Positional Restrictions on the Non-nasal Coda Phoneme *q* in Japanese

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1 Introduction

In this talk I clarify that the strength of positional restrictions on the non-nasal coda phoneme Q^1 in Japanese can be divided into four levels. This study intends to characterize Q both phonetically and phonologically and to describe how it is phonologically opposed to the nasal coda phoneme *N*, in an effort to reconstruct the phonemic system of Old Japanese.

2 Coda phonemes in Japanese

Supposing that syllables in Modern Japanese (hereafter "MJ") consist of one obligatory component and three optional components as in (1) below, we find out that a variety of nasals (including nasal vowels) and obstruents² appear in coda slots:

(1) Syllable structure in MJ: (O)(M)N(,C)

O: onset M: medial N: nucleus C: coda ,: mora boundary (): optional

(2) Structurally different monosyllable words in MJ

N_	$O_N_$	$_MN_$	N, C	OMN_	0_N,C	_MN, C	OMN,C
0_	<i>t_e_</i>	_wa_	u,N	tsja_	g_i, N	_jo,i	mjo,o
[0	te	ŴВ	щ↓м	tev	g ^j i↓n	jo↑į	$m^j o \downarrow$:] ³
tail	hand	circle	luck	tea	silver	early evening	strange

¹ Roman letters in italics denote phonologically distinctive categories in most variations.

² In this paper, obstruents are limited to non-nasal obstruents and are used as the antonym of sonorants. Strictly speaking, this definition is not correct because obstruents do not exclude nasal ones as [m], [n], and so on which are sonorants simultaneously.

³ The phonetic values of vowel phonemes are affected by the adjacent phones in Japanese. For example, the allophones of a vowel phoneme slightly differ from each other in position of the tongue dorsum, depending on the point of articulation of the preceding phones. This is because the tongue dorsum stays relatively forward immediately after phones articulated at the hard palate and backward after phones at the velum or uvula. Additionally, vowels immediately adjacent to nasals (especially, vowels before nasals) are nasalized by the preparation or perservation of lowering the velum so that air may escape through the nose. For this reason, (Continued on the following page)

↑: rising between morae (*upstep) ↓: falling between morae (*downstep)

As seen in the following examples, nasals and obstruents in coda slots are phonologically opposed to each other, whereas there are neither oppositions between the nasals nor those between the obstruents:

(3) Oppositions between nasals and obstruents in coda slots

a.	b.	с.
[se↓ n .tci] 'production area'	[sɐ↓ ŋ .k ^j i] 'three terms'	[sețĩ.cin] 'strikeout'
[se↓t.tci] 'sensing'	[sɐ↓ k .k ^j i] 'a wile ago'	[sɐ↑ c .cĩn] 'reform'

(4) Complementary distribution of nasals in coda slots

- a. $[se\uparrow m.pei]$ 'three losses' (cf. * $[se\uparrow n-]$, * $[se\uparrow n-]$)
- b. $[se \downarrow n.tei]$ 'three statues^{[$\exists m = 1$}, (cf. * $[se \downarrow m]$, * $[se \downarrow \eta]$)
- c. $[sv \downarrow \eta.kvi]$ 'three times' (cf. * $[sv \downarrow m-]$, * $[sv \downarrow n-]$)
- (5) Complementary distribution of obstruents in coda slots
 - a. $[se\uparrow \vec{\mathbf{p}}.pv.k\psi]$ 'urgency' (cf. * $[se\uparrow \vec{\mathbf{t}}-]$, * $[se\uparrow \vec{\mathbf{k}}-]$)
 - b. $[se\downarrow \vec{t}.te.km]$ 'my house (modestly)^{[lill} \exists]', (cf. * $[se\downarrow \vec{p}-]$, * $[se\downarrow \vec{k}-]$)
 - c. $[se\downarrow \vec{k}.kv.kw]$ 'with some fortune or efforts^[ifi], (cf. *[se\downarrow \vec{p}-], *[se\downarrow \vec{k}-])

