Supplemental Materials for:

Applying Mixed-Effects Modeling to Behavioral Economic Demand: An Introduction

Submitted to Perspectives on Behavior Science

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Supplemental Materials

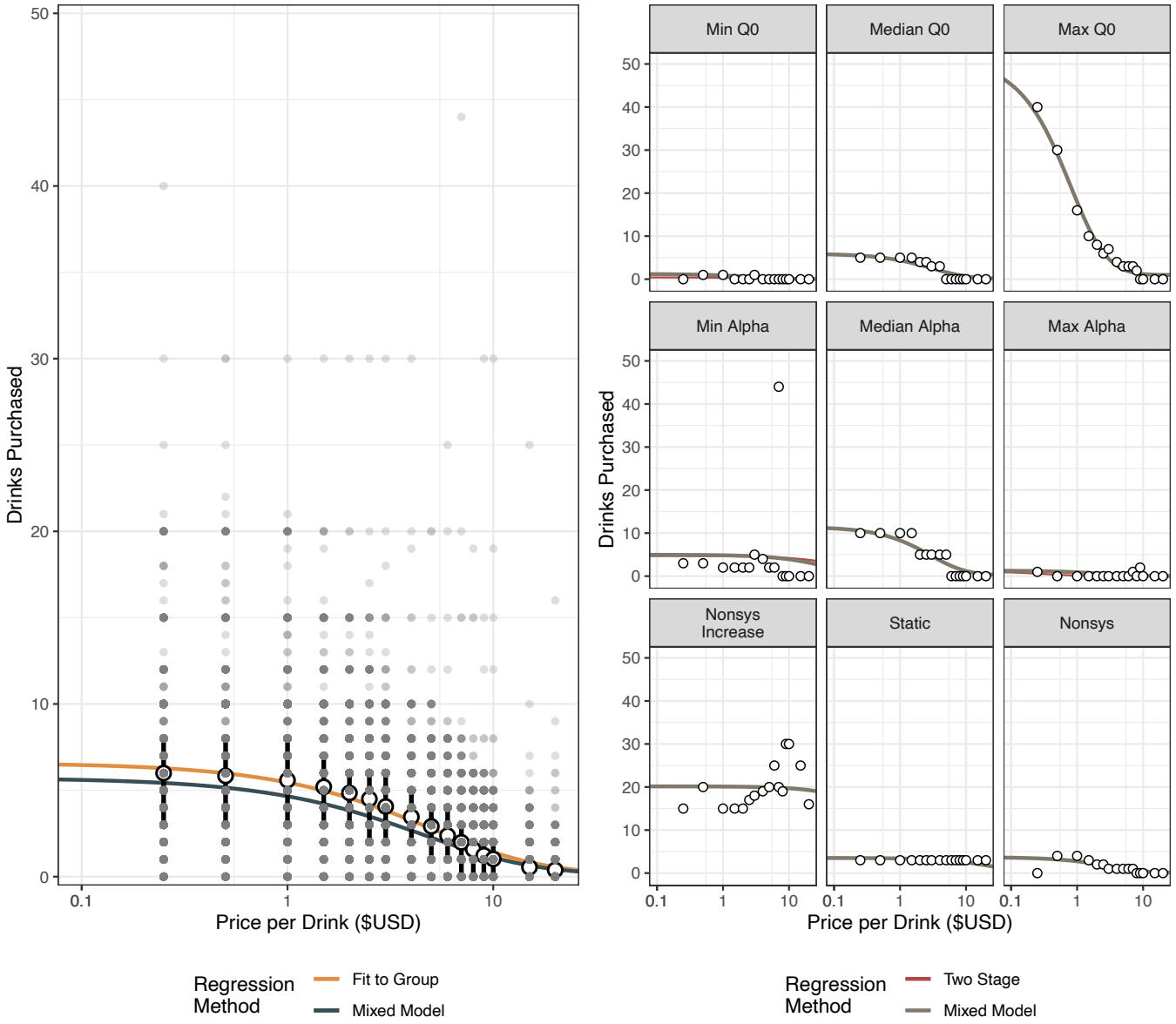

Figure S1. Graphical comparisons between the three different approaches to analyzing demand curve data. Original data from Kaplan and Reed (2018). *Left panel:* Individual points in gray circles and mean consumption at each price in open circles. The orange line represents the best-fit line using the fit-to-group approach whereas the blue line represents the best-fit line obtained from the fixed effects estimated using the mixed-effects modeling approach. Notice how the population-level fixed effects provides a best-fit line slightly lower than the fit-to-group approach. The mixed-effects model is able to provide random effect predictions for some datasets with low and flat line consumption values (e.g., "static" dataset bottom row of right panel), which influences the population level fixed effects, while also shrinking predictions from datasets with high consumption values. *Right panel:* A subset of participants and their responses. The maroon lines show the best fit lines from the two-stage approach for each participant. The gray lines show the predicted lines from the random effects obtained from the mixed-effects model approach. Overall, the lines show close correspondence with the bottom row yielding predicted lines from only the mixed-effects model approach.

