

Appendix A

Multinomial logistic regression

Package: nnet

Function: multinom()

Analysis 1 (the whole set)

formula: suffix ~ consonant + extrasyllabic + foreign + consonant:extrasyllabic + extrasyllabic:foreign + consonant:foreign

Reference category of the dependent variable *suffix*: **-∅-sk-**

Reference category of *consonant*: **s**

Reference category of *extrasyllabic*: **no**

Reference category of *foreign*: **no**

Only statistically significant results are included.

			<i>z score</i>	<i>p value</i>	
	Intercept	-ap-sk	-58.69	p<.001	
		-ep-sk	-139.92	p<.001	
		-ij-sk	-177.7	p<.001	
		-tsk	-68.25	p<.001	
		V	-1.02	p=.31	
consonant					
		<i>preferred</i>	<i>z score</i>	<i>p value</i>	<i>dispreferred</i>
	/ts/	-tsk	47.15	p<.001	-sk, -ij-sk, V
		-ep-sk	28.67	p<.001	
		-ap-sk	21.43	p<.001	
	/t/	-tsk	47.83	p<.001	-sk, V
		-ap-sk	23.36	p<.001	
		-ep-sk	26.62	p<.001	
		-ij-sk	48.84	p<.001	
	/k/	-tsk	64.35	p<.001	-sk, -ep-sk, V
		-ap-sk	39.66	p<.001	
		-ij-sk	27.07	p<.001	
	/tʃ/	-tsk	45	p<.001	-sk, -ij-sk, V
		-ap-sk	41.23	p<.001	
		-ep-sk	34.74	p<.001	
	/s/	-sk			-ap-sk, -ij-sk, -ep-sk, -tsk, V
	/e/	-sk			-ap-sk, -ij-sk, -ep-sk, -tsk, V
	/ʃ/	-sk			-ij-sk, V
		-ap-sk	36.22	p<.001	
		-ep-sk	74.41	p<.001	
	/x/	-sk			-ap-sk, -ep-sk, -ij-sk, -tsk, V
	/g/	-sk			-ep-sk, -tsk, V
		-ij-sk	91.36	p<.001	
		-ap-sk	30.95	p<.001	

	/m/	-sk			-ap-sk, -tsk
		-ij-sk	50.66	p<.001	
		-ɛp-sk	26.83	p<.001	
	/n/	-sk			-ap-sk, -tsk
		-ij-sk	78.32	p<.001	
		-ɛp-sk	20.84	p<.001	
	/ɲ/	-sk			-ap-sk, -ɛp-sk, -tsk, V
		-ij-sk	3.19	p=.001	
	/r/	-sk			-ap-sk, -tsk, V
		-ij-sk	80.93	p<.001	
		-ɛp-sk	21.89	p<.001	
	/l/	-sk			-ap-sk, -ɛp-sk, -tsk
		-ij-sk	52.72	p<.001	
	/j/	-sk			-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
	/w/	-sk			-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
	/v/	-sk			-tsk
		-ap-sk	21.16	p<.001	
		-ɛp-sk	22.65	p<.001	
		-ij-sk	55.97	p<.001	
		V	34896.5	p<.001	
	/f/	-ij-sk	70.97	p<.001	-sk, -ap-sk, -ɛp-sk, -tsk, V
	/p/	-ij-sk	52.35	p<.001	-sk, -ɛp-sk, -tsk, V
		-ap-sk	22.54	p<.001	
	/b/	-ij-sk	34.50	p<.001	-sk, -ap-sk, -ɛp-sk, -tsk, V
	/d/	-ap-sk	129.62	p<.001	-sk, -tsk, V
		-ɛp-sk	41.38	p<.001	
		-ij-sk	73.88	p<.001	
	/dz/	-ap-sk	96.8	p<.001	-sk, -ɛp-sk, -tsk, V
		-ij-sk	177.01	p<.001	
	/z/	-sk			-tsk, V
		-ap-sk	24.10	p<.001	
		-ɛp-sk	23.60	p<.001	
		-ij-sk	53.44	p<.001	
	/z/	-sk			-ɛp-sk, -tsk, V
		-ap-sk	44.92	p<.001	
		-ij-sk	90.38	p<.001	
extrasyllabic					
	yes	-ap-sk	51.06	p<.001	
		-ɛp-sk	8.09	p<.001	
		-ij-sk	3.71	p<.001	
		V	2.13	p=.03	
foreign					
	yes	-ap-sk	35.75	p<.001	
		-ɛp-sk	28.71	p<.001	
		-ij-sk	5.20	p<.001	