On the basis of the distribution of nasals and obstruents in coda slots as in (3)–5), we can determine the following two types of coda phoneme: the nasal coda phoneme N and the non-nasal Q^4 . The former and the latter are traditionally called "hatsuon^[$\frac{1}{W}\hat{e}$] (lit. 'flicking sound')" and "sokuon^[$\frac{1}{W}\hat{e}$] (lit. 'choked sound')" in Japanese linguistics, respectively. According to the following description in *Shittan Yōketsu*^{[$\frac{1}{W}\frac{1}{2}$, written in 1101 or later, these coda phonemes seem to have been from the late Heian period (11–12 C) or earlier⁵:}

⁴ In this case the phonetic values of these coda phonemes can be defined as follows:

(I) As seen in (3)-5, *N* is realized as nasals the point of articulation of which always fit those of the next phones by regressive assimilation, and *Q* as obstruents both of the point and manner of articulation of which are regressively assimilated.

(II) a. $\{ar^{u}mer-i\}$ 'to be-EVD-DECL' $\rightarrow \mathfrak{K}(\mathfrak{U}/\mathcal{K})\mathfrak{H}$ /aN.me.ri/ **[$\mathfrak{v}n$.me. $\underline{r}^{j}i$]

(Continued on the following page)

 $^{[\}mathfrak{y} \downarrow n]$, $[\mathfrak{fev}]$, $[g^{j} i \downarrow n]$, $[jo\uparrow \underline{i}]$, and $[m^{j} o \downarrow :]$ in (2) should be respectively transcribed as $[\mathfrak{w} \downarrow n]$, $[\mathfrak{fev}]$, $[g^{j} \mathfrak{i} \downarrow n]$, $[jo\uparrow \underline{i}]$, and $[m^{j} o \downarrow :]$ strictly speaking. Such diacritics, however, are completely omitted for brevity's sake in this talk because the precise phonetic values can be easily estimated without them.

⁵ Nasals and obstruents in coda slots are considered to have existed then, considering the following examples, in which {ru} appears to be regressively assimilated with nasals:

(6) Description about sandhi of *r*-initial syllables in *Shittan Yōketsu* 日本_{ニモ}ラリルレロ_ハ急声_ノ時成^二ツ_ノ音_二⁻⁻。サリシ_ヲサツシ_トイヒトリサカ_ヲトツサ カ_トイヒハリテ_ヲハツテ_トイヒキリテ_ヲキツテ_トイヒカリシ_ヲカツシ_トイヒアリシ_ヲ アツシ_トイフ等也。或同舌内故ン_ノ音_ト成_{ルアリ}。タリナム_ヲタンナム_トイヒアリナム _ヲアンナム_トイヒシリナム_ヲシンナム_トイヒサル_ノトキ_ァイン,トキ_トイヒトリ_ノトキ _¬トン_ノトキ_トイヒトリ_ノウミ_¬トン_ノウミ_トイヒヒダリ_{ノヲ}ヒダン_{ノト}イフ。

3 Positional restrictions on Japanese coda phonemes

3.1 On the nasal coda phoneme *N*

Some of the nasal coda phoneme N are derived from the nasal phonemes m or n in coda slots of Sino-words. These m and n used to avoid standing immediately before non-consonantal phonemes or, from another viewpoint beyond micro-phonotactics, onsetless syllables. The nasal phonemes take the avoidance by sandhi in which they copy themselves to the next empty onset slots as follows:

- (7) Old Sino-words with sandhi in which *m* or *n* in coda slots copies itself to the next empty onset slots
 - a. $kwan__om^{[\overline{\mathbb{R}}]} \rightarrow kwan.n_om$ 'Avalokiteśvara; the Goddess of Mercy', $han__ou^{[\overline{C}]} \rightarrow han_n_ou$ 'reaction' (No example of *m*-copy.)
 - b. $om_jau^{[\&B]} \rightarrow om.mjau$ 'two opposite and complementary universal categories in Chinese philosopy', $hen_ja.ku^{[>>>} hen_nja.ku$ 'changing'
 - c. $sam_wi^{[\pm 0]} \rightarrow sam.mwi$ 'three persons; the third rank', $ten_wau^{[\Xi \pm]} \rightarrow ten_nwau$ 'emperor'