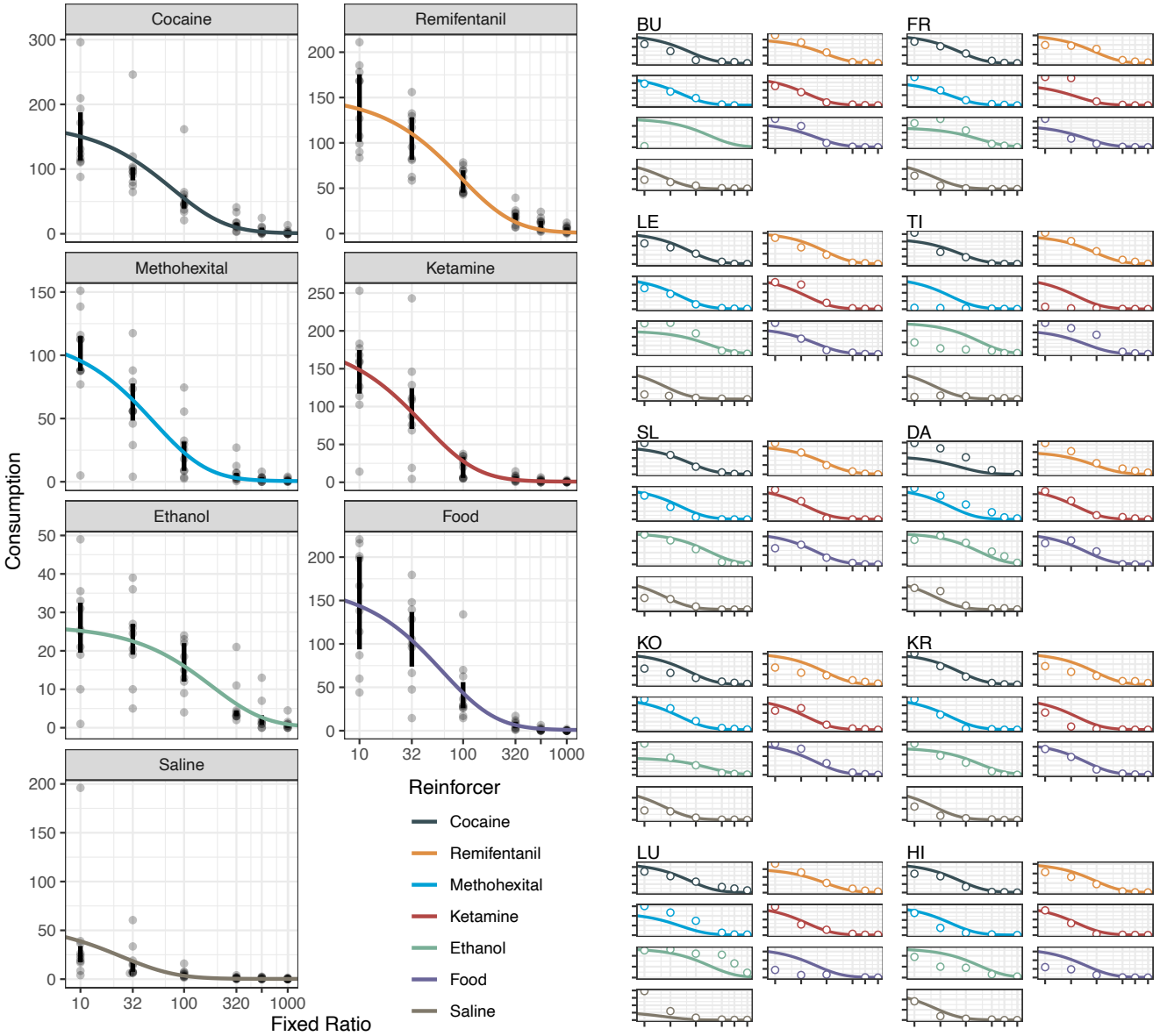

Figure S2: Results from the monkey fit-to-group approach. Original data from Koffarnus et al. (2012). *Left panel:* Individual points in gray. Black vertical bars indicate the interquartile range between 25% and 75%. The colored lines show the predictions from the fit-to-group approach for each reinforcer. *Right panel:* Nonhuman points and the observed consumption. The colored lines are identical across monkeys and within reinforcer, but vary across reinforcers, as is represented in the left panel.

