vowels of Russian are guaranteed to attain a certain minimum duration, since they possess timing units (moras). The nonmoraic (unfooted) syllables, however, are not guaranteed any minimum duration since they lack timing units—this might mean realization of a nonmoraic vowel as very short, deleted, devoiced, or (as described for extremely reduced Russian vowels in Bondarko *et al*. 1966, p. 63) as a vowel that is highly overlapped with the preceding consonant. Formally, the moraic distribution described above for Russian can be derived using the following constraints:

   *STRUC-μ: Moras do not occur in output forms.

   CULMINATIVITY: A prosodic word has exactly one stress.

   FTBINμ: Feet have at least two moras.

The constraint *Struc-μ is a structure avoidance constraint. It assigns one violation mark for every mora that occurs in an output candidate. Culminativity

assigns one violation mark to any output candidate that does not have exactly one stress. The FtBinµ constraint is a familiar binarity constraint that demands all feet have two moras: It assigns one violation mark to any foot in an output form that does not have at least two moras. The appropriate moraic distribution is achieved in Russian by ranking Culminativity and FtBinµ above *Struc-µ, as shown in the following tableau:

(5) Deriving Foot Structure: Culminativity, FtBinµ » *Struc-µ

/σσσσ́σσ/	CULMINA-TIVITY	FTBINµ	*STRUC-µ	*comments:*
☞ σσ(σ$_µ$σ́$_µ$)σσ			**	winner
σ$_µ$σ$_µ$(σ$_µ$σ́$_µ$)σ$_µ$σ$_µ$			******	too many moras
σσ (σσ́$_µ$)σσ		*!	*	foot isn't binary
σσσ(σ́$_µ$)σσ		*!	*	foot isn't binary
σσσσσσ	*!			no stress
(σ$_µ$σ̀$_µ$)(σ$_µ$σ́$_µ$)(σ$_µ$σ̀$_µ$)	*!		******	too many stresses

As shown in this tableau, the combination of FtBinµ and *Struc-µ conspires to exclude all but two moras from the winning output form: In other words, the winning candidate is the one that has as few unstressed moras as possible without violating the two higher-ranking constraints.

Before moving on, it should be noted that at this point it is difficult or impossible to determine that moraicity is the critical factor in deciding where extreme reduction and moderate reduction apply. Based on the vowel reduction facts discussed so far, the different distribution of extreme vs. moderate vowel reduction in Russian could be described in terms of footedness vs. nonfootedness. There are, however, certain exceptions to the pattern already described—these exceptions can be expressed in terms of moraicity, but not footedness. For example, unstressed /a,o/ undergo moderate reduction when they occur in unstressed position at the extreme left edge of the prosodic word—regardless of the distance between that syllable and the stressed syllable. For example, forms like /ogoród/ 'vegetable garden' and /antropológija/ 'anthropology' are pronounced [agarót] and [antrəpalóg^{j}ijə], respectively. Note that the initial vowels reduce to [a] and not [ə], even though they are *not* immediately pretonic: Extreme reduction has been blocked. This blockage cannot be the result of a foot, since there is no secondary stress on these vowels. Furthermore, mere extension of the main stress foot to include the word-initial vowels cannot be a possibility,

since such a structure would predict that all vowels intervening between the first vowel and the stressed vowel would also be subject to moderate reduction. The form [antrəpalóg^{j}ijə] shows that this is not the case. There is nothing, however, that would prevent these vowels from being moraic. In fact, the duration of word-initial unstressed vowels is increased (Zlatoustova 1981), and such vowels are not subject to the deletion and devoicing phenomena observed with nonmoraic unstressed vowels in Russian. An alignment constraint can derive this effect:

Align-μ: The left edge of every word must align with some mora.

Assuming that onset consonants are barred from being moraic, this constraint will enforce the presence of a word-initial mora only in those cases when the first segment of a word is a vowel.

The moraic basis for the distribution of extreme vs. moderate vowel reduction is also supported by evidence from European and Brazilian Portuguese (Brakel 1985, Carvalho 1988-92). This evidence is discussed in more detail in section 4.0.1

3.0.2. Extreme Reduction as Prominence Reduction

Given the moraic distribution discussed for Russian in the preceding section, the constraint that motivates extreme vowel reduction can now be introduced:[3]

*Nonmoraic/-high: Nonmoraic vowels may not have a sonority greater than that of i,u.

Here, vowel sonority is defined based on inherent duration and/or jaw position. According to these criteria, [ə] is the least sonorous vowel, and [i,u] are the next most sonorous. This means that the *Nonmoraic/-high constraint will assign one violation mark to any surface nonmoraic vowel that is not [i], [u], or [ə]. As discussed in section 2.0.2, the neutralizations that are used to avoid violation of *Nonmoraic/-high are different for underlying /o,a/ on the one hand and

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[3] This constraint is formally derived using Prince and Smolensky's prominence-alignment mechanism (Prince and Smolensky 1993). Prominence alignment formally produces a ranked family of prominence constraints. Here, since no constraints need to be interleaved between the members topmost members of this constraint family, I am "encapsulating" these into a single constraint for ease of presentation.

underlying /e/ on the other: /a,o/ reduce to [ə] under extreme reduction (barring presence of a palatalized consonant), while /e/ reduces to [i]. The two following tableaux illustrate extreme reduction of nonmoraic /o,a/ to [ə]. Note: only violations for the *un*footed unstressed vowel are considered in this tableau.

(6) Extreme Reduction for /o,a/: *Nonmoraic/-high » Dep[+high]

	/domovój/ *'house spirit'*	*NONMORAIC/ -high	DEP +HI
a.	☞ də(mavój)		
b.	du(mavój)		*!
c.	di(mavój)		*!
d.	da(mavój)	*!	
e.	do(mavój)	*!	
f.	de(mavój)	*!	

	/sadovód/ *'gardener'*	*NONMORAIC/ -high	DEP +HI
g.	☞ sə(davót)		
h.	su(davót)		*!
i.	si(davót)		*!
j.	sa(davót)	*!	
k.	so(davót)	*!	
l.	se(davót)	*!	

As shown in the these tableaux, the ranking of *Nonmoraic/-high above Dep[+hi] produces the correct neutralization pattern for both nonmoraic /o/ and /a/. The *Nonmoraic/-high constraint rules out all candidates with sonorous vowels in nonmoraic position (candidates d-f and j-l). Of the remaining candidates, the [ə]-reduced forms (candidates a and g) are the winners because they do not involve insertion of a [+hi] feature specification. The candidates with high vowels (candidates c,d, h,i) do involve insertion of [+hi], and are therefore ruled out by Dep[+hi].

Now let's consider the reduction of nonmoraic /e/ in Russian. Recall that nonmoraic /e/ does not follow a centralizing reduction pattern: instead of reducing to [ə], nonmoraic /e/ reduces to [i]:

**(7) Extreme Reduction for /e/: *Nonmoraic/-high and Max[+front] »
Dep[+high]**

/t͡sexovój/ '(factory) shop' (adj.)	*NONMORAIC/ -high	MAX[+FT]	DEP +HI
☞ t͡si(xavój)			*
t͡sə(xavój)		*!	
t͡su(xavój)		*!	*
t͡se(xavój)	*!		
t͡so(xavój)	*!	*	
t͡sa(xavój)	*!	*	

As demonstrated here, reduction via raising is derived for underlying /e/ due to the constraint Max[+front], which dominates Dep[+hi]. In other words, the [ə]-reduced form is unacceptable here since it involves sacrifice of the underlying frontness of the unstressed /e/. Reduction via raising is therefore the best option. Since /o,a/ are not underlyingly front, the constraint Max[+front] has no effect on the reduction of those vowels.

Finally, extreme reduction of /o,a/ after a palatalized consonant produces [i] instead of [ə]. I will account for this effect using the following positional markedness constraint:

Cʲ/[+front]: In unstressed syllables, a palatalized consonant must be followed by a [+front] vowel.

In effect, the Cʲ/[+front] constraint is a type of licensing constraint that applies over strings of segments, rather than over single segments. In this respect, the Cʲ/[+front] constraint can be described as a position-specific sequential grounding constraint such as those discussed by Suzuki (1991). In other words, the Cʲ/[+front] constraint expresses the preference *not* to have the strings Cʲə, Cʲa, etc. in unstressed position. This constraint is perceptually motivated: Russian palatalized consonants are marked by a [j]-like off glide. In stressed positions, this gives a following non-front vowel a dipthongal character—the first portion of a following non-front vowel is obscured by the palatalization of the preceding consonant, with the underlying non-palatality of the vowel only emerging later. In unstressed positions where vowels are briefer, there may not be enough

duration to convey both the phonemic palatalization of a palatalized consonant and the phonemic non-palatality of the unstressed vowel. The C^j/[+front] constraint applies pressure to resolve this conflict in favor of the palatalized consonant. (It should be noted, however, that the interaction between vowel reduction and consonant palatalization is somewhat more complicated than represented here, especially as concerns underlying /o/. For a more detailed discussion of this relationship, please see Note 3 on p. 166.) The ranking of the C^j/[+front] constraint is demonstrated below:

(8) Extreme Reduction after a Palatalized Consonant: C^j[+ft] » Dep[+high]

/t^joploxod/ 'motorized ship'	*NON-MORAIC/-high	MAX[+FT]	MAX-HI	C^j/[+FT]	DEP +HI
☞ t^ji(plaxót)			*		*
t^jə(plaxót)			*	*!	
t^ju(plaxót)			*	*!	*
t^je(plaxót)	*!				
t^jo(plaxót)	*!			*	
t^ja(plaxót)	*!			*	

/t͡ʃʲastotá/ 'frequency'	*NON-MORAIC/-high	MAX[+FT]	MAX-HI	C^j/[+FT]	DEP +HI
☞ t͡ʃʲi(statá)			*		
t͡ʃʲə(statá)			*	*!	
t͡ʃʲu(statá)			*	*!	
t͡ʃʲo(statá)	*!				
t͡ʃʲe(statá)	*!				
t͡ʃʲa(statá)	*!				

Assuming that underlyingly palatalized consonants are specified [+front], the ranking Max[+Front] » C^j/[+front] will prevent de-palatalization of the consonant when followed by a non-front vowel underlyingly. Also note that in these tableaux the constraint Max[-high] has been added, although it does not affect the choice of the winning candidate. Furthermore, the evidence provided in these tableaux does not give us enough information to determine its ranking with respect to the C^j/[+front] constraint, although we do know that it must be dominated by the vowel reduction constraint *Nonmoraic/-high (otherwise it

would block reduction).   The ranking of Max[-high] with respect to C^j/[+front] will be discussed as it pertains to moderate reduction in subsequent sections, where it will be shown that the ranking of these two constraints varies dialectally and causes variation in moderate neutralization patterns.

3.0.3. Extreme Reduction in Dissimilative Dialects

The analysis of extreme reduction in dialects with the Dissimilative pattern is similar to the situation laid out in the preceding section. The operative difference is that extreme reduction has a wider sphere of application in the dialects with Dissimilative reduction: the immediately pretonic syllable sometimes undergoes extreme vowel reduction instead of moderate vowel reduction.

In addition to the different distribution of extreme vs. moderate reduction, the Dissimilative dialects are also set apart by their rhythmic pattern. Recall that the occurrence of moderate reduction in the immediately pretonic syllable is associated with the "strong center and weak periphery" rhythmic pattern described in section 3.0.1 above. In the Dissimilative dialects, the "strong center and weak periphery" pattern is only found in that subset of words that retain a two-pattern reduction system. (Kasatkina 1996, Kasatkin *et al.* 1989). To put it another way, the immediately pretonic syllable is parsed as part of the foot when the stressed vowel is low in sonority. In words where the stressed vowel is high in sonority, the two-pattern reduction system does not surface, and the immediately pretonic syllable experiences extreme reduction. In other words, if the stressed vowel is high in sonority, the immediately pretonic syllable is not included as part of the foot.   This being the case, we can claim that the different distribution of extreme and moderate reduction in the Dissimilative dialects is caused by the fact that different words (predictably) place foot boundaries in different locations.

Furthermore, as noted in section 2.0.2, different variants of the Dissimilative pattern classify stressed vowel qualities differently with respect to their sonority. In one pattern of Dissimilative reduction, all non-high vowels are considered "high sonority", and therefore block occurrence of the two-pattern reduction system. This pattern is historically referred to as the Don Dissimilative pattern.[4]   Other basic Dissimilative variants include the Zhizdra and Obojan patterns, summarized below.