Nevertheless, N can come in most coda slots including those of the final syllables, and especially, modern N can precede onsetless syllables directly even in Sino-words⁶ as follows:

(8) Modern Sino-words without sandhi

a. $iN_ei^{[\underline{\&}\underline{\&}]}$ 'shade', $aN_i^{[\underline{\nabla}\overline{B}]}$ 'easy(-going)' (cf. * $iN.m_ei$, * $aN.n_i$)

b. $\{ar^unar-i\}$ 'to be-HS-DECL' $\rightarrow \mathfrak{F}(\mathfrak{U}/\mathcal{A})\mathfrak{L}^{\mathfrak{h}} / an.na.ri/**[un.nu.\underline{r}^ii]$

**: reconstructed or suppositional form

⁶ In onomatopoeia, phonologically odd native words, *N* can precede onsetless syllables as follows:

(III) *jaN._wa.ri* (cf. *ja.wa*) [jɛw̃.wɛ.<u>i</u>^ji] 'softly', *boN._ja.ri* (cf. *bo.jo*) [boĩ.jɛ.<u>i</u>^ji] 'vaguely'

- b. *ra*N._*joo*^[濫用] 'abuse', *ho*N._*ja.ku*^[翻譯] 'translation' (cf. **ra*N.*mjoo*, **ho*N.*nja.ku*)
- c. *daN._wa*^[談話] 'comment; conversation', *biN._waN*^[敏腕] 'competent' (cf. **daN.m_a*, **biN.n_an*)

3.2 On the non-nasal coda phoneme Q

On the other hand, the non-nasal coda phoneme Q shuns coming in coda slots of the final syllables or in those immediately before voiced onsets⁷. In other words, Q appears only in coda slots followed by voiceless onsets. For example, the following Q does not stand immediately before the voiced onsets d, dz, and z but the voiceless onsets t, ts, and s, as if this coda phoneme avoids preceding voiced onsets directly:

- (9) Alternation of voiced obstruent onsets with voiceless ones which prevents *Q* from preceding voiced ones directly
 - a. $ja = na # ko.to = da^{(1)} \rightarrow # ko,t.da^{(2)} \rightarrow # ko,t.ta^{(3)} \rightarrow # ko,Q.ta$ dislike=COP.NPST#thing=COP.NPST [#kot].te]
 - b. $na, N = no\#ko.to = \widehat{dz}ja^{(1)} \rightarrow \#ko, t. \widehat{dz}ja^{(2)} \rightarrow \#ko, t. \widehat{ts}ja^{(3)} \rightarrow \#ko, Q. \widehat{ts}ja$ what=GEN#thing=COP.NPST $[\#ko\overline{t} \downarrow . \widehat{ts} e]$

(Kansai dialect)

⁷ In loan words, Q often stands immediately before syllables with voiced onsets as in (I) but, even there, still tends to escape from there as in (II):

- (IV) English: stud [st∧d] → su.taQ.do [s:.tet.do] (cf. *[s:.ted.do]); flag [flæg] → hu.raQ.gu [φu.lek.gu] (cf. *[φu.leg.gu])
 - Italian: Alleguri [al:egri] 'a family name' $\rightarrow a \varrho. re. gu. ri$ [$v. \vec{l}. le. gu. \underline{r}^{j}i$]; Luglio#Dodici [lu Λ :o#] 'July 12' $\rightarrow ru\varrho. rjo#$ [$\underline{r}u\mu \vec{l}. \underline{r}^{j}o#$] (An Italian restaurant in Sakai City which I got to know by chance and confirmed the pronunciation by telephone)
 - Arabian: Allāh [?alʰ:a:h] $\rightarrow a(Q).raa [v(I]).Iv:] (aQ.raa is due to its faithfulness to the original$ pronunciation; on the other hand,*a.raa*its obedience to the phonotactics of Modern StandardJapanese, in which Q can immediately precede only voiceless onsets. The former seems to beolder than the latter and to have been being replaced by the latter. Incidentally, I rememberthat I learnt the name not as <math>aQ.raa but as *a.raa* when I was a schoolchild.)
- (V) English: bed [bed] → beQ.to [bet.to] (cf. *beQ.do [bet.do]); bag [bæg] → baQ.ku [bek.ku] (cf. *baQ.gu [bek.gu]) (Incidentally, constraint on dakuon phonemes might work in these examples because native roots cannot include two or more dakuon phonemes in Japanese.)
 - Korean: 막걸리 [mʌk̄.k*ʌ[,lj] 'sweet crude alcoholic beverage made from rice or wheat' → *maQ.ko.(ru.)ri* [mɐk̄.k*o.(<u>r</u>ᡎ.)<u>r</u>^ji] (cf. **maQ.koQ.ri* [mɐk̄.k*o<u>r</u>_.<u>r</u>^ji]); 신라^[新羅] [ɛi[.lɐ] 'An ancient Korean kingdom' → *si.ru.ra* [ɛi.<u>r</u>ᡎ.lɐ] (cf. **siQ.ra* [ɛi<u>]</u>.lɐ])