consonant:extrasyllabic (yes)					
	/m/	-aŋ-sk	57.54	p<.001	-sk, -tsk, -ɛŋ-sk, V
		-ij-sk	35.08	p<.001	
	/n/	-aŋ-sk	123.21	p<.001	-sk, -tsk
		-ɛŋ-sk	53.38	p<.001	
		-ij-sk	10.82	p<.001	
		V	11.26	p<.001	
	/ɲ/	-aŋ-sk	32.08	p<.001	-sk, -tsk
		-ɛŋ-sk	89.19	p<.001	
		-ij-sk	73.97	p<.001	
		V	12.80	p<.001	
	/r/	-aŋ-sk	3.64	p<.001	-sk, -tsk, -ɛŋ-sk, -ij-sk
		V	6.64	p<.001	
	/l/	-aŋ-sk	12.94	p<.001	-sk, -tsk, -ɛŋ-sk, -ij-sk, V
	/j/	-sk			-aŋ-sk, -ɛŋ-sk, -ij-sk, -tsk, V
	/w/	-aŋ-sk	17.41	p<.001	-sk, -tsk, -ɛŋ-sk, -ij-sk
		V	13.15	p<.001	
	/v/	V	479634	p<.001	-sk, -aŋ-sk, -ɛŋ-sk, -ij-sk, -tsk
extrasyllabic:foreign (yes)					
	yes	-aŋ-sk	-14.22	p<.001	
		-ɛŋ-sk	-6.33	p<.001	
		-ij-sk	15.94	p<.001	
consonant:foreign (yes)					
	/ts/	-tsk	11.87	p<.001	-sk, -aŋ-sk, -ij-sk, V
		-ɛŋ-sk	143.17	p<.001	
	/t/	-ɛŋ-sk	106.09	p<.001	-sk, -tsk, -aŋ-sk, V
		-ij-sk	149.10	p<.001	
	/k/	-ij-sk	228.23	p<.001	-sk, -tsk, -aŋ-sk, -ɛŋ-sk, V
	/tʃ/	-tsk	32.42	p<.001	-sk, -ij-sk, V
		-aŋ-sk	40.37	p<.001	
		-ɛŋ-sk	173.47	p<.001	
	/s/	-sk			-aŋ-sk, -ij-sk, -ɛŋ-sk, -tsk, V
	/ʃ/	-sk			-aŋ-sk, -ij-sk, -ɛŋ-sk, -tsk, V
	/x/	-sk			-ij-sk, -ɛŋ-sk, -tsk, V
		-aŋ-sk	34.10	p<.001	
	/g/	-sk			-aŋ-sk, -ɛŋ-sk, -tsk, V
		-ij-sk	203.89	p<.001	
	/m/	-sk			-tsk
		-aŋ-sk	48.26	p<.001	
		-ij-sk	70.10	p<.001	
		-ɛŋ-sk	101.44	p<.001	
	/n/	-sk			-tsk
		-aŋ-sk	5.04	p<.001	
		-ij-sk	87.49	p<.001	
		-ɛŋ-sk	5.35	p<.001	

	/p/	-sk			-ɛp-sk, -ij-sk, -tsk, V
	/r/	-sk			
		-ap-sk	14.92	p<.001	
		-ij-sk	302.71	p<.001	
		-ɛp-sk	72.74	p<.001	
		V	4.76	p<.001	
	/l/	-sk			-ɛp-sk, -tsk, V
		-ap-sk	47.48	p<.001	
		-ij-sk	222	p<.001	
	/j/	-sk			-ɛp-sk, -ij-sk, -tsk
		-ap-sk	5.82	p<.001	
	/w/	-sk			-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
	/v/	-sk			-ap-sk, -tsk, V
		-ɛp-sk	73.12	p<.001	
		-ij-sk	64.45	p<.001	
	/f/	-ij-sk	70.97	p<.001	-sk, -ap-sk, -ɛp-sk, -tsk, V
	/p/	-ij-sk	169.06	p<.001	-sk, -ap-sk, -ɛp-sk, -tsk, V
	/b/	-ap-sk	82.97	p<.001	-sk, -ɛp-sk, -tsk, V
		-ij-sk	161	p<.001	
	/d/	-ɛp-sk	44.21	p<.001	-sk, -tsk, -ap-sk, V
		-ij-sk	101.07	p<.001	
	/dz/	-ap-sk	96.80	p<.001	-sk, -ɛp-sk, -tsk, V
		-ij-sk	177	p<.001	
	/z/	-sk			-tsk, -ap-sk, V
		-ɛp-sk	71.63	p<.001	
		-ij-sk	152.13	p<.001	
	/z/	-sk			-ap-sk, -ɛp-sk, -ij-sk, -tsk, V