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[4] The name "Don" traditionally refers specifically to the occurrence of this pattern after palatalized consonants. Ward (1985) suggests the name "Belgorod" to refer

(9) Types of Dissimilative Reduction

Don pattern: immediately pretonic /a,e,o/ →   [a] / ___ í,ú
                                                      →   [ə,i] / ___ é,ó,ɛ́,ɔ́,á
Obojan pattern: immediately pretonic /a,e,o/ →   [a] / ___ í,ú, é,ó
                                                      →   [ə,i] / ___ ɛ́,ɔ́,á
Zhizdra pattern: immediately pretonic /a,e,o/→   [a] / ___ í,ú,é,ó,ɛ́,ɔ́
                                                      →   [ə,i] / ___ á

Realization of Unstressed /a,e,o/ immediately pretonically			*Vowels Under Stress*		
reduction to a		Don	i		u
	Obojan		e		o
Zhizdra			ɛ		ɔ
		reduction to i,ə		a	

In these dialects, certain stressed vowels condition the appearance of extreme reduction in the immediately pretonic syllable, or in other words, certain stressed vowels condition the appearance of a monosyllabic foot (i.e., a foot that does not include the immediately pretonic syllable). Broadly speaking, the vowels that condition this occurrence can be described as the sonorous vowels of that dialect. The three different sub-types illustrated above vary with respect to which vowels are considered sonorous enough to have this effect: in the Zhizdra pattern, only the highest sonority vowel [á] conditions a monosyllabic foot as revealed by lack of the two-pattern reduction system; in the Obojan pattern low vowels and lax mid vowels pattern together in this behavior [á,ɛ́,ɔ́]; and in the Don pattern all the non-low vowels do [á,ɛ́,ɔ́,é,ó].   Put another way, in the Zhizdra pattern (for example), a syllable with stressed [á] is capable of being footed alone, while a syllable with some other stressed vowel must be footed in conjunction with the preceding syllable: for purposes of building feet, a stressed [á] is equivalent to [é] plus another vowel, [í] plus another vowel, or any other non-low stressed vowel plus another vowel. This is shown schematically below. A period stands for a syllable boundary, and square brackets indicate foot boundaries:

---

specifically to occurrence of this pattern after non-palatalized consonants. I will use the more widespread term "Don" to refer to this pattern, regardless of consonantal environment.

(10) Foot Equivalences in Dissimilative Dialects

Zhizdra	[Cá]	=	[CV.Cɛ́] [CV.Cɔ́] [CV.Cé]
			[CV.Có] [CV.Cí] [CV.Cú]
Obojan	[Cá] [Cɛ́] [Cɔ́]	=	[CV.Cé] [CV.Có] [CV.Cí] [CV.Cú]
Don	[Cá] [Cɛ́] [Cɔ́] [Cé] [Có]	=	[CV.Cí] [CV.Cú]

This brings to mind classical weight equivalence phenomena, such as that in Latin where a single long vowel (Vː) is equivalent in weight to two short vowels (VV) or a short vowel plus a coda consonant (VC). In Russian dialects there are no phonemic length contrasts, but assuming (following works such as Repetti 1989) that phonological phenomena can introduce vowels with varying mora counts at the surface level even in languages that do not underlying contrast long and short vowels, the Dissimilative variants described above can be accounted for moraically. That is, I analyze the monosyllabic feet displayed in (10) as containing a single bimoraic vowel, and the disyllabic feet as containing two monomoraic vowels. For example, in dialects displaying the Zhizdra pattern, a stressed [á] is structurally bimoraic, while stressed [ɛ́, ɔ́, é,ó,í,ú] are monomoraic: [Cá$_{\mu\mu}$] vs. [CV$_\mu$Cé$_\mu$].[5] This result seems phonetically plausible since inherent duration differences (i.e., sonority-based differences in duration) are quite significant in Russian, and since Russian stress has a large duration-based component. Given these two factors, Russian vowels that are both stressed and high in sonority are particularly long. Assuming, following the works of Hubbard (1995) and Broselow, Chen, and Huffman (1997), that moraicity is concretely (if not straightforwardly) linked with phonetic duration, it seems plausible that language learners could interpret these stressed high-sonority vowels as structurally bimoraic.

The different Dissimilative variants can be derived by placing limitations on which vowel qualities can lengthen under stress. As predicted by Prince and Smolensky's (1993) prominence alignment mechanism, the vowels that are most likely to lengthen are those that are segmentally prominent (sonorous). The appropriate constraints for generating this pattern are shown below:

---

[5] It should be noted that stressed [á] is quite longer in these dialects than unstressed (i.e., moderately reduced) [a]. However, it should also be noted that this is the case in most dialects, since Russian stress is duration-based (Zlatoustova 1981). Since inherent vowel duration differences are quite striking in Russian, it is not suprising that stressed vs. unstressed duration differences are most pronounced with high-sonority stressed vowels and their unstressed counterparts.

Prominence Alignment Constraints: *μμ/i,u » *μμ/e,o » *μμ/ɛ,ɔ » *μμ/a,æ

As described by Prince and Smolensky, prominence alignment constraint families like the one shown above are produced by "crossing" two phonetic scales. The constraint family shown above was produced by crossing a moraic prominence scale with segmental prominence. Note that the symbol "»" means "dominates" and is used with constraints, while the symbol "‹" means "is less prominent than", and is not used with constraints.

Moraic Prominence: μ ‹ μμ   "1 mora is less prominent than 2."
Segmental Prominence: i,u ‹ e,o ‹ ɛ,ɔ ‹ a,æ   "Low sonority vowels are less
                                                                           prominent than higher sonority ones."

Since these scales are arranged from low sonority to high, the constraint family that results from crossing them is a "prominence reduction" constraint hierarchy, and defines the type of vowels that are not sonorous enough to co-occur with a bimoraic level of prominence.[6] That is, a constraint like *μμ/i,u expresses the notion that high vowels are not sonorous enough to be bimoraic.

By interleaving the members of the *μμ/X constraint family with an additional constraint, it is possible to derive the differences in foot structure observed in the three basic Dissimilative dialects (Don, Obojan, Zhizdra). The constraint that must be used is the Weight-to-Stress Principle (WSP) (Smolensky, 1993). The version of WSP used here is formulated as follows:

WSP: Stressed vowels should be bimoraic.

This constraint, if given full rein, would cause lengthening of all stressed vowels. However, its sphere of influence will be limited by the *μμ/X constraint family discussed above. Specifically, any *μμ/X constraint that dominates WSP will block vowel lengthening for its specific vowel quality. For example, if *μμ/i,u outranks WSP, then stressed high vowels will not be able to lengthen under stress. Similarly, if all the *μμ/X constraints except *μμ/a outrank WSP (as shown below), then only low vowels will lengthen under stress:

*μμ/i » **WSP** » *μμ/e » *μμ/ɛ » *μμ/a

---

[6] The term prominence reduction was coined by Jian-King (19xx).

The following tableau illustrates how the ranking shown above derives the correct foot boundary placement for the Zhizdra pattern. Note: in these and subsequent tableaux, only the relevant portion of the *μμ/X constraint family will be shown, due to space considerations.

Tableau (11): Lengthening of Stressed [á] Due to WSP and *μμ/a (Zhizdra)

Words with Stressed Low Vowel				
/luná/ *'moon'*	***Struc-μ**	***μμ/ε**	**WSP**	***μμ/a**
☞ lu(ná$_{\mu\mu}$)	**			
(lu$_\mu$ná$_\mu$)	**		*!	
(lu$_\mu$ná$_{\mu\mu}$)	***!			

Words with Stressed Non-Low Vowels				
/lut͡ʃʲɔ́k/	***Struc-μ**	***μμ/ε**	**WSP**	***μμ/a**
☞ (lu$_\mu$t͡ʃʲɔ́$_\mu$k)	**		*	
lu(t͡ʃʲɔ́$_{\mu\mu}$k)	**	*!		
(lu$_\mu$t͡ʃʲɔ́$_{\mu\mu}$k)	***!			

In the first tableau, the optimal output lu[ná$_{\mu\mu}$] shows lengthening of the tonic vowel [a]. The second candidate, *[lu$_\mu$ná$_\mu$], without lengthening of the tonic vowel, is ruled out because it violates WSP. In addition, the final candidate, *[lu$_\mu$ná$_{\mu\mu}$] shows that the immediately pretonic syllable must be left unfooted when the tonic vowel undergoes lengthening, in order to avoid excessive violation of *Struc-μ. In the second tableau, the optimal output [lu$_\mu$t͡ʃʲɔ́$_\mu$k] does not have lengthening of the tonic vowel. Lengthening of the tonic vowel would cause a fatal violation—either a fatal violation of *μμ/ε (as shown in the second row), or a fatal violation of *Struc-μ (as shown in the third row).

By changing the ranking of WSP with respect to the *μμ/X constraint family, the Obojan and Don patterns can also be derived. Additionally, by ranking WSP below the entire *μμ/X family, a di-syllabic foot shape will always result, since no vowel qualities will be able to lengthen—this is the type of pattern that is seen in the non-dissimilative dialects (including CSR).

(12) Possible Rankings for WSP, and Resulting Reduction Patterns

Pattern	Ranking
Non-Dissimilative	*μμ/i,u » *μμ/e,o » *μμ/ɛ,ɔ » *μμ/a » **WSP**
Zhizdra	*μμ/i,u » *μμ/e,o » *μμ/ɛ » **WSP** » *μμ/a
Obojan	*μμ/i,u » *μμ/e,o » **WSP** » *μμ/ɛ,ɔ » *μμ/a
Don	*μμ/i,u » **WSP** »*μμ/e,o » *μμ/ɛ,ɔ » *μμ/a

At this point, it should be noted that the *μμ/X and WSP constraints need to be dominated by faithfulness constraints for vowel height—otherwise, changes in vowel quality might be expected in order to satisfy the higher-ranking *μμ/X constraints while still satisfying WSP. This can be avoided by ranking the faithfulness constraint Max [+Hi] and Dep [+Low] above the *μμ/X constraints, as shown in the following tableaux:

Tableau (13): Avoidance of Quality Changes to Satisfy *μμ/X and WSP Constraints

/nʲɔ́s/ *'he carried'*	Dep +Lo	Max +Hi	*μμ/i	*μμ/e	*μμ/ɛ	*μμ/a
☞ nʲɔ́ːs					*	
nʲáːs	*!					*

/ʒíznʲ/ *'life'*	Dep +Lo	Max +Hi	*μμ/i	*μμ/e	*μμ/ɛ	*μμ/a
☞ ʒíːznʲ			*			
ʒéːznʲ		*!		*		
ʒɛ́ːznʲ		*!			*	
ʒáːznʲ	*!					*

In the first tableau, lowering of underlying /ɔ/ to [a] is blocked by Dep[+low]—without this ranking, we would expect the incorrect output candidate *[nʲaːs] to emerge as the winner, since it violates a less-highly ranked *μμ/X constraint. Similarly, in the second tableau, lowering of input /i/ is also blocked by the faithfulness constraints.   Here, a number of lowering possibilities are considered—each is ruled out by either Dep[+low] or Max[+high].

By using the WSP and *μμ/X constraint families to derive the correct foot boundaries for the Dissimilative reduction patterns as well as the non-dissimilative reduction patterns, the same ranking of *Nonmoraic/-high will correctly derive extreme reduction in both types of dialect.

3.1. Analyzing Moderate Reduction

Now that extreme vowel reduction is accounted for, I will turn towards the analysis of moderate reduction. Recall that in the current approach, moderate vowel reduction will occur in moraic unstressed syllables, where it generates a vowel sub-inventory containing only the peripheral vowels [i,u,a] in the output. To account for this fact, I will propose the following licensing constraint:

LIC NONPERIPH/STRESS: A nonperipheral vowel may not occur in the output unless under stress.

Note that this constraint does not refer to moraicity. Instead, it applies to all unstressed vowels. However, since nonmoraic unstressed syllables are also subject to *Nonmoraic/-high, the effects of the Lic-Nonperiph/Stress constraint will only be visible in the complement of these two sets, viz., in moraic unstressed syllables.

To avoid violation of the Lic-Nonperiph/Stress constraint, unstressed mid vowels will have to either raise to the high peripheral vowels [i,u] or lower to the peripheral vowel [a]. As explained previously, different dialects choose differently in this respect. I will begin with an analysis of [a]-reduction below, along with a discussion concerning the combination the analyses for moderate and extreme reduction. Afterwards, I will work through the other types of moderate reduction described in section 2.0.3.

3.1.1. Moderate Neutralizations in *[a]-reduction*

In [a]-reduction, unstressed /e,o/ both reduce to [a] in the immediately-pretonic syllable, regardless of the palatality of the preceding consonant. This neutralization pattern is observed in many south Russian dialects, including those displaying the Dissimilative variants discussed above. (For this reason, they are traditionally referred to as *dissimilative [a]-reduction* dialects). In order to derive reduction via lowering, the faithfulness constraint Dep[+low] must be dominated both by Lic-Nonperiph/Stress and Max[-high]. This is demonstrated in the following tableau for reduction after a non-palatalized consonant. In this and

subsequent tableaux, I will present di-syllabic foot forms with monomoraic stressed vowels, unless otherwise noted.

Tableau (14): Moderate Neutralization Via *[a]-reduction*—Max[-high] » Dep[+low]

/domá/ *'houses'*	LIC NONPERIPH/ STRESS	MAX[-HI]	DEP +LO
☞ (damá)			*
(dumá)		*!	
(dimá́)		*!	
(domá)	*!		
(demá́)	*!		
(dəmá)	*!	*	

/sadú/ *'garden' (loc.)*	LIC NONPERIPH/ STRESS	MAX[-HI]	DEP +LO
☞ (sadú)			
(sudú)		*!	
(sidú́)		*!	
(sodú)	*!		
(sedú́)	*!		
(sədú)	*!	*	

Here, the last three candidate forms in each tableau are ruled out by Lic-Nonperiph/Stress: they all contain a nonperipheral vowel that is not stressed. The second two candidates are both ruled out for deleting an underlying [-high] specification, in violation of Max[-high]. The winner violates only the low-ranked constraint Dep[+low] (and only in the first tableau), since a [+low] specification has been inserted which was not present underlyingly. It should also be pointed out at this time that Max[-high] must also dominate faithfulness constraints for [front] and [round]—if Max[+front] or Max[round] were ranked above Max[-high], they could force reduction via raising in order to preserve the palatality or rounding of the underlying vowel. Since this is not the case in the pattern under consideration, it must be the case that Max[-high] » Max[+front], Max[round].