c. $\widehat{tsja.w-i.ma.s-u=ze}^{(1)} \rightarrow \widehat{tsja.wi.ma,s.ze}^{(2)} \rightarrow \widehat{tsja,i.ma,s.se}^{(3)} \rightarrow -ma, Q.se$ to_differ-POL-NPST=CNFM.INFM [$\widehat{tevi}.mvs \downarrow .se$] (Ibid)

⁽¹⁾ The deletion of the nuclei of O_N syllables to decrease one syllable while keeping the number of morae ((9a) 3σ - 3μ to 2σ - 3μ ; (9b) 3σ - 3μ to 2σ - 3μ ; (9c) 5σ - 5μ to 4σ - 5μ).

⁽²⁾ Progressive assimilation of the voicedness (= [-voiced]).

⁽³⁾ Regressive assimilation.

4 Unique distribution of Q in minor dialects

Q, however, appears also in coda slots not followed by voiceless onsets, namely coda slots of the final syllables or those followed by voiced onsets, in some dialects of MJ. Interestingly, it can come in coda slots immediately before non-nasal obstruent onsets in all of the dialects but in the other coda slots only in few of the dialects.

Considering this difference in the strength of positional restrictions on Q, we find out that this coda phoneme avoids immediately preceding the following syllable components in ascending order from the least restrictive ones to the most:

(10) Syllable components which Q shuns immediately preceding⁸

- a. The voiced obstruent onsets b, d, z, and g (e.g. $to Q.g_a$ [$to \overline{g} \overline{?} \downarrow .g_{\mathfrak{P}}$] 'to fly:NPST:INFM'⁹)
- b.1. The nasal sonorant onsets *m* and *n* (e.g. $toQ.n_a$ [to $d\vec{?}\downarrow.n_{}$] 'to fly:NPST:CALL')
- b.2. The non-nasal sonorant onset *r* (e.g. *huQ.rjo.ru* 'to fall:IPFV:NPST', *oQ.rjoN.no.ni* 'to go down:IPFV:NPST:DSTFV'¹⁰; See Figure 1 on page 6 for more examples)
- c.1. The medials w and j (e.g. toQ_woQ [to $\vec{2}\downarrow.o\vec{2}$] 'to fly:IPFV:NPST'¹¹, $toQ_jo.ka$ [to $\vec{j}\vec{2}.\uparrow jo\downarrow.ke$] 'to fly:NPST:CMPR')

⁸ The examples in (10a–b) except (10b.2) are from dialect spoken in Ichiki-Kushikino^[市来-申木野] City, located in the Midwestern part of Kagoshima Prefecture, and the examples in (10b.2) Sanuki^[讚岐] dialect, widely spoken in Kagawa Prefecture. (See Figure 2 on page 7 for the spoken areas of the dialects cited in this paper.)

⁹ This word can be realized as $[to \vec{k}.gv]$ or $[to \vec{g}.gv]$, without the voiceless glottal stop [?], in some dialects.

¹⁰ These two forms are phonemic ones into which I transcribed words written in kara^[#A] because I have not actually heard their phonetic forms.