Analysis 2: native stratum

formula: suffix ~ consonant + extrasyllabic + consonant:extrasyllabic

Reference category of the dependent variable *suffix*: **-∅-sk-**

Reference category of *consonant*: **s**

Reference category of *extrasyllabic*: **no**

Only statistically significant results are included.

Native stratum

			<i>z score</i>	<i>p value</i>	
	Intercept	-ap-sk	-425.60	p<.001	
		-ɛp-sk	-58.85	p<.001	
		-ij-sk	-1161.08	p<.001	
		-tsk	-3673.50	p<.001	
		V	-2.08	p=.04	

consonant					
		<i>preferred</i>	<i>z score</i>	<i>p value</i>	<i>dispreferred</i>
/ts/	-tsk		1521.49	p<.001	-sk, -ɛp-sk, -ij-sk, V
	-ap-sk		377.57	p<.001	
/t/	-tsk		1601.57	p<.001	-sk, -ɛp-sk, -ij-sk, V
	-ap-sk		381.92	p<.001	
/k/	-tsk		3196.87	p<.001	-sk, -ɛp-sk, -ij-sk, V
	-ap-sk		416.46	p<.001	
/tʃ/	-tsk		1668.80	p<.001	-sk, -ɛp-sk, -ij-sk, V
	-ap-sk		415.28	p<.001	
/s/	-sk				-ap-sk, -ij-sk, -ɛp-sk, -tsk, V
/ɛ/	-sk				-ap-sk, -ij-sk, -ɛp-sk, -tsk, V
/ʃ/	-sk				-ij-sk, V
	-ap-sk		412.14	p<.001	
	-tsk		1072.32	p<.001	
/x/	-sk				-ij-sk, -ɛp-sk, -tsk, V
/g/	-sk				-ɛp-sk, -ij-sk, -tsk, V
	-ap-sk		403.40	p<.001	
/m/	-sk				-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
/n/	-sk				-tsk
	-ap-sk		13.36	p<.001	
	-ɛp-sk		9.94	p<.001	
/p/	-sk				-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
/r/	-sk				-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
/l/	-sk				-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
/j/	-sk				-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
/w/	-sk				-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
/v/	-sk				-ɛp-sk, -ij-sk, -tsk, V
/p/	-sk				-ɛp-sk, -ij-sk, -tsk, V
	-ap-sk		384.12	p<.001	
/b/	-sk				-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
/z/	-sk				-ɛp-sk, -ij-sk, -tsk, V
	-ap-sk		387.75	p<.001	
/z/	-sk				-ɛp-sk, -tsk, V
	-ap-sk		420.40	p<.001	
extrasyllabic					
	yes	-ap-sk	148.85	p<.001	-ij-sk-, tsk
		-ɛp-sk	42.92	p<.001	
		V	6.11	p<.001	
consonant:extrasyllabic (yes)					
	/n/	-ap-sk	63.34	p<.001	-sk, -tsk, -ij-sk
		-ɛp-sk	220.84	p<.001	
		V	59.73	p<.001	
	/p/	-ap-sk	106.03	p<.001	-sk, -tsk, -ij-sk
		-ɛp-sk	200.54	p<.001	

		V	39.58	p<.001	
	/r/	-ap-sk	21.37	p<.001	-sk, -tsk, -ɛp-sk, -ij-sk, V
	/l/	-ap-sk	2.59	p=0.01	-tsk, -ɛp-sk, -ij-sk, V
	/j/	-sk			-ap-sk, -ɛp-sk, -ij-sk, -tsk, V
	/w/	-ap-sk	73.27	p<.001	-sk, -tsk, -ɛp-sk, -ij-sk
		V	46.21	p<.001	

Analysis 3: foreign stratum

formula: suffix ~ consonant + extrasyllabic + consonant:extrasyllabic

Reference category of the dependent variable *suffix*: -∅-sk-

Reference category of *consonant*: s

Reference category of *extrasyllabic*: no

Only statistically significant results are included.