Now let's look at [a]-reduction after a palatalized consonant. Recall that [a]-reduction is not affected by this environment—unstressed nonperipheral

vowels in the immediately-pretonic syllable reduce via lowering to [a] regardless of the quality of the preceding consonant. This results from the ranking Max[-high] » C^j/[+front], as shown in the following tableau for unstressed /o/ preceded by a palatalized consonant:

(15) Moderate Neutralization of /o/ via *a-reduction*: After a Palatalized Consonant

/p^{j}okú/ *'I bake'*	LIC NONPERIPH/ STRESS	MAX[-HI]	C^j/[+FT]	DEP +LO
☞ (p^{j}akú)			*	*
(p^{j}ukú)		*!	*	
(p^{j}ikú)		*!		
(p^{j}okú)	*!		*	
(p^{j}ekú)	*!			
(p^{j}əkú)	*!	*	*	

The same result is also generated for unstressed /e/ and /a/ preceded by a palatalized consonant:

(16) Moderate Neutralization of /a/ or /e/ via *[a]-reduction*: After Palatalized

/r^{j}eká/ *'river'*	LIC NONPERIPH/ STRESS	MAX[-HI]	C^j/[+FT]	DEP +LO
☞ (r^{j}aká)			*	*
(r^{j}uká)		*!	*	
(r^{j}iká)		*!		
(r^{j}oká)	*!		*	
(r^{j}eká)	*!			
(r^{j}əká)	*!	*	*	

/pʲatʲí/ 'five' (gen.)	LIC NONPERIPH/ STRESS	MAX[-HI]	Cʲ/[+FT]	DEP +LO
☞ (pʲatʲí)			*	
(pʲutʲí)		*!	*	
(pʲitʲí́)		*!		
(pʲotʲí)	*!		*	
(pʲetʲí́)	*!			
(pʲətʲí)	*!	*	*	

3.1.2. Combining Moderate and Extreme Reductions

Now that we have examined both the moderate and extreme vowel neutralizations in isolation, let's take a look at them in combination to ensure that the constraints and rankings discussed separately do not produce the incorrect results when combined. In particular, the Cʲ/[+front] constraint must be ranked in a manner such that it will motivate reduction to [i] in cases of extreme reduction, but not in cases of moderate reduction. The ranking Max[-high] » Cʲ/[+front] suggested above has the appropriate effect. Recall from tableau (8) that the ranking of Cʲ/[+front] and Max[-high] cannot be determined based only on the evidence provided from extreme reduction. In other words, the correct extreme reduction patterns result from either ranking. In the [a]-reduction dialects, the ranking must be Max[-high] » Cʲ/[+front], since this ranking avoids reduction to [i] in contexts of moderate reduction. To see how this works, compare the following two tableaux illustrating reduction of unstressed /o/ in both extreme and moderate reduction cases:

(17) Moderate Reduction of /o/ After Palatalized: Full Constraint Set

/tʲopló/ 'warmly'	*NONMORAIC/ -high	LIC-NONPERIPH/ STRESS	MAX [+FT]	MAX [-HI]	Cʲ/ [+FT]	DEP [+HI]
☞ (tʲapló)					*	
(tʲipló)				*!		*
(tʲupló)				*!	*	*
(tʲepló)		*!				
(tʲopló)		*!			*	
(tʲəpló)		*!		*	*	

(18) Extreme Reduction of /o/ after Palatalized: Full Constraint Set

Note: Only violations for the first unstressed vowel are shown

/tʲoploxód/ *'motorized ship'*	*NON- MORAIC/ -high	LIC-NONPERIPH/ STRESS	MAX +FT	MAX [-HI]	Cʲ/ [+FT]	DEP [+HI]
☞ tʲi(plaxót)				*		*
tʲu(plaxót)				*	*!	*
tʲə(plaxót)		*!		*	*	
tʲa(plaxót)	*!				*	
tʲe(plaxót)	*!					
tʲo(plaxót)	*!				*	

Note that in the first tableau, an [a]-reduced form is the optimal candidate, due in part to the fact that it satisfies the Max[-high] constraint. This ranking allows the [a]-reduced form to win despite the fact that it violates the Cʲ/[+front] constraint. However, in the second tableau the [a]-reduced form is cast out of the running at an early stage by the *Nonmoraic/-high constraint. In other words, although [a]-reduction is optimal in this dialect with respect to the ranking Max[-high] » Cʲ/[+front], it produces a vowel that is too sonorous to be used under extreme reduction due to the higher-ranking constraint *Nonmoraic/-high. Therefore, in [a]-reduction dialects the Cʲ/[+front] constraint is able to play a decisive role under extreme reduction, but not under moderate reduction.

The remainder of this sections will demonstrate how additional moderate neutralization patterns can be derived.

3.1.3. Dialects with *[i]-reduction*

A number of Central Russian dialects, including CSR, show a pattern referred to as *[i]-reduction*. This pattern is similar to [a]-reduction (discussed above) in that /a,o/ neutralize to highly sonorous [a] in this the immediately pretonic syllable,   In [i]-reduction, this pattern is blocked when preceded by a palatalized consonant. In that case, /o,a/ reduce to [i] in the immediately pretonic, just as in the non-immediately-pretonic syllables. Underlying /e/ reduces to [i] regardless of the preceding consonant.   The [i]-reduction pattern is seen in many central Russian dialects, including CSR, from which the example forms listed below are taken.

(19) Moderate neutralization via [i]-reduction
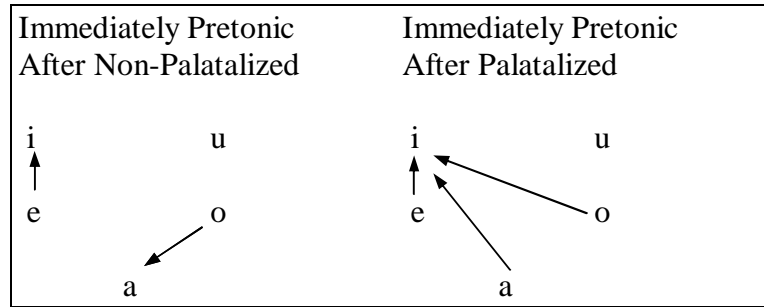
After Non-Palatalized		After Palatalized	
/etáʒ/	[itáʃ] 'floor, story' cf. variant [etáʃ]	/rʲeká/	[rʲiká] 'river' cf. [rʲé t͡ʃʲka] 'little river'
/davátʲ/	[davátʲ] 'to give' (iter.) cf. [dátʲ] 'to give'	/pʲatʲí/	[pʲitʲí] 'five' (gen. sg.) cf. [pʲátʲ] 'five' (nom. sg.)
/kotá/	[katá] 'cat' (gen. sg.) cf. [kót] 'cat' (nom. sg.)	/tʲopló/	[tʲipló] 'warmly' cf. [tʲóplij] 'warm'

In this type pattern, reduction of /o,a/ to [i] after a palatalized consonant occurs in both moderate and extreme reduction contexts. This pattern can be accounted for by ranking Max[-high] *below* Cʲ/[+front]. (This is the opposite of the [a]-reduction pattern described above.) This ranking will allow Cʲ/[+front] to motivate reduction to [i] in all unstressed syllables:

(20) Moderate Neutralization via *[i]-reduction*: Cʲ/[+front] » Max[-high]

/nʲoslí/ *'they carried'*	NON-MORAIC-i	LIC NONPERIPH/STRESS	MAX +FT	Cʲ/ [+FT]	MAX –HIGH	DEP +LOW
☞ (nʲislí)					*	
(nʲaslí)				*!		*
(nʲuslí)				*!	*	
(nʲəslí)		*!			*	
(nʲeslí)		*!				
(nʲoslí)		*!				

Since Max[-high] still dominates Dep[+low], reduction via lowering is still produced when not preceded by a palatalized consonant, as shown below:

(21) Moderate Reduction in [i]-reduction dialect after Nonpalatalized

/domá/ 'homes'	*NON- MORAIC/ -high	LIC NONPERIPH/ STRESS	MAX +FT	Cʲ/ [+FT]	MAX −HIGH	DEP +LOW
☞ (damá)						*
(dimá)					*!	
(dumá)					*!	
(dəmá)		*!				
(demá)		*!				
(domá)		*!				

3.1.4. Dialects with *[e]-reduction*

The diachronic predecessor of *[i]-reduction* is a type of reduction pattern where /e/ does not undergo reduction, and where unstressed /o,a/ after palatalized consonants also surface as [e]. This pattern, "[e]-reduction", still exists in many dialects in the Moscow region, and was characteristic of Moscow pronunciation at one time.

(22) Moderate Neutralization via [e]-reduction
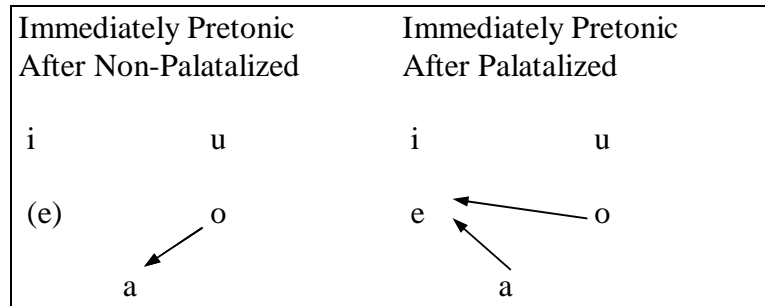
/rʲeká/	[rʲeká] 'river'	cf. [rʲétʃkə] 'little river'
/pʲatí/	[pʲetí] 'five' (gen. sg.)	cf. [pʲátʲ] 'five' (nom. sg.)
/nʲosú/	[nʲesú] 'I carry'	cf. [nʲós] 'he carried'

Based on the available descriptions of [e]-reduction, there seem to be at least three variants of this pattern. The variant described above seems to be the one most commonly described in dialectological handbooks (cf. Avanesov and Orlova (1964), Kuznetsov (1973) and Kasatkin (1989)): reduction to [e] only in the immediately pretonic syllables, with reduction to [i] elsewhere. First the analysis for this variant will be presented. Discussion of the two other [e]-reduction patterns will follow.

The [e]-reduction pattern differs from the [i]-reduction analysis given above in that the Lic-Nonperiph/Stress constraint is more lowly ranked—the constraints Max[+front], C^j/[+front], and Max[-high] have been promoted to a position above Lic-Nonperiph/Stress, but below *Nonmoraic/-high. As shown below, this blocks raising:

(23) Moderate Reduction of /e/ via [e]-reduction

/r^{j}eká/ *'river'*	*NON- MORAIC/- high	MAX +FRONT	C^j/ +FT	MAX −HIGH	LIC NONPERIPH/ STRESS	DEP +LOW
☞ (r^{j}eká)					*	
(r^{j}iká)				*!		
(r^{j}oká)		*!	*		*	
(r^{j}aká)		*!	*			*
(r^{j}əká)		*!	*	*		
(r^{j}uká)		*!	*	*		

Here, the optimal candidate retains the underlying mid vowel in an unstressed syllable, despite the fact that this violates Lic-Nonperiph/Stress. To do otherwise would mean either raising to [i], which violates the more highly-ranked constraint Max[-high]; lowering to [a], or centralizing to [ə], both of which violate Max[+front]. The same constraints and rankings also correctly predict that unstressed /o,a/ will reduce to [e] when preceded by a palatalized consonant. This is illustrated below for underlying /o/:

(24) Moderate Reduction of /o/ via [e]-reduction (after palatalized)

/tʲopló/ *'warmly'*	NON- MORAIC/i	MAX +FT	Cʲ/ +FT	MAX −HIGH	LIC NONPERIPH/ STRESS	DEP +LOW
☞ (tʲepló)					*	
(tʲipló)				*!		
(tʲopló)			*!		*	
(tʲapló)			*!			*
(tʲəpló)			*!	*		
(tʲupló)			*!	*		

Note that this re-ranking does not mean that unstressed /o/ can remain unreduced: presence of Lic-Nonperiph/Stress, even in a lowly-ranked position, will still motivate reduction, as shown below:

(25) Moderate Reduction of /o/ in [e]-reduction dialect (after nonpalatalized)

/domá/ *'homes'*	NON- MORAIC/i	MAX +FT	Cʲ/ +FT	MAX −HIGH	LIC NONPERIPH/ STRESS	DEP +LOW
☞ (damá)						*
(demá)					*!	
(domá)					*!	
(dəmá)				*!		
(dimá)				*!		*
(dumá)				*!		*

Here, the constraints Max[+front] and Cʲ/[+front] have no effect—in the analysis of [i]-reduction, they helped to motivate raising. In the case of underlying /o,a/ *not* preceded by a palatalized consonant, there is nothing that would motivate reduction via raising—instead, the default pattern of reduction via lowering is maintained.

This analysis of [e]-reduction can be summarized by saying that higher rank for Max[+front] and Cʲ/[+front] block lowering after Cʲ, while higher rank for Max[-high] simultaneously blocks raising to [i].