¹¹ The voiceless glottal stop [?] in the first coda slot is standing immediately before a vowel (e.g. $[kv\vec{2}.o\vec{2}]$), but phonologically, what Q precedes directly is considered to be not a nucleus but a medial (e.g. $kaQ._woQ$). This is because nucleus-initial syllables are highly rare in this dialect, and furthermore, we should define the medial w in this example for the purpose of explaining the existence of toQ.gwoQ $[to\vec{g}\vec{2}\downarrow.go\vec{2}]$ 'to fly:IPFV:NPST', uQ.gwoQ $[u\vec{g}\vec{2}.\uparrow go\vec{2}]$ 'to hit:IPFV:NPST', and so on, which include the onset g following Q.

- c.2. No components (e.g. toQ [to7] 'to fly:NPST')
- d. Nuclei (no example)



Figure 1 Qr sequences which are seen in Kotoden's^[琴電] enlightening signs denoting bad manners at stations and on trains

	Segami	Kuchinotsu	Sanuki	Ichi-Kushi ⁽¹⁾
(10a) <i>Q</i> .O[-son, -nas, +voi]	OK	ОК	$OK > N^{(2)}$	OK
(10b.1) Q.O[+son, +nas, +voi]		OK > N		OK > N
(10b.2) Q.O[+son, -nas, +voi]			OK > N	
(10c.1) <i>Q</i> M				OK
(10c.2) <i>Q</i> #				OK
(10d) <i>Q</i> N				

Table 1 Correctness of Q not followed by voiceless onsets in some dialects of MJ

⁽¹⁾ Segami^[$m \perp$]: dialect spoken in a small village on Kami-Koshiki Island^[\perp mm], located about 40 km west of the main land of Kagoshima Pref. Kuchinotsu^[$\Box \neq \pm \pm$]: dialect spoken at the Southern end of Shimabara Peninsula^[$\beta m \pm \beta =$], Nagasaki Pref. Ichi-Kushi: Ichiki and Kushikino dialect ⁽²⁾ Q has been being replaced by N recently (e.g. Sanuki: o.raQ.bjo.ru > o.raN.bjo.ru [$o.\uparrow _lem.b^j o\downarrow _r\mu$]; buQ.rjo.ru >buN.rjo.ru [$bu\uparrow n.r^j o\downarrow _r\mu$]; Kuchinotsu: kiQ.ne [$[k^j i \vec{q}.n^j e]$]¹² (Minami 1959) > kiN.ne [k^j in.ne]; Kushikino: kiQ.ne[$k^j i \vec{q}$], ne] > kiN.ne [k^j in, ne]).

Among the four dialects in Figure 2, Q in Segami is most strongly restricted in terms of its occurrence and is allowed only to precede obstruent onsets. Q in



Figure 2 Spoken areas of the dialects cited in this paper

Segami seems to avoid immediately preceding sonorants, which can be divided into onsets and medials phonotactically, as follows:

- (11) Alternation of sonorants with voiced obstruents which prevents *Q* from preceding sonorants directly
 - a. $ka, k-i+_jo-ka \xrightarrow{(1)} ka, k_jo.ka \xrightarrow{(2)} ka, k_dzjo.ka \xrightarrow{(4)} ka, Q_dzjo.ka$ to write-EV+good-NPST [[kad_dʒ/dzo.↑ga]]

(Kamimura 1965: 34)

b. $we.k-u=me, e^{(1)} \rightarrow we, k.me, e^{(3)} \rightarrow we, k.gwe, e^{(4)} \rightarrow we, Q.gwe, e$ to put-NPST=NEG.INFR **[weg.g^we:] (Minami 1967: 14)

¹² [[]] indicates phonetic transcriptions in previous studies.

c.
$$to.b-u=me, e^{(1)} \rightarrow to, b.me, e^{(3)} \rightarrow to, b.be, e^{(4)} \rightarrow to, Q.be, e$$

to fly-NPST=NEG.INFR **[tob.be:] (Minami 1967: 13)

⁽¹⁾ The deletion of the nuclei of O_N syllables to decrease one syllable while keeping the number of morae (equal to Note (1) in (9)).

⁽²⁾ Progressive assimilation of the manner of articulation which strengthens onsetless syllables.