Foreign stratum

			<i>z score</i>	<i>p value</i>	
	Intercept	-ap-sk	-2.92	p=.003	
		-ɛp-sk	-53.91	p<.001	
		-ij-sk	-108.55	p<.001	
		-tsk	-2.92	p=.003	
		V	-51.19	p<.001	
consonant					
		<i>preferred</i>	<i>z score</i>	<i>p value</i>	<i>dispreferred</i>
	/ts/	-tsk	36.48	p<.001	-sk, -ap-sk, -ij-sk, V
		-ɛp-sk	53.76	p<.001	
	/t/	-tsk	4.17	p<.001	-sk, V
		-ap-sk	3.88	p<.001	
		-ɛp-sk	23.48	p<.001	
		-ij-sk	33.29	p<.001	
	/k/	-tsk	2.30	p=.02	-sk, -ɛp-sk, V
		-ap-sk	2.18	p=.03	
		-ij-sk	39.36	p<.001	
	/tʃ/	-tsk	33.51	p<.001	-sk, -ij-sk, V
		-ap-sk	36.27	p<.001	
		-ɛp-sk	57.63	p<.001	
	/s/	-sk			-ap-sk, -ij-sk, -ɛp-sk, -tsk, V
	/ʃ/	-sk			-ap-sk, -ij-sk, -ɛp-sk, -tsk, V
	/x/	-sk			-ij-sk, -ɛp-sk, -tsk, V
	/g/	-sk			-ɛp-sk, -tsk, V
		-ij-sk	46.36	p<.001	
	/m/	-sk			-tsk, V
		-ij-sk	16.45	p<.001	
		-ɛp-sk	19.88	p<.001	
	/n/	-sk			-ap-sk, -tsk, V

		-ij-sk	21.91	p<.001	
		-ɛɲ-sk	13	p<.001	
	/p/	-sk			-aɲ-sk, -ɛɲ-sk, -ij-sk, -tsk, V
	/r/	-sk			
		-ij-sk	63.31	p<.001	
		-ɛɲ-sk	13.76	p<.001	
		V	3.12	p=.002	
	/l/	-sk			-ɛɲ-sk, -tsk, V
		-ij-sk	42.14	p<.001	
	/j/	-sk			-ɛɲ-sk, -ij-sk, -tsk, V
	/w/	-sk			-aɲ-sk, -ɛɲ-sk, -ij-sk, -tsk, V
	/v/	-sk			-tsk
		-ɛɲ-sk	14.78	p<.001	
		-ij-sk	16.90	p<.001	
		V	4014660	p<.001	
	/f/	-ij-sk	22.88	p<.001	-sk, -aɲ-sk, -ɛɲ-sk, -tsk, V
	/p/	-ij-sk	36.50	p<.001	-sk, -aɲ-sk, -ɛɲ-sk, -tsk, V
	/b/	-aɲ-sk	2.49	p=.01	-sk, -ɛɲ-sk, -tsk, V
		-ij-sk	34.50	p<.001	
	/d/	-aɲ-sk	3.27	p=.001	-sk, -tsk, V
		-ɛɲ-sk	14.68	p<.001	
		-ij-sk	29.90	p<.001	
	/dz/	-aɲ-sk	42.84	p<.001	-sk, -ɛɲ-sk, -tsk, V
		-ij-sk	66.33	p<.001	
	/z/	-sk			-tsk, V
		-aɲ-sk	2.17	p=.03	
		-ɛɲ-sk	15.25	p<.001	
		-ij-sk	32.03	p<.001	
	/z/	-sk			-aɲ-sk, -ɛɲ-sk, -ij-sk, -tsk, V
extrasyllabic					
	yes	-aɲ-sk	70.75	p<.001	
		-ɛɲ-sk	25.27	p<.001	
		-ij-sk	73.43	p<.001	
		V	103.83	p<.001	
consonant:extrasyllabic (yes)					
	/m/	-aɲ-sk	30.38	p<.001	-sk, -tsk, -ɛɲ-sk, V
		-ij-sk	11.43	p<.001	
	/n/	-aɲ-sk	52.85	p<.001	-sk, -tsk
		-ɛɲ-sk	50.47	p<.001	
		-ij-sk	11.43	p<.001	
		V	89.36	p<.001	
	/p/	-aɲ-sk	51.01	p<.001	-sk, -tsk, V
		-ɛɲ-sk	126.94	p<.001	
		-ij-sk	96.85	p<.001	
	/r/	-aɲ-sk	17.43	p<.001	-sk, -tsk, -ɛɲ-sk