Finally, by keeping the constraint Nonmoraic/-high in an undominated position, the [e]-reduction pattern is limited to occurring in the syllable immediately preceding the stress. This is demonstrated in the following tableau:

(26) Extreme Reduction of /e/ in an [e]-reduction dialect

/rʲet͡ʃʲovój/ 'vocal'	NON-MORAIC/i	MAX +FRONT	Cʲ/ +FT	MAX −HIGH	LIC NONPERIPH/ STRESS	DEP +LOW
☞ rʲi(t͡ʃʲevój)				*		
rʲə(t͡ʃʲevój)		*!	*	*		
rʲu(t͡ʃʲevój)		*!	*	*		
rʲe(t͡ʃʲevój)	*!				*	
rʲa(t͡ʃʲevój)	*!	*	*			*
rʲo(t͡ʃʲevój)	*!	*	*		*!	

(27) Extreme Reduction of /o/ in an [e]-reduction dialect

/tʲoplovátoj/ 'warmish'	NON-MORAIC/i	MAX +FRONT	Cʲ/ +FT	MAX −HIGH	LIC NONPERIPH/ STRESS	DEP +LOW
☞ tʲi(plavá)tij				*		
tʲu(plavá)tij			*!	*		
tʲə(plavá)tij			*!	*		
tʲe(plavá)tij	*!				*	
tʲo(plavá)tij	*!		*		*	
tʲa(plavá)tij	*!		*			*

However, Avanesov (1984) describes a different [e]-reduction pattern as being characteristic of some speakers of the pre-Revolutionary Moscow pronunciation norm ("Old Muscovite"). In this variant, reduction to [e] occurs in all unstressed syllables irregardless of their position with respect to the stressed syllable. This pattern results from promoting Max[-high] not only above one reduction constraint (as illustrated in tableaux (26) and (27) above), but above both reduction constraints. This is demonstrated in the following tableaux:

(28) Avanesov's variant of [e]-reduction; underlying /e/

/rʲet͡ʃʲovój/ *'vocal'*	MAX –HIGH	NON- MORAIC/i	MAX +FRONT	Cʲ/ +FT	LIC NONPERIPH/ STRESS	DEP +LOW
☞ rʲe(t͡ʃʲevój)		*			*	
rʲa(t͡ʃʲevój)		*	*!	*		*
rʲo(t͡ʃʲevój)		*	*!	*	*!	
rʲi(t͡ʃʲevój)	*!					
rʲə(t͡ʃʲevój)	*!		*!	*		
rʲu(t͡ʃʲevój)	*!		*!	*		

(29) Avanesov's variant of [e]-reduction; underlying /o/

/tʲoplovátoj/ *'warmish'*	MAX –HIGH	NON- MORAIC/i	MAX +FRONT	Cʲ/ +FT	LIC NONPERIPH/ STRESS	DEP +LOW
☞ tʲe(plavá)təj		*			*	
tʲo(plavá)təj		*	*!	*	*	
tʲa(plavá)təj		*	*!	*		*
☞ tʲi(plavá)təj	*!					
tʲu(plavá)təj	*!			*!		
tʲə(plavá)təj	*!			*!		

Finally, in certain dialects of Belarusian described by Lamprecht (1987), reduction to [e] only occurs in the elsewhere environment: in the syllable immediately preceding the stress, [a]-reduction occurs while the remaining unstressed syllables show [e]-reduction. This pattern can be generated by maintaining the higher rank for Max[-high] used in Avanesov's [e]-reduction variant (cf. (26) abd (27) above), but reversing the ranking of Lic-Nonperiph and Cʲ/+front used in the basic [e]-reduction pattern (cf. (28) and (29) above).

3.1.5. Attenuated *[a]-reduction*

In a number of dialects in the South Russian dialect area, reduction to [i] also occurs in the immediately pretonic syllable, similar to the [i]-reduction pattern described immediately above, but only when the unstressed vowel in question is *flanked* by palatalized consonants on both sides. In unfooted unstressed positions, reduction to [i] occurs after palatalized consonants, as normal (no double-sided environment is necessary). This pattern is traditionally

referred to as "attenuated [a]-reduction", since the tendency to reduce to [a] is attenuated, not occurring in the double-sided palatalization environment. This pattern occurs in a number of central and southern dialects in the regions of Moscow, Kalinin, and Tula.

(30) Moderate Neutralization via attenuated [a]-reduction
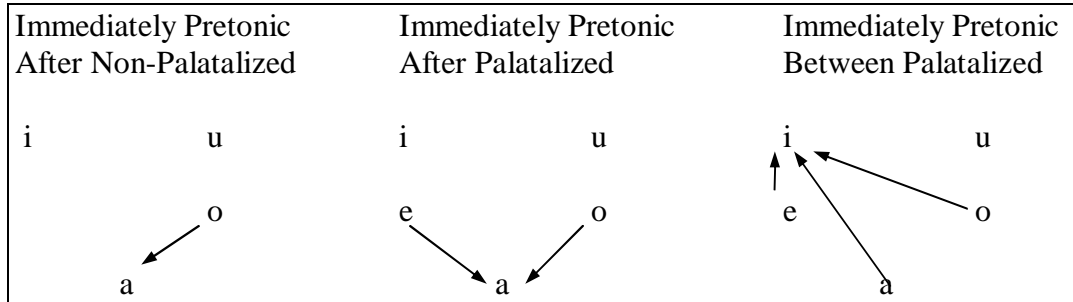
After Palatalized		Between Palatalized	
/rʲeká/	[rʲaká] 'river'	/rʲétʃʲnój/	[rʲitʃʲnój] 'river' (adj.)
	cf. [rʲé tʃʲka] 'little river'		cf. [rʲé tʃʲka] 'little river'
/pʲata/	[pʲatá] 'heel' (sg.)	/pʲatʲí/	[pʲitʲí] 'five' (gen. sg.)
	cf. [pʲáti] 'heels'		cf. [pʲátʲ] 'five' (nom. sg.)
/tʲopló/	[tʲapló] 'warmly'	/tʲoléts/	[tʲiléts] 'calf'
	cf. [tʲóplij] 'warm'		cf. [tʲólkə] 'heifer'

This pattern can be derived by adding a double-sided phonotactic constraint such as the following:

> **Cʲ_Cʲ:** A vowel may not occur between two palatalized consonants unless it is [+front].

By sandwiching the Max[-high] constraint between the double-sided palatalization constraint and the single-sided palatalization constraint, the correct results will be produced: the high-ranking Cʲ_Cʲ constraint will force reduction to [i] in all appropriate contexts, including footed positions, due to the ranking Cʲ_Cʲ » Max[-high].   The low-ranking constraint Cʲ/[+front] will also motivate reduction to [i], but will be blocked in nonmoraic unstressed syllables by the ranking Max[-high] » Cʲ/[+front].

3.1.6. Incomplete *okan'e*

The last dialect type to be considered here is traditionally referred to as "incomplete okan'e". In this type of dialect, the mid vowels do not reduce at all in the immediately pretonic syllable—unstressed /o/ remains [o], and unstressed /e/ remains [e]. However, in other unstressed syllables, extreme reduction occurs as expected. This type of pattern is characteristic of the Vladimir-Volga Basin dialect group, which is found in an area that is transitional between the vowel-reducing Central dialects and the non-reducing Northern dialects. According to Vysotskii's (1973) phonetic survey of dialect vowel duration, the Vladimir-Volga Basin group is similar to the central Russian dialects in terms of the duration of the immediately-pretonic vowel, and is usually considered a member of the Central dialect group. In Kasatkina's (1996) terminology, the Vladimir-Volga Basin group displays the "strong nucleus and weak periphery" pattern. This contrasts with the vowel duration results that Vysotskii (1973) reports for the northern neighbors of the Vladimir-Volga Basin group, which would be more similar to the "wave" rhythmic pattern.

The Vladimir-Volga Basin "incomplete okan'e" pattern is easily assimilated into the analysis already provided by demoting the Lic-Nonperiph/Stress constraint below Max[-low], thus making it preferable to deploy mid vowels in unstressed syllables rather than incur a faithfulness violation. However, this does not prevent *Nonmoraic/-high from producing vowel reduction in the remaining unstressed, nonmoraic syllables. In the nonmoraic syllables, unstressed /o/ and /e/ are not allowed to surface—but this is due to their relatively sonorous status, not to their nonperipheral nature. Of course, if the remaining unstressed vowels were to regain their moraic status (due to low rank of *Struc-μ), there would be no chance for vowel reduction at all under this grammar. This is a desirable effect in that it allows us to account for those Northern dialects that lack vowel reduction entirely. As described by Vysotskii (1973), the non-reducing dialects do not make sharp durational distinctions among different types of unstressed syllable—it would therefore be reasonable to assume that the Northern dialects lacking reduction altogether have a much lower ranking for the constraint *Struc-μ, which prevents the occurrence of both nonmoraic vowels and (resultantly) extreme reduction in these dialects.

3.1.7. Additional Dissimilative Reduction Patterns

As demonstrated in the preceding section, the two-constraint approach to Russian vowel reduction is capable of accounting for a number of dialectal neutralization patterns, including reduction to [a], [e], [i], and [ə]. Furthermore,

by having two separate reduction constraints, it is possible to block one or the other constraint, while allowing the remaining one to remain unfettered. By linking the distribution of extreme and moderate reduction patterns with foot form and moraic distribution, the same analysis was easily extended to include the Dissimilative vowel reduction patterns. However, only the three most basic Dissimilative variants were discussed. Extension of this analysis to additional, more complex Dissimilative variants provides strong additional support for this analysis. Namely, be exploring the interaction between vowel reduction constraints and foot-form constraints, the role of prominence constraints in Russian vowel reduction becomes even more evident. In this section, I present additional Dissimilative variants and their analyses that highlight this role.

Let me start off by pointing out that the preceding sections have proceeded on the assumption that the constraints used in accounting for foot form do not interact with the constraints on vowel reduction. For example, interactions between, say, $*\mu\mu/X$ and $C^j/[+front]$ were considered irrelevant. In point of fact, however, this is not the case. Recall that in the [a]-reduction pattern, the immediately pretonic vowel will reduce to [a] even after a palatalized consonant. This means that the constraints Dep[+high] and Max[-high] must outrank the constraint $C^j\_\_/[+front]$ in dialects with this pattern. In other words, in the [a]-reduction pattern, it is more important to avoid raising than it is to follow the $C^j\_\_/[+front]$ constraint. However, even in this low-ranked position, it is possible for $C^j\_\_/[+front]$ to motivate reduction to [i] in the immediately pretonic syllable—namely, by forcing the word to have a monosyllabic foot, thus exposing the immediately pretonic syllable to extreme reduction. In order to prevent this state of affairs, it must be the case that all of the $*\mu\mu/X$ constraints outrank the $C^j\_\_/[+front]$. That is, if $*\mu\mu/a$ outranks $C^j\_\_/[+front]$, it will not be possible for the $C^j\_\_[+front]$ to force a monosyllabic footing since doing so would violate the more highly-ranked $*\mu\mu/X$ constraints that limit lengthening. The opposite ranking would allow lengthening of (some subset of) stressed vowels just in case the immediately pretonic vowel is preceded by a palatalized consonant. This is an attested pattern: all three of the basic Dissimilative variants do occur in certain dialects only in contexts after palatalized consonants (a non-dissimilative pattern is observed after non-palatalized consonants). The opposite pattern with dissimilation only after plain consonants and non-dissimilative reduction after palatalized consonants is unattested (Kuznetsov 1973). Dissimilative reduction limited to contexts after palatalized consonants can be summarized as follows:

(31) Dissimilative variants Limited to Contexts After C^j

Pattern	Ranking
No dissimilation at all	$*\mu\mu/i,u$ » $*\mu\mu/e,o$ » $*\mu\mu/\varepsilon,\mathfrak{o}$ » $*\mu\mu/a$ » **$C^j\_\_/[+front]$**, WSP
Zhizdra after C^j only	$*\mu\mu/i,u$ » $*\mu\mu/e,o$ » $*\mu\mu/\varepsilon$ » **$C^j\_\_/[+front]$** » $*\mu\mu/a$ » WSP
Obojan after C^j only	$*\mu\mu/i,u$ » $*\mu\mu/e,o$ » **$C^j\_\_/[+front]$** » $*\mu\mu/\varepsilon,\mathfrak{o}$ » $*\mu\mu/a$ » WSP
Don after C^j only	$*\mu\mu/i,u$ » **$C^j\_\_/[+front]$** » $*\mu\mu/e,o$ » $*\mu\mu/\varepsilon,\mathfrak{o}$ » $*\mu\mu/a$ » WSP

As shown in the table above, if the constraint $C^j\_\_/[+front]$ is ranked immediately above $*\mu\mu/\varepsilon,\mathfrak{o}$, then the vowels $/\varepsilon,\mathfrak{o},a/$ will all lengthen under stress just in case the immediately pretonic vowel is preceded by a palatalized consonant. This will force the immediately pretonic vowel in such contexts to be unfooted and nonmoraic, and thus subject to extreme reduction, resulting in reduction of the pretonic vowel to [i] and satisfying $C^j\_\_/[+front]$. As mentioned in the preceding paragraph, these patterns are attested.