⁽³⁾ Progressive assimilation of the point and manner of articulation which occurs only in graves.

⁽⁴⁾ Regressive assimilation (equal to Note (3) in (9)).

Alternation similar to (11a) is seen also in Kuchinotsu; on the other hand, that similar to (11b–c) is not there. This is maybe because Q in Kuchinotsu does not avoid preceding nasal sonorant onsets unlike that in Segami. In fact, the avoidance of Q immediately before sonorants as in (11–12) is not carried out in Ichiki and Kushikino, in which Q can come in most codas as the other coda phoneme N (cf. (10b.1, c.1)).

(12) Alternation as in (11a) which occurs in Kuchinotsu

- a. $ka,k-t_+_jaQ-ta \ ^{(1)} \rightarrow ka,kt.dzjaQ.ta \ ^{(2)} \rightarrow ka,kQ.dzjaQ.ta \ ^{(3)} \rightarrow kja,Q.dzjaQ.ta$ to write-ATT+to give-PST $[k^{j}ed.\uparrow dzet] \downarrow.te]$
- b. $ka, w-t_+_jaQ-ta \xrightarrow{(1)} ka, wt. \widehat{dzj}aQ.ta \xrightarrow{(2)} ka, wQ. \widehat{dzj}aQ.ta \xrightarrow{(3)} ko, Q. \widehat{dzj}aQ.ta$ to buy-ATT+to give-PST $[kod \downarrow. \widehat{dzvt.tv}]$
- c. $jo,m-t_+_jaQ-ta^{(1)} \rightarrow jo,mt.\widehat{dzj}aQ.ta^{(2)} \rightarrow jo,mQ.\widehat{dzj}aQ.ta^{(3)} \rightarrow jo,Q.\widehat{dzj}aQ.ta$ to read-ATT+to give-PST $[jod.\uparrow \widehat{dz}vt]\downarrow.tv]$

⁽¹⁾ Progressive assimilation of the manner of articulation which strengthens onsetless syllables (equal to Note (2) in (11)).

⁽²⁾ Regressive assimilation (equal to Note (3) in (9) and Note (4) in (11)).

⁽³⁾ Lexically limited non-synchronic alternation which suggests past natural classes (Kuroki 2014).

5 Conclusion

In this talk I clarify that the strength of positional restrictions on the non-nasal coda phoneme Q in Japanese can be divided into the following four levels:

- (13) Syllable components which *Q* shuns immediately preceding
 - a. The voiced obstruent onsets b, d, z, and g
 - b.1. The nasal sonorant onsets m and n
 - b.2. The non-nasal sonorant onset r
 - c.1. The medials w and j
 - c.2. No components

d. Nuclei

Geographical differences in the strength of the positional restrictions might teach the phonetic values of Q, which Kuroda (1967) defines instead of Q and N on the basis of complementary distribution of these coda phonemes. Q is realized as voiceless obstruents and nasals immediately before voiceless onsets and voiced ones, respectively, because of regressive assimilation in Modern Standard Japanese. Its realization seems to vary between dialects, according to positional restrictions on Q in each dialect.

- (14) The phonetic values of Q
 - a. buQ.ko.wa.su :: buN.na.gu.ru [bயk.ko.we.si] [bun.ne.gu.<u>r</u>u] 'EMP:to break' 'EMP:to hit'
 - b.1. $paa=des \cdot u = neN \rightarrow paa.des.neN \rightarrow paa=deQ = neN$ airbrain=COP.POL-NPST=SE [pv:.den.ne \tilde{e}]
 - b.2. $su+udoN=des-u=ze \rightarrow -des.ze \rightarrow -des.se \rightarrow -deQ.se$ nature+udon noodles=COP.POL-NPST=CNFM.INFM [-des.se]



Figure 3 パーデンネン and すうどんでっせ

Abbreviations

ATT: attaining CMPR: comparative CNFM: confirming COP: the meaning of copula verb roots 'to be sb/st' DSTFV: dissatisfactive EMP: emphatic EV: epenthetic vowel GEN: genitive-nominative INFM: informing INFR: inferential IPFV: imperfective NEG: negative NPST: non-past POL: polite PST: past SE: scope expansion

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