		-ij-sk	9.17	p<.001	
		V	72.69	p<.001	
	/l/	-ap-sk	14.12	p<.001	-sk, -tsk, -εp-sk, V
		-ij-sk	8.16	p<.001	
	/j/	-sk			-ap-sk, -εp-sk, -ij-sk, -tsk, V
	/v/	V	210415	p<.001	-sk, -ap-sk, -εp-sk, -ij-sk, -tsk,

Appendix B

Tableaux used in the simulations in Noisy Harmonic Grammar

Native stratum

		freq	OCP	sk>sk	S>sk	T>sk	CoalS	CoalT	Ident[+voice]	Ident[+labial]	Uniform	R-sk	*Struct	IM	SSP	Max	Dep
VOR	VO-sk-	24										1		1		1	
	VO <u>V</u> R-sk-	55												1			1
	VOR-IM-sk-	28											1				
	VOR-sk-	0												1	1		
VR	VR-sk-	881												1			
	VR <u>V</u> -sk-	0										1		1			1
	VR-IM-sk-	1											1				
	V-sk-	0										1		1		1	
VS	VS-sk-	0					1					1		1			
	VS-IM-sk-	5			1								1				
	V <u>S</u> -sk-	0										1		1			1
	V-s1,2k-	27									1	1		1			
	V-sk-	0										1		1		1	
VT	VT-sk-	0						1				1		1			
	VT-IM-sk-	18				1							1				
	VT <u>V</u> -sk-	0										1		1			1
	V-ts1,2k-	221									1	1		1			
	V-sk-	0										1		1		1	
VD	VD-sk-	0						1				1		1			
	VD-IM-sk-	16											1				
	VD <u>V</u> -sk-	0										1		1			1
	V-ts1,2k-	0							1		1	1		1			
	V-sk-	67										1		1		1	
VP	VP-sk-	9										1		1			
	VP-IM-sk-	1											1				
	VP <u>V</u> -sk-	0										1		1			1
	V-ts1,2k-	0								1	1	1		1			
	V-sk-	0										1		1		1	
Vsk	Vsk-sk-	0	1									1		1			
	Vsk-IM-sk-	0	1	1		1							1				
	Vsk <u>V</u> -sk-	0										1		1			1
	V-sk1,2-	63									1	1		1			
	V-sk-	0										1		1		1	

Foreign stratum

		freq	OCP	sk>sk	S>sk	T>sk	CoatS	CoatT	Ident[+voice]	Ident[+labial]	Uniform	R-sk	*Struct	IM	SSP	Max	Dep
VOR	VO-sk-	72										1		1		1	
	VOVR-sk-	157												1			1
	VOR-IM-sk-	49											1				
	VOR-sk-	0												1	1		
VR	VR-sk-	422												1			
	VRV-sk-	0										1		1			1
	VR-IM-sk-	54											1				
	V-sk-	0										1		1		1	
VS	VS-sk-	0					1					1		1			
	VS-IM-sk-	2			1								1				
	VSY-sk-	0										1		1			1
	V-s1,2k-	35									1	1		1			
	V-sk-	0										1		1		1	
VT	VT-sk-	0						1				1		1			
	VT-IM-sk-	59				1							1				
	VTV-sk-	0										1		1			1
	V-ts1,2k-	59									1	1		1			
	V-sk-	0										1		1		1	
VD	VD-sk-	0						1				1		1			
	VD-IM-sk-	52											1				
	VDV-sk-	0										1		1			1
	V-ts1,2k-	0							1		1	1		1			
	V-sk-	57										1		1		1	
VP	VP-sk-	12										1		1			
	VP-IM-sk-	25											1				
	VPV-sk-	0										1		1			1
	V-ts1,2k-	0								1	1	1		1			
	V-sk-	0										1		1		1	
Vsk	Vsk-sk-	0	1									1		1			
	Vsk-IM-sk-	1	1	1		1							1				
	VskV-sk-	0										1		1			1
	V-sk1,2-	27									1	1		1			
	V-sk-	0										1		1		1	