By introducing the doubly-sided constraint $C^j\_\_C^j/[+front]$, this typology can be extended even further. If $C^j\_\_C^j/[+front]$ is ranked immediately above $C^j\_\_/[+front]$ with no constraints intervening in the hierarchies illustrated in (31), the same output patterns will result. However, if $C^j\_\_C^j/[+front]$ is ranked above the entire $*\mu\mu/X$ constraint family, the result will be dissimlative reduction only in the non-flanked C^jVC environment. In the flanked environment, $C^j\_\_C^j/[+front]$ will force a monosyllabic footing in all cases, resulting in pretonic reduction to [i]. This type of pattern is attested, and referred to as Dissimilative/Attenuated vowel reduction.[7] This type of pattern is summarized in

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[7] Traditional Russian dialectological pattern names of the type X/Y are easily distinguished from similar names of the form Y/X using the following mnemonic: The pattern name given first is the pattern observed in the context CVC^j (non-flanked), while the second pattern name given is the pattern observed in the context C^jVC^j (flanked). For example, Dissimilative/Attenuated patterns follow a dissimilative pattern in CVC^j, and follow attenuated [a]-reduction in C^jVC^j. Likewise, Attenuated/Dissimilative variants follow attenuated [a]-reduction in CVC^j, and follow a dissimilative pattern in C^jVC^j.

(33) below. These rankings generating each pattern are provided in (33). As illustrated, only two of the three possible Dissimilative/Attenuated patterns predicted by this typology are attested.

(32) Dissimilative/Attenuated Reduction Patterns

Dissimilative/Attenuated I (most common)

Cʲ V C __´		Cʲ V Cʲ __´
i	u	*all stressed V's condition reduces to [i]*
▉	o	
	ɔ	
a		

condition reduction to [a]→ (aligns with u/o/ɔ rows)

conditions reduction to [i]→ (aligns with a row)

Dissimilative/Attenuated II

Cʲ V C __´		Cʲ V Cʲ __´
i	u	*all stressed V's condition reduces to [i]*
▉	o	
	ɔ	
a		

condition reduction to [a]→ (aligns with u/o rows)

condition reduction to [i]→ (aligns with ɔ/a rows)

As shown in the illustrations, the Dissimilative/Attenuated patterns are basically Dissimilative reduction patterns that are interrupted or blocked in contexts flanked by palatalized consonants. In contexts flanked by palatalized consonants, [i]-reduction is the observed reduction pattern. Dissimilative/Attenuated I is an interrupted version of the Zhizdra Dissimilative pattern—the Zhizdra reduction pattern occurs except in contexts flanked by palatalized consonants. Similarly, Dissimilative/Attenuated II is an interrupted version of the Obojan Dissimilative pattern.

(33) Rankings for Dissimilative/Attenuated Reduction Patterns

Pattern	**Ranking**
No dissimilation at all (attenuated [a]-reduction)	$C^j\_\_C^j$/[+**front**] » *μμ/i,u » *μμ/e,o » *μμ/ɛ,ɔ » *μμ/a » $C^j\_\_$/[+**front**], WSP
Dissimilative/Attenuated I (cf. Zhizdra)	$C^j\_\_C^j$/[+**front**] » *μμ/i,u » *μμ/e,o » *μμ/ɛ » $C^j\_\_$/[+**front**] » *μμ/a » WSP
Dissimilative/Attenuated II (cf. Obojan)	$C^j\_\_C^j$/[+**front**] » *μμ/i,u » *μμ/e,o » $C^j\_\_$/[+**front**] » *μμ/ɛ,ɔ » *μμ/a » WSP
Unattested Dissimilative/Attenuated pattern (cf. Don)	$C^j\_\_C^j$/[+**front**] » *μμ/i,u » $C^j\_\_$/[+**front**] »*μμ/e,o » *μμ/ɛ,ɔ » *μμ/a » WSP

If, on the other hand, $C^j\_\_C^j$/[+front] is the constraint that is interleaved among the members of *μμ/X, and $C^j\_\_$/[+front] is left at the bottom of the *μμ/X constraint family, we will find [a]-reduction in the non-flanked environment C^jVC (cf. first ranking in (31)), while simultaneously finding a Dissimilative reduction pattern in the flanked environment $C^j\_\_C^j$. This type of pattern is attested, and is referred to as Attenuated/Dissimilative reduction (see fn. 7). Attested Attenuated/Dissimilative variants are summarized in (34). The rankings generating these patterns are illustrated in (35).[8]

(34) Attenuated/Dissimilative Reduction Patterns

Zhizdra-II:

C^j V C ´	C^j V C^j ´	
░all stressed░	i u	← condition reduction to [a]
░vowels░	e ■■■	
░condition░	ɛ ɔ	
░reduction to [a]░	a	← conditions reduction to [i]

---

[8] The Kidusov and Novoselkov Attenuated/Dissimilative patterns should not be confused with the similar-sounding but formally distinct Kidusov and Novoselkov Assimilative-Dissimilative reduction patterns.

Kidusov: (see fn. 8)

C^j V C __	C^j V C^j __	
all stressed vowels condition reduction to [a]	i	u
	e	■
	ε	ɔ
	a	

← condition reduction to [a]

← condition reduction to [i]

Novoselkov (most common; see fn. 8):

C^j V C __	C^j V C^j __	
all stressed vowels condition reduction to [a]	i	u
	e	■
	ε	ɔ
	a	

← condition reduction to [a]

← condition reduction to [i]

As shown above, the Novoselkov pattern is a combination of attenuated [a]-reduction and the Obojan Dissimilative pattern. The Kidusov pattern combines attenuated [a]-reduction with the Don Dissimilative pattern, and the Zhizdra-II pattern combines attenuated [a]-reduction with the Zhizdra Dissimilative pattern. As noted, the Novoselkov pattern is the most common type of Attenuated/Dissimilative reduction.

(35) Rankings for Attenuated/Dissimilative Reduction Patterns

Pattern	**Ranking**
No dissimilation at all ([a]-reduction)	*μμ/i,u » *μμ/e,o » *μμ/ε,ɔ » *μμ/a » C^j__C^j/[+front], C^j__/[+front], WSP
Zhizdra-II	*μμ/i,u » *μμ/e,o » *μμ/ε » C^j__C^j/[+front] » *μμ/a » C^j__/[+front], WSP
Kidusov (cf. Obojan)	*μμ/i,u » *μμ/e,o » C^j__C^j/[+front] » *μμ/ε,ɔ » *μμ/a » C^j__/[+front], WSP
Novselkov (cf. Don)	*μμ/i,u » C^j__C^j/[+front] »*μμ/e,o » *μμ/ε,ɔ » *μμ/a » C^j__/[+front], WSP

Finally, if both C^j__/[+front] and C^j__/[+front] are interleaved with the *μμ/X constraint family at different places, compound Dissimilative systems will be the result. In compound dissimilation, one Dissimilative pattern occurs in the context C^j__, and a second Dissimilative pattern occurs in the context C^j__ C^j. Importantly, this analysis predicts that you cannot freely combine Dissimilative

variants to produce a compound system. Rather, the analysis predicts that the Dissimilative pattern used in the context C^j__ C^j should always favor reduction to [i] under more conditions than the pattern found in the same dialect in the context C^j__. Compound Dissimilative systems are in fact attested, and they do obey this generalization. The attested compound Dissimilative variants are illustrated below in (36), and the rankings that generate them are given in (37).

(36) Compound Dissimilative Systems:

Sudzha:

C^j V C __´		C^j V C^j __´	
i	u	i	u
■	o	e	■
	ɔ	ɛ	ɔ
a		a	

Shchigri:

C^j V C __´		C^j V C^j __´	
i	u	i	u
■	o	e	■
	ɔ	ɛ	ɔ
a		a	

Dmitrov:

C^j V C __´		C^j V C^j __´	
i	u	i	u
■	o	e	■
	ɔ	ɛ	ɔ
a		a	

Key

□ = indicates stressed vowels that condition reduction to [a] in the immediately pretonic syllable

▫ = indicates stressed vowels that condition reduction to [i] in the immediately pretonic syllable

■ = indicates that a vowel of the particular quality in question never occurs in the context shown (i.e., [e,ɛ] do not occur after plain consonants, [o] does not occur after C^j)

As illustrated, the Sudzha pattern combines Zhizdra and Don Dissimilative variants, the Shchigri pattern combines Zhizdra and Obojan, and the Dmitrov pattern combines Obojan and Don. As shown in these illustrations, the compound Dissimilative variants share a common characteristic: The reduction pattern observed in contexts flanked by palatalized consonants are always ones that produce reduction to [i] *more often* than the patterns they are paired with. For example, in the Sudzha compound pattern, reduction to [i] is observed between

palatalized consonants except when the stressed vowels are high ([í,ú]), whereas reduction to [i] is observed in the non-flanked environments only in the context of a stressed low vowel ([á]). In other words, the compound patterns are similar to the interrupted dissimilation patterns discussed above—recall that interrupted Dissimilative variants are characterized by blockage of a Dissimilative pattern in order to have [i]-reduction in contexts flanked by palatalized consonants. The compound Dissimilative variants are similar: a Dissimilative pattern is blocked in contexts flanked by palatalized consonants in order to have a *second* Dissimilative pattern that favors reduction to [i] in a larger number of contexts.

(37) Rankings for The Three Attested Compound Dissimilative variants

Pattern	Ranking
Sudzha (cf. Zhizdra + Don)	$*\mu\mu/\text{i,u}$ » $C^j\_\_C^j/[+\textbf{front}]$ » $*\mu\mu/\text{e,o}$ » $*\mu\mu/\varepsilon,\mathrm{\mathfrak{o}}$ » $C^j\_\_/[+\textbf{front}]$ » $*\mu\mu/\text{a}$ » WSP
Shchigri (cf. Zhizdra + Obojan)	$*\mu\mu/\text{i,u}$ » $*\mu\mu/\text{e,o}$ » $C^j\_\_C^j/[+\textbf{front}]$ » $*\mu\mu/\varepsilon,\mathrm{\mathfrak{o}}$ » $C^j\_\_/[+\textbf{front}]$ » $*\mu\mu/\text{a}$ » WSP
Dmitrov (cf. Obojan + Don)	$*\mu\mu/\text{i,u}$ » $C^j\_\_C^j/[+\textbf{front}]$ » $*\mu\mu/\text{e,o}$ » $C^j\_\_/[+\textbf{front}]$ » $*\mu\mu/\varepsilon,\mathrm{\mathfrak{o}}$ » $*\mu\mu/\text{a}$ » WSP

Of course, there are many more logical rankings available similar to those shown in (37), but which are unattested. Furthermore, the ranking of WSP could also be varied in any of the hierarchies discussed in this section, correctly predicting the existence of dialects that use one of the three basic Dissimilative variants (Don, Obojan, Zhizdra) after non-palatalized consonants, but elsewhere use some other pattern, including Don, Obojan, Zhizdra, Zhizdra-II, Kidusov, Novoselkov, Sudzha, Shchigri, Dmitrov, Dissimilative/Attenuated I, or Dissimilative/Attenuated II (Stroganova and Bromlei 1986, maps #1 and #7).

### 3.1.8. An Alternative Analyis for Dissimilative variants

      As noted in the introduction, previous analyses of Dissimilative Russian vowel reduction have relied on the idea that the quality of the stressed vowel directly influences the surface quality of the preceding unstressed vowel (Halle (1965), Nelson (1974), Davis (1970), Suzuki (1998)), using rules or constraints on dissimilation. The analysis presented here demonstrates that it is possible to side-step the question of dissimilation by mediating the stressed vowel's influence on the surface quality of the preceding vowel via word prosody. This approach crucially relies on the idea that the more complex Dissimilative variants discussed in the immediately preceding section are properly described as the intersection of

simple dissimlative patterns (Zhizdra, Obojan, and Don) with the effects of both single-sided and double-sided palatalization constraints, as already discussed. However, an alternative viewpoint has been suggested by Davis (1970) and Suzuki (1998) in which the direct influence of stressed vowel quality cannot be obviated.

Confusion over the exact nature of the more complex Dissimilative variants results from the fact that the vowels /e,ɛ/ do not occur after non-palatalized consonants, due to accidents of the historical development of the Russian vowel system. Similarly, the vowel /o/ cannot occur after palatalized consonants. In other words, if the immediately pretonic vowel is in the singly-flanked environment Cʲ__C, the stressed vowel *cannot* be [é] or [ɛ́]; if the imediately pretonic vowel is in the doubly-flanked environment Cʲ__Cʲ, the stressed vowel *cannot* be [ó]. In other words, the following sequences do not occur: *Cʲ__Cʲó, *Cʲ__Cé, *Cʲ__Cɛ́. These distributional facts have been indicated in the illustrations provided in the preceding sections by presenting separate vowel inventories for the environments Cʲ__C and Cʲ__Cʲ, and by blacking out the cells corresponding to the unattested sequences. It is important to note at this point that these distributional accidents cloud the proper characterization of certain dialectal reduction patters by providing an (accidental) link between stressed vowel quality and consonant palatalization: the front mid vowels are linked specifically with the occurrence of palatalized consonants, while one of the back mid vowels is linked specifically with the absence of paltalized consonants. Only one of the mid vowels, /ɔ/ can occur after either palatalized or non-palatalized consonants. This means that the description provided earlier for, say, the Dmitrov compound reduction pattern could be stated more concisely, without reference to consonantal environment, as indicated below:

(38) The Dmitrov Reduction Pattern: Expanded and Concise Descriptions

Concise:

| i	u
e	o
ɛ	ɔ
a	

☐ = this vowel conditions reduction to [a]

▨ = this vowel conditions reduction to [i]

In the case of the Dmitrove pattern, the concise version that does not differentiate between Cʲ__C and Cʲ__Cʲ does not lose any information since the stressed vowel [ɔ́] is the only mid vowel that can occur in both environments, and in this pattern [ɔ́] happens to have a uniform behavior in both environments. However, the same cannot be said for the Sudzha and Shchigri patterns, where the stressed vowel [ɔ́] does not have a uniform behavior. The full description of these patterns as provided earlier is repeated below:

(39) Sudzha and Shchigri Patterns, Expanded Version (Correct)

Sudzha:

Cʲ V C __ ´		Cʲ V Cʲ __ ´	
i	u	i	u
▉	o	e	▉
	ɔ	ɛ	ɔ
a		a	

Key

☐ = indicates stressed vowels that condition reduction to [a] in the immediately pretonic syllable

▨ = indicates stressed vowels that condition reduction to [i] in the immediately pretonic syllable

▉ = this vowel does not occur in that context

Shchigri:

Cʲ V C __ ´		Cʲ V Cʲ __ ´	
i	u	i	u
▉	o	e	▉
	ɔ	ɛ	ɔ
a		a	

The analyses of the Sudzha and Shchigri patterns provided by Davis and Suzuki depend on a "collapsed" description that loses information. The patterns as described by these two authors are basically as follow:

(40) Sudzha and Shchigri Patterns, Collapsed Version (Incorrect)

Sudzha (incorrect)

i	u
e	o
ɛ	ɔ
a	

☐ = this vowel conditions reduction to [a]

▨ = this vowel conditions reduction to [i]

Shchigri (incorrect)

i	u
e	o
ɛ	ɔ
a	
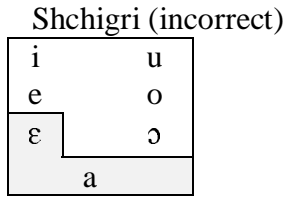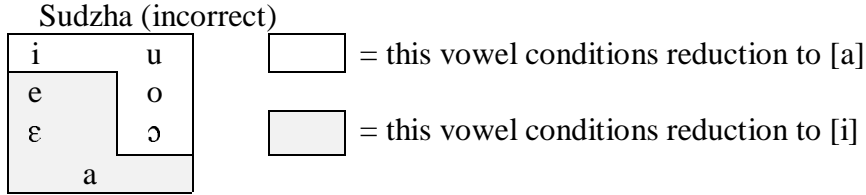
Comparing these two types of description shows that reliance on stressed vowel quality alone to condition the surface quality of the preceding vowel is inadequate: use of the collapsed descriptions loses track of the fact that the vowel [ɔ́] does not have a uniform behavior. Using consonantal enviroment as the conditioning factor avoids this undesirable consequence. Alternatively, one could also correctly describe the Sudzha and Schigri patterns by referring to the etymological origin of different vowel qualities, distinguishing the /ɔ/ that derives from a back yer (*ŭ) from the /ɔ/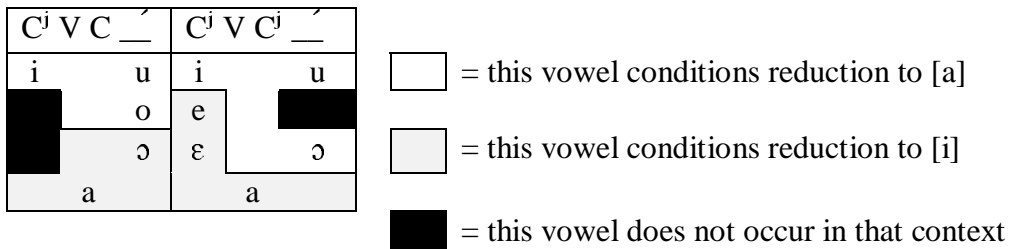 that derives from /ɛ/ (historically, Cʲɛ́C > Cʲɔ́C, while Cʲɛ́Cʲ remained Cʲɛ́Cʲ). However, this is plainly impossible for a synchronic analysis.

The lone piece of evidence for the alternative viewpoint expressed by Davis and Suzuki is the existence of an unsual reduction pattern, usually referred to by the name Mosalʲ. The Mosalʲ pattern is as follows:

(41) The Mosalʲ Reduction Pattern

Cʲ V C __´		Cʲ V Cʲ __´	
i	u	i	u
■	o	e	■
■	ɔ	ɛ	ɔ
a		a	

☐ = this vowel conditions reduction to [a]

▨ = this vowel conditions reduction to [i]

■ = this vowel does not occur in that context

As illustrated, the Mosal[j] pattern can be described as having the Obojan reduction pattern in singly-flanked palatalization environments, but the reduction pattern described for the doubly-flanked environments is not an attested form of Dissimilative reduction. This puts the Mosal[j] pattern in stark contrast with all the other Dissimilative variants discussed so far, which are either simple Dissimilative patterns, or combinations of patterns that are independently attested in isolation. Indeed, according to Avanesov and Bromlei (1986, p. 103), the Mosal[j] pattern is poorly attested, and is shown on the DARJa dialect atlas only in coocurrence with either the Sudzha or Zhizdra patterns. Based on the irregular nature of the Mosal[j] pattern, as well as its poor attestation in isolation, I suggest that the Mosal[j] pattern is either inappropriately described in the literature, or is not the result of purely phonological factors.[9] Whatever the exact nature of the Mosal[j] pattern, it is clear that Davis' and Suzuki's collapsed description of the pattern is incorrect. They describe Mosal[j] essentially as follows:

(42) Incorrect Description of the Mosal[j] Pattern

i		u	☐	= this vowel conditions reduction to [a]
e		o		
ε		ɔ	▦	= this vowel conditions reduction to [i]
	a			

The error in presenting the Mosal[j] pattern in this way can be ascertained by examining the behavior of stressed vowels found after consonant cluster. For example, Nelson (1974) considers vowel reduction data that are taken from the actual field notebooks of Russian dialectologists working on dialect atlases for the Russian Academy of Sciences. Discussing the notebook entry describing a dialect with Mosal[j] compound Dissimilative reduction, Nelson notes:

> In position [9] [*i.e., in the context C^{j}VCέ -KC*], [a] instead of the
> expected [i] was recorded several times in the fieldworker's

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[9] One appealing reanalysis based on Ward's (1984) hypothesis concerning the historical development of the Mosal[j] pattern is that the sequence identified by dialectologists as C^j__C^{j}ɔ́ (on largely etymological rather than phonetic grounds) is actually identified by native speakers as C^j__C^{j}ó—a phoneme shift that makes the phonotactic distribution of the phoneme /o/ more regular by eliminating the accidental gaps *C^{j}ó discussed in the main text.

booklet Strikingly enough and probably of significance is the fact that in every case where [a] was recorded a consonant cluster preceded the stressed vowel, the second member of which was invariably a resonant. (Nelson 1974, p. 166).

For example, the forms [tʲamnʲɛ́tʲ], [vtʲaplʲɛ], [vvʲadrʲɛ], and [svʲatlʲɛ́tʲ] were recorded.   Under the collapsed description of Mosalʲ, we would expect stressed [ɛ] to directly condition reduction to [i] in the preceding syllable, predicting the incorrect forms *[tʲimnʲɛ́tʲ], *[vtʲiplʲɛ], *[vvʲidrʲɛ], and *[svʲitlʲɛ́tʲ].   The important observation here is that the first member of these consonant clusters is non-palatalized.   Given this observation, the expanded description that differentiates between Cʲ__C and Cʲ__Cʲ makes the correct predictions—the immediately pretonic vowels in [tʲamnʲɛ́tʲ], [vtʲaplʲɛ], [vvʲadrʲɛ], and [svʲatlʲɛ́tʲ] are in the environment CʲVC (a non-flanked environment), and therefore reduce to [a].   The stressed vowel [ɛ́] can condition reduction to [i] only when the preceding vowel is surrounded by palatalized consonants.

In summary, an alternative analysis that depends on direct featural dissimilation to determine the surface quality of the preceding vowel is capable of making correct predictions only for the Dmitrov reduction pattern—incorrect results are obtained for the Sudzha, Shchigri, and Mosalʲ patterns. Although the exact analysis for the Mosalʲ pattern remains elusive due to the irregular reduction pattern observed when the immediately pretonic vowel is surrounded by palatalized consonants, the exact status of this pattern is questionable, and it is clear that even the Mosalʲ pattern relies on reference to consonantal environment. Finally, it should be emphasized that the very idea that Sudzha, Shchigri, Dmitrov, Mosalʲ (if it exists), and related complex Dissimilative variants rely on direct featural dissimilation rather than consonantal environment is in principle called into question by a single overarching consideration: all of the discussed complex Dissimilative variants *only* affect the reduction of unstressed vowels that follow palatalized consonants. Unstressed vowels that follow non-palatalized consonants have only four basic options: Obojan, Zhizdra, Don (a.k.a. Belgorod, cf. Ward (1984)), or non-dissimilative reduction.

4. *Conclusions*

In the preceding sections, I have presented an analysis of the various two-pattern vowel reduction systems that are attested in the southern and central

dialects of Russian. This analysis presents a non-dissimilatory explanation for the Don, Zhizdra, and Obojan reduction patterns that can be easily converted to account for a range of other attested Russian vowel reduction patterns.

This analysis also demonstrates that the two different vowel reduction patterns found in these dialects ("extreme" and "moderate") are in fact caused by two different types of phonetic motivation: the desire to avoid certain perceptually-challenging vowel qualities (in this case, mid vowels), and the desire to avoid sonorous vowels in non-prominent positions (in this case, nonmoraic positions), observations formalized over 70 years ago by Jakobson (1929). The orthogonal nature of these two trends is especially clear from the analysis of [e]-reduction (section 3.1.4), where the two vowel reduction constraints—Lic-Nonperiph/Stress and *Nonmoraic/-high—must have distinct rankings; and from the analysis of incomplete okan'e (section 3.1.6), where one of these vowel reduction processes is completely inactive (blocked). Furthermore, it should also be pointed out that the rich variety of two-pattern vowel reduction systems attested in Russian dialects all follow a single generalization: the extreme vowel reduction patterns differ from the moderate vowel reduction patterns in disallowing certain sonorous reduction vowels, such as [a] or [e]. This observation meshes well with the proposed analysis for these dialects. The analysis of extreme vowel neutralization as prominence reduction predicts that it will never be the case that extreme vowel neutralization will differ from moderate reduction in disallowing certain non-sonorous reduction vowels. This is especially clear when one compares the vowel sub-inventories that are most commonly observed in stressless position in Southern and Central Russian dialects: [i,u,a] in moraic unstressed syllables and [i,u,ə] in nonmoraic unstressed syllables. This is a telling fact since it is *not* the case that extreme reduction results in the preservation of fewer contrasts or the usage of a smaller sub-inventory. Instead, it seems to be the case that extreme reduction is a completely independent type of vowel reduction process. And finally, by mediating the effect of the stressed vowel quality in the Dissimilative dialects via foot form and the alignment of sonority and moraicity, a wide range of complex yet attested Dissimilative variants can also be accounted for without adding any additional formal machinery to the analysis.

These results shed light on several issues of phonological theory. For example, this analysis suggests that bounded feet can and do occur in languages that do not possess the usual indicators of this phenomenon, such as fixed stress placement or occurrence of rhythmic secondary stress. The observed link across Russian dialects between foot form, vowel reduction, and phonetic phenomena such as non-phonemic vowel duration, devoicing, and deletion suggest that the

presence of bounded feet can be learned based on phonetic as well as phonological factors.

4.0.1. Beyond Russian: Evidence from Other Languages

Now that we have a clear picture of how vowel reduction works in Russian, we can investigate some linkages between vowel reduction in other languages and vowel reduction in Russian. In particular, many of the formal mechanisms investigated above are also useful in accounting for reduction in other languages, such as Catalan. Similarly, evidence from other languages— such as European Portuguese—helps to provide additional support for some of the formal mechanisms used in the analysis for Russian, such as the use of the moraic vs. nonmoraic distinction for extreme reduction rather than the footed vs. unfooted distinction.

<p style="text-align:center">4.0.1.1. <u>Catalan</u></p>

In standard Catalan (Mascaró 1978, Recasens 1991), unstressed syllables may not contain vowels other than [i,u,ə]. This contrasts with the situation found in stressed syllables, where the phonemic vowel inventory includes /i,u,e,o,ɛ,ɔ,a/. The neutralizations used to reduce the phonemic 7-vowel inventory to the 3-vowel subinventory [i,u,ə] are depicted below, with examples from Mascaró (1978):

(43) Vowel Neutralization in Catalan (data from Mascaró 1978):
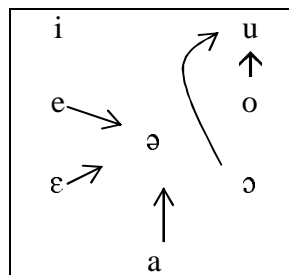
V under stress		Same V unstressed	
pɔ́rt	'harbor'	purtuári	'related to harbor'
gós	'dog'	gusás	'big dog'
ʎúm	'light'	ʎuminós	'light' (adj.)
sák	'sack'	səkɛ́t	'small sack'
pɛ́l	'hair'	pəlút	'hairy'
sérp	'snake'	sərpɔ́tə	'big snake'
prím	'thin'	əprimá	'to make thin'

This pattern of reduction is similar to that seen in Russian extreme (non-immediately-pretonic) reduction: a vowel sub-inventory of [i,u,ə] is produced, using a reduction strategy that involves both raising and centralization. However, the Catalan reduction pattern differs in two important respects. First, the neutralizations utilized are the reverse of those seen in Russian: in Russian, the front mid vowel raises and the back mid vowel centralizes with /a/ to [ə]; in Catalan, the front mid vowels centralize with /a/ to [ə], while the back mid vowels raise. Second, in Catalan, these neutralizations are not part of a two-pattern reduction system. That is, there is no "moderate" reduction in Catalan. Note, for example, that [ə] can occur in the syllable immediately preceding the stress (cf. [səkɛ́t], 'little sack').

To account for the Catalan neutralization pattern, we can use basically the same reduction constraint that was seen in the Russian case. The only modification necessary concerns the conditioning environment: whereas in Russian, we used *Nonmoraic/-high, in Catalan we must use *Unstressed/-high. It should be pointed out, however, that if we make the simplifying assumption that Catalan unstressed vowels are nonmoraic, we could use exactly the same reduction constraint for both languages. However, in the absence of any additional data supporting this claim for Catalan, I will make the less controversial assumption that all Catalan vowels are moraic, and simply modify the reduction constraint accordingly. (This is possible in Catalan, but not in Russian, since Catalan does not have a two-pattern reduction system.) The vowel reduction constraint used in Catalan will therefore be:

*Unstressed/-high: Unstressed syllables may not contain a vowel with a sonority greater than that of [i,u].

As mentioned above for Russian, the vowel [ə] is not more sonorous than [i,u], so the constraint given above will not be violated if [ə] occurs in an unstressed syllable.

The other difference mentioned above—the different neutralization strategy seen in Catalan—is accomodated simply by changing the rankings of vocalic faithfulness constraints with respect to the reduction constraint. Recall that in the Russian case, Max[-high] was high-ranked, making lowering/centralization the preferred reduction strategy. This will remain the case in Catalan: if possible, vowels will reduce via centralization. In the Russian case, Max[+front] was also ranked high, causing the unstressed vowel /e/ to forego centralization in favor of raising, in order to preserve its underlying palatality. In Catalan, the situation is reversed: Max[+front] is ranked low, but Max[round] is ranked high. Thus, Catalan unstressed /o,ɔ/ will forego reduction-via-centralization for raising, in order to maintain their underlying rounding. Example tableaux are provided below to show how this ranking works (the first tableau demonstrates reduction of a front mid vowel; the second tableau demonstrates reduction of a back mid vowel):

	/pɛlút/	*UNSTRESSED/ -high	MAX[ROUND]	MAX[-HI]
a.	☞ pəlút			
d.	pilút			*!
e.	pulút			*!
b.	pɛlút	*!		
c.	pelút	*!		
f.	polút	*!		
g.	pɔlút	*!		
h.	palút	*!		

	/gosás/	*Unstressed/ -high	Max[Round]	Max[-Hi]
a.	☞ gusás			*
g.	gəsás		*!	
d.	gisás		*!	*
e.	gosás	*!		
f.	gɔsás	*!		
b.	gesás	*!	*	
c.	gɛsás	*!	*	
h.	gasás	*!	*	

Vowel reduction is also blocked in a few contexts in Catalan. These are discussed in Crosswhite (1999).

4.0.1.2. European Portuguese

In European Portuguese (Brakel 1985, Carvalho 1988-92), stressed syllables can contain the vowels /i,u,e,o,ɛ,ɔ,a/ and, with a limited distribution, /ɐ/. In unstressed syllables, however, only [i,u,ə] and sometimes [ɐ] can occur—the neutralizations that produce this subinventory are similar to those seen in Catalan: /e,ɛ/ > [ə], /o,ɔ/ > [u], /a/ > [ə] (or [ɐ]).

(44) Iberian Portuguese Vowel Reduction (Brakel 1985)

	Vowels Under Stress		Same Vowels Unstressed	
i > i *(no change)*	píʃku	'I blink'	piʃkár	'to blink'
u > u *(no change)*	púlu	'I jump'	pulár	'to jump'
e > ə	méðu	'fear'	məðrózu	'fearful'
ɛ > ə	pɛ́kə	'sins'	pəkár	'to sin'
a > ə	kátə	'picks up'	kətár	'to pick up'
ɔ > u	tɔ́ku	'I play'	tukár	'to play'
o > u	bókə	'mouth'	bukərɐ̃́w̃	'big mouth'

Furthermore, vowel reduction in European Portuguese is also similar to that found in Catalan in that it is not part of a two-pattern reduction system. This being the case, we might be tempted to simply apply the same analysis sketched above for Catalan to European Portuguese. However, there is one important difference between the European Portuguese and Catalan vowel reduction systems that needs

to be addressed. Namely, vowel reduction in European Portuguese is blocked in unstressed syllables that end with a sonorant consonant. Examples of this sort of vowel-reduction blockage include the following forms (from de Carvalho 1988-92 and Brakel 1985).[10]

(45) Blockage of Vowel Reduction in European Portuguese

syllable-final *j*	bajʃár	tejmár
syllable-final *w*	kawzár	ewrópə
syllable-final *r*	əsúkar	kədáver
syllable-final *l*	faltár	voltár
syllable-final *n*	konsəsẽw̃[11]	sentár

It would be tempting to assume that blockage of vowel-reduction in these syllables is simply due to the adjacency of a sonorant consonant—we might assume, for example, that V + sonorant is a combination that is particularly easy to articulate or that it has some special perceptual advantage. However, it seems as though the sonorant consonants can only block vowel reduction when they are syllable-final. That is, intervocalic sonorant consonants do not block reduction of a preceding unstressed vowel—consider [dəlatór][12] (*[delatór]), [kurɛtívu] (*[korɛtívu]), where the initial unstressed vowel undergoes reduction despite the following non-tautosyllabic sonorant (for blockage of reduction on the unstressed vowels [a] and [ɛ] see fn. 12). In fact, according to Brakel, a following non-tautosyllabic sonorant increases the likelihood that an unstressed vowel will be deleted—for example, deletion of the unstressed [u] in [pulár] is more likely than deletion of the [u] in [tukár]. (He also states, however, that the unstressed [u] in [tukár] is more likely to be devoiced.)

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[10] The behavior of syllable-final [r] seems to be unstable—in Brakel (1985) it does not block reduction, but in de Carvalho (1992) it does. It is possible that syllable-final /r/ is sometimes pronounced as a non-sonorant, as in Brazilian Portuguese, where syllable-final /r/ is pronounced /x/.

[11] The vowel /ɐ/ occurs in Iberian, but not Brazilian, Portuguese. It is minimally contrastive with [a]—this contrast is mainly limited to verbal desinences. The vowel /ɐ/ reduces in a manner identical to unstressed /a/.

[12] The blockage of vowel reduction seen with the unstressed [a] and [ɛ] in these forms effects a number of derived forms, and is not associated with the preceding sonorant—see Brakel (1985) for discussion of this effect in Iberian Portuguese.

Blockage of vowel reduction in European Portuguese before a sonorant coda is an important point, since it introduces a parallel between European Portuguese and the two-pattern reduction system seen in Russian: in both languages, completely unstressed syllables must be divided into two groups based on their behavior with respect to reduction. In the Russian case, these two groups are (1) moderately-reducing unstressed syllables (the immediately pretonic and word-initial onsetless syllables), and (2) extremely-reducing unstressed syllables. In European Portuguese, the two groups are (1) unstressed syllables that are immune to reduction and (2) unstressed syllables that are not immune to reduction. The same formal device used to account for these two groups in the Russian case can also be applied to the European Portuguese case: some of the unstressed syllables are nonmoraic, while others are not. Namely, I claim that unstressed syllables in European Portuguese are nonmoraic, unless they are closed by a sonorant consonant.

Before discussing this possibility, first let's look at an alternative that won't work: namely, that the syllables where reduction is blocked receive secondary stress. This alternative is similar to one proposed by Miller (1972) for Easter Ojibwa: she proposes that all long vowels in that language receive some degree of stress, explaining why they are resistant to vowel reduction. Following this example, it might be possible to hypothesize that in European Portuguese, all syllables closed by a sonorant consonant are heavy, similar to the case seen in Kwakw'ala (Boas 1947) and Inga Quechua (Levinsohn 1976). If this were the case, heavy syllables might attract secondary stress and therefore escape vowel reduction.   However, although European Portuguese *does* possess secondary stress, its placement is not determined in the manner under consideration. In current pronunciations as described by Lüdtke (1953) and de Carvalho (1988-92), secondary stress falls on the initial syllable of any word where there would otherwise be more than two unstressed syllables preceding the main stress, as in *rèctangulár*. Both sources also mention other, less common, patterns for placing secondary stress in European Portuguese, but none seem to place secondary stress on syllables closed by a sonorant.   Consider, for example, the form *vagàbundágem* cited by Carvalho.   Clearly, these examples show that the immunity of sonorant-final syllables to vowel reduction cannot be explained in terms of stress placement.

It is, however, possible to explain the immunity of sonorant-final syllables to vowel reduction in terms of moraicity. For example, if the sonorant coda consonant is obligatorily moraic (as suggested above), the preceding vowel might share the consonantal mora, or may be prevented from undergoing demorification in order to avoid a situation in which a coda consonant is moraically more

prominent than the nuclear vowel of that same syllable. With this being the case, it would be possible to apply the *Nonmoraic/-high constraint of Russian to European Portuguese and predict the correct results: only nonmoraic unstressed vowels—that is, unstressed vowels not followed by a sonorant coda—will undergo reduction.

It should be noted that it seems phonetically reasonable to posit nonmoraic vowels for European Portuguese. Unstressed vowels (other than those that are immune to reduction) are phonetically similar to the non-immediately-pretonic vowels of Russian, in that they are extremely short, and are commonly devoiced or deleted entirely (Brakel 1985, Carvalho 1988-92).

4.0.1.3. Additional Two-Pattern Systems

Finally, it should be noted that the approach taken to the two-pattern reduction system of Russian has repercussions for prosodic structures of other languages with a two-pattern reduction system. In some languages with two-pattern reduction systems, the conditioning environment for extreme vs. moderate corresponds to the difference between post-tonic and pre-tonic. For example, in both Rhodope Bulgarian (Miletich 1936) and northern Italian dialects (Maiden 1995), any unstressed syllable that precedes the stress will undergo moderate reduction, while any unstressed syllable that follows the stress will undergo extreme reduction. This suggests that these languages use foot structures such as those illustrated below:

(46) Assumed Foot Structure for Rhodope Bulgarian and northern Italian

$$(\sigma_\mu\ \sigma_\mu\ \sigma_\mu\ \sigma_\mu\ \sigma_\mu\ \sigma_\mu\ \sigma_\mu\ \acute{\sigma}_\mu)\ \sigma\ \sigma$$

Assuming that some high-ranking constraint in these languages requires footed syllables to be moraic, the pretonic unstressed syllables will be protected from demorification (*Struc-μ), while post-tonic unstressed syllables will not be. The proposed foot structure is also supported in the northern Italian case by data discussed by Maiden (1995). He points out that there are several processes in addition to vowel reduction that are sensitive to the post-tonic vs. pre-tonic difference (for example, certain types of vowel assimilations occur in pretonic, but not post-tonic, unstressed syllables in these dialects)[13].

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[13] It should be pointed out, however, that Maiden proposes a tripartite prosodic structure for these words, in which the pretonic unstressed syllables constitute a prosodic domain apart from the stressed syllable.

Another example of a language that has a two-pattern reduction system is Brazilian Portuguese (Redenbarger 1981, Dukes 1993). As described by Dukes, all stressed syllables (including both primary and secondary stresses) in Brazilian Portuguese are immune to vowel reduction[14]. Secondary stresses are found on every other syllable to the left of the main stress: σσ̀σσ̀σ́σ. Furthermore, those unstressed syllables that are found between stresses are subject to moderate vowel reduction (/ɛ/ > [e], /ɔ/ > [o]). That is, in the example given in the preceding paragraph, the 2nd and 4th syllables would be subject to moderate reduction, but not the 1st or 6th. Unstressed syllables that do not occur between stressed syllables are subject to extreme reduction (/ɛ,e/ > [i]; /o,ɔ/ > [u], /a/ > [ə]). Such syllables will occur in two places: word-final unstressed position and word-initial unstressed position. Given our assumption that extreme reduction in two-pattern systems results from nonmoraicity, we must assume the following prosodic structure for Brazilian Portuguese:

(47) Brazilian Portuguese Prosodic Structure (proposed)

$$\sigma\ (\grave{\sigma}_\mu\ \sigma_\mu)\ (\grave{\sigma}_\mu\ \sigma_\mu)\ (\acute{\sigma}_\mu)\ \sigma$$

Note that in any word with a penultimate main stress, the main stress foot will be monosyllabic under this analysis: the syllable immediately preceding the stress is the weak member of the preceding syllabic trochee, and the following syllable is left unfooted. The unfooted nature of the final syllable can easily be derived using Prince & Smolensky's (1993) **Nonfinality** constraint, which prohibits a foot to stand at the right edge of a word ("the right edge of a word may not align with the right edge of a foot"). This proposal is supported in Brazilian Portuguese by the fact that in words with an antepenultimate main stress, the penultimate syllable (unstressed) is subject to only moderate reduction, suggesting a foot form such as $(\grave{\sigma}_\mu\sigma_\mu)(\acute{\sigma}_\mu\sigma_\mu)\sigma$, for example.

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[14] The descriptions of moderate reduction and extreme reduction in Brazilian Portuguese provided, respectively, by Dukes (1993) and Redenbarger (1981) do not agree in all details. It seems as though dialectal variation regarding some aspects of this pattern.

4.1. Addendum: Notes to the Russian Analysis:

The following notes concern details of the analysis of Russian vowel reduction that may be of interest to those scholars who are more familiar with the Russian vowel reduction patterns than the average reader would be.

Note 1: On Traditional Names for the Dialects

The dialects of Russian discussed here are all considered "folk dialects"— a term used in Russian dialectology to refer to dialects of Russian spoken in those areas traditionally inhabited by a Russian-speaking population, excluding major metropolitan areas. The patterns described here are based on the descriptions provided in Avanesov and Orlova (1964), Kuznetsov (1973) and Kasatkin (1989). These dialects are usually grouped into three large groups: the Northern, Central (or Mid), and Southern dialect groups. Each of these three dialect groups is associated with particular phonological characteristics. For example, the dialects in the Northern group tend to either lack vowel reduction, or have only limited vowel reduction. Strong reduction patterns are characteristic for the Central and Southern dialect groups. However, it should be noted that there is no such thing as "the" Northern dialect of Russian—each of these three dialect groups comprise a multitude of individual dialects, often showing significant variation from village to village. In addition, dialects vary not only with respect to vowel reduction, but also with respect to other phonological parameters (vowel inventory, consonant inventory, patterning of consonant clusters, accentual patterns, etc.) as well as a number of other linguistic parameters, including lexical, syntactic, and morphological characteristics. It is not the case, for example, that a specific vowel reduction pattern is associated with a single unique dialect. Instead, a given vowel reduction pattern might be attested in several individual dialects that differ significantly with respect to other parameters.   Therefore, Russian dialectologists do not refer, to e.g. "*the* [e]-reduction dialect of Russian", but rather to "those dialects showing [e]-reduction". Similarly, although the dialects that show a specific vowel reduction pattern tend to group geographically, these geographical groupings may be cross-cut by groupings based on other parameters—therefore, although there are some groups of dialects that are both linguistically similar and geographically compact (i.e., "Vladimir-Volga Basin dialects"), geographically-based dialect names are usually linguistically uninformative. For example, the Obojan Dissimilative vowel reduction pattern was first noted outside the south Russian city of Obojan—however, other vowel reduction patterns are also noted in and around Obojan, and the Obojan pattern is

noted in numerous other southerly regions of Russia. Therefore, we can speak of the Obojan *pattern* of vowel reduction, or dialects displaying the "Obojan pattern"—realizing that the collection of all dialects displaying this pattern might differ in their syntax, morphology, lexicon, etc. We can also speak of the "Obojan dialects", which would refer to those dialects found in the geographical area of Obojan, regardless of whether or not they are linguistically similar. However, we cannot really speak of "*the* Obojan dialect".

Note 2: The reduction of unstressed /e/

Throughout this work, reduction of unstressed /e/ to [i] in Russian is treated as a "direct" reduction fact. That is, it is not treated as the result of consonant palatalization.

In the non-immediately-pretonic syllables of Russian dialects, vowel reduction is often profoundly affected by the palatality of the preceding consonant. In most dialects, /o,a/ reduce to [i] in non-immediately-pretonic syllables if the preceding consonant is palatalized, and reduce to [ə] in other non-immediately-pretonic syllables. This pattern presents something of a riddle for the analyst of Russian vowel reduction patterns because unstressed /e/ also reduces to [i] after palatalized consonants. Is this because Russian reduces /e/ to [i] directly (similar to vowel reduction in Bulgarian, for example), or because of the influence of the preceding palatalized consonant? In order to test this hypothesis, it is necessary to see how unstressed /e/ reduces when *not* preceded by a palatalized consonant. Unfortunately, due to the historical development of the Russian vowel system, /e/ does not occur in such positions, or does so only marginally—making this a largely academic question.

Evidence from CSR indicates that /e/ > [i] is not due to the presence of a preceding palatalized consonant. In this dialect, /e/ can occur after some non-palatalized consonants—namely /t͡s, ʃ, ʒ/. These consonants were historically palatalized, but subsequently lost palatalization. In most dialects, the non-palatalized consonants /t͡s, ʃ, ʒ/ still produce the vowel reduction patterns seen after palatalized consonants—unstressed /e,a,o/ reduce to [i][15]. However, in some

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[15] It is possible that this anomalous behavior is caused by the high tongue position characteristic of the /ʃ,ʒ/ phonemes, which are strongly velarized in many dialects. For example, in the Old Muscovite pronunciation norm (which was prevalent earlier this century), /ʒ,ʃ/ caused /o,a/ to reduce to [i]. These consonants were also produced with such noticeable velarization that some Russian

dialects, including CSR, /t͡s, ʃ, ʒ/ do not have this behavior. In these dialects, /a,o/ reduce to [ə] after /t͡s, ʃ, ʒ/, but /e/ reduces to [i]. Some examples of this pattern are given below using the consonant /t͡s/, where this behavior is most consistent:

(48) Reduction of /e/ > [i] and /o,a/ > [ə] After Nonpalatalized Consonant

	Vowels Under Stress	**Same Vowels Unstressed**	*gloss*
unstressed e > i	t͡sérkəfʲ	t͡sirkóvnij	'church' noun/adj.
	t͡sélij	t͡silʲikóm	'whole'/'in whole'
unstressed o,a > ə	t͡sárʲ	t͡səradvórʲits	'czar'/'czar's palace'
	t͡sókət	t͡səkátátʲ	'chirp' noun/verb

We can also see the direct reduction of /e/ to [i] in the nativized pronunciations of certain foreign words that contain /e/ at the absolute beginning of the word. For example, forms like [ékspərt] 'export (noun)' versus [ikspartʲírəvətʲ] 'to export' show that the *e>i* alternation is not a consonant~vowel assimilation process. The suffixed form /eksportʲírovatʲ/ also has a more conservative pronunciation without vowel reduction on the initial vowel—this type of pronunciation sometimes gives the impression that the unreduced vowel was pronounced with a secondary stress, although such vowels are, in fact, unstressed. However, there is no variant pronunciation with reduction of /e/ to [ə] or [a], and native speakers find such a pronunciation unacceptable: *[akspartʲírəvətʲ]. Therefore, it can be assumed that in at least some dialects of Russian, e>i is a straightforward case of vowel neutralization under reduction, and not a consonant-vowel assimilation effect.

Note 3 On reduction after palatalized consonants

As mentioned in the text, the interplay of consonant palatalization and vowel reduction is somewhat more complex than depicted in this analysis. In this note, I shall make the complicating factors more explicit. As discussed below, an analysis that is in effect only a slight modification of the one presented in the main text will be sufficient, given proper assumptions about the input and output structures involved in this reduction pattern.

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phoneticians considered them to be doubly-articulated consonants (Akishina & Baranovskja 1980). Currently, /ʃ,ʒ/ do not cause reduction of /o,a/ to [i], and are no longer obligatorily velarized.

One complicating factor is that the unstressed back rounded vowel /u/ does not undergo fronting when preceded by a palatalized consonant, but the unstressed back rounded vowel /o/ does. That is, in unstressed position preceded by C^j, /o/ reduces to [i], but /u/ remains unreduced (surfacing as [u]). Phonetically speaking, the [u] that is found in such environments is produced with a much more forward tongue position than is stressed [u] or unstressed [u] not preceded by C^j. However, phonetic measurements such as those provided in Jones (1959) suggest that these fronted variants of [u] are not truly front vowels.

The analysis of the interaction between the C^j/[+front] constraint, faithfulness constraints, and reduction constraints provided here are designed to generate surface [i] for unstressed /o/. However, this incorrectly predicts that unstressed /u/ should also surface as [i]. This unusual pattern of /o/>[i] but /u/>[u] derives historically from the fact that *stressed* /e/ became [o] when preceded by a palatalized consonant but not followed by one: C^{j}éC > C^{j}óC. However, in unstressed position, /e/ remained [e], where it was eventually subject to the reduction phenomenon /e/ > [i]. In words with etymological /e/ that experience stress shifts, this resulted in the surface alternation of stressed [ó] and unstressed [i]:

C^{j}óC	C^{j}iC	gloss
ʒóni (pl.)	ʒiná (sg.)	'wife' (nom. case)
t^{j}ópləj (long form, masc.)	t^{j}ipló (short form, neut.)	'warm'

The pattern resulting from this historical development can be described synchronically as follows: a non-front vowel will reduce to [i] after C^j *iff* doing so simultaneously involves raising (for the variant [e]-reduction pattern, substitute "lack of raising"). In other words, violation of Max[-high] triggers the constraint C^j/[+front]. This suggests an alternative analysis of Russian reduction after C^j that utilizes constraint conjunction. This alternative will be considered here due to its generality of application, although a simpler alternative that seems applicable for at least some dialects of Russian will also be suggested. As discussed by Crowhurst and Hewitt (1997), constraint conjunction can be used to generate "triggering" effects of the sort under consideration. In this case, the C^j/[+front] constraint can be conjoined with Max[-high]: [Max[-high] ^ C^j/[+front]]. This sort of conjoined constraint is violated only in case both conjuncts are violated simultaneously. In other words, an output candidate that violates one or the other of the conjuncts, or neither, will not violate the conjoined constraint as a whole. This means that the conjoined constraint has nothing to say about the reduction of /i/ or /u/, since they will always vacuously satisfy at least

one of the conjuncts since they do not possess an underlying [-high] specification (i.e., Max[-high] is vacuously satisfied). Unstressed /i/ and /u/ are therefore incapable of violating the conjoined constraint [Max[-high] ∧ C^j/[+front]], resulting in a situation where /u/ is immune to consonant palatalization effects in unstressed positions, but /e/, /o/, /a/ are not. In other words, the conjoined constraint will make no distinction between /u/>[i] and /u/>[u]—both satisfy the conjoined constraint. However, other constraints, namely Max[round] prefer the faithful candidate [u].

Obviously, this solution is somewhat akward. And indeed, it appears as though either the conjoined constraint or the pattern that it attempts to replicate are being ousted by native speakers of CSR. Consider, for example, the fact that the /o/ > [i] reduction pattern is not being extended to new words. Consider, for example, the following derived forms:

simplex form	gloss	derived form	gloss
[rajón]	'administrative region'	[rəjanⁱírəvətⁱ]	'develop into a *rajon*'
[pəvⁱilⁱón]	'pavilion'	[pəvⁱilⁱanⁱírəvətⁱ]	'develop into a pavilion'

The first derived word included in the table above, [rəjanⁱírəvətⁱ] is an existing, newly-formed word of Russian, which is pronounced as indicated. The expected pronunciation with /o/>[i] is not observed: *[rəjinⁱírəvətⁱ]. The second derived form, [pəvⁱilⁱanⁱírəvətⁱ], is a word I constructed and presented to native speakers to test whether the [rəjanⁱírəvətⁱ] pattern would also occur in new formations after C^j as well as after /j/. The native speakers polled all preferred [pəvⁱilⁱanⁱírəvətⁱ] (as indicated in the table). The alternative pronunciation *[pəvⁱilⁱinⁱírəvətⁱ] was uniformly rejected, and was even rated as worse than a form lacking reduction altogether (*[pəvⁱilⁱonⁱírəvətⁱ]). This pattern suggests that in at least some dialects of Russian (including CSR), the existing cases of /o/~[i] alternation might be morphophonologically conditioned. It could be, for example, that certain lexical items are listed with two different stem variants, and morphophonological rules determine which stem is to be used in a given context. That is, a case of alternation like [ʒóni]~[ʒiná] ('wives'~'wife') could be accounted for by using the stem variant /ʒon-/ in one case, and the stem variant /ʒen-/ in the other. Further scrutiny of the /o/>[i] alternation in CSR suggests that this hypothesis should not be taken lightly. For example, it is well known that derivatives of words with [o]~[i] alternations will surface with *stressed* [é] in certain morphological categories: cf. [ʒénⁱskⁱij] 'feminine', for example.

Furthermore, recent dictionaries of CSR list variant forms with *either* stressed [ó] or stressed [é] for some words using this type of stem—for example, *both* [ʒónʲin] and [ʒénʲin] are attested forms for the possessive adjective 'wive's'. If this morphophonological analysis can be extended beyond CSR, a much simpler analysis that is very similar to the one provided in the main text above would suffice. Under this scenario, it would be the case that only /e/ and /a/ reduce to [i] after palatalized consonants. This means that one could use the simple, nonconjoined version of C^j/[+front] presented in the main text ("a palatalized consonant must be followed by a [+front] vowel in unstressed position"). The ranking of Max[-front] above C^j/[+front] would block /u/>[i] and /o/>[i]. Given an underlying representation for /a/ that is unmarked for [front], the C^j/[+front] constraint would effect unstressed /a/, but not unstressed /o/. Reduction of unstressed /o/ to [a] after C^j (as in [rəjanʲírəvətʲ]) would require only the assumption that surface [a] derived from unstressed /o/ *is* specified [-front] (to be faithful to the underlying [-front] specification of /o/), while underlying /a/ is not.

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