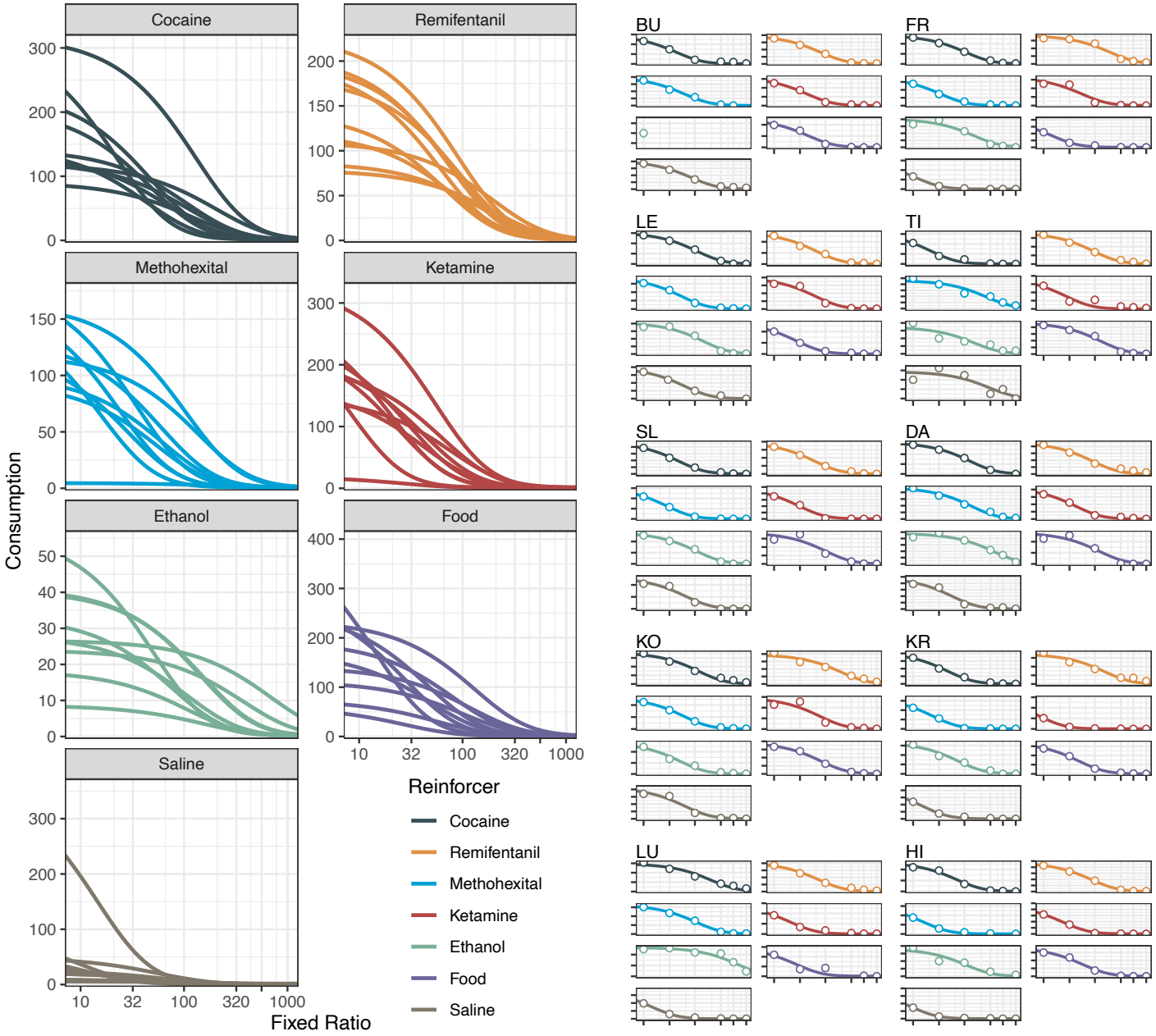

Figure S3: Results from the monkey stage one analysis from the two-stage approach. Original data from Koffarnus et al. (2012). *Left panel:* Individual predicted curves for each monkey and each reinforcer. *Right panel:* Nonhuman points and the observed consumption. The predicted lines are fit to each monkey and each reinforcer. Note that the following monkeys and reinforcers were not fit: BU (Ethanol).

Table S1: Posthoc pairwise comparisons (*t*-tests) of log(α) resulting from the mixed-effects model.

Contrast	Estimate (difference)	SE	d.f.	t-value	p-value
Cocaine - Ethanol	-0.3715	0.1109	386	-3.3517	**0.0018**
Cocaine - Food	-0.0911	0.1008	386	-0.9036	0.4054
Cocaine - Ketamine	-0.2189	0.0960	386	-2.2793	**0.0375**
Cocaine - Methohexital	-0.3026	0.0908	386	-3.3337	**0.0018**
Cocaine - Remifentanil	0.0614	0.0660	386	0.9308	0.4054
Cocaine - Saline	-0.8880	0.1370	386	-6.4794	**0.0000**
Ethanol - Food	0.2804	0.1215	386	2.3086	**0.0375**
Ethanol - Ketamine	0.1527	0.1174	386	1.3006	0.2549
Ethanol - Methohexital	0.0690	0.1131	386	0.6101	0.5422
Ethanol - Remifentanil	0.4329	0.0950	386	4.5591	**0.0000**
Ethanol - Saline	-0.5164	0.1530	386	-3.3759	**0.0018**
Food - Ketamine	-0.1277	0.1082	386	-1.1806	0.2946
Food - Methohexital	-0.2114	0.1036	386	-2.0416	0.0628
Food - Remifentanil	0.1525	0.0828	386	1.8425	0.0926
Food - Saline	-0.7968	0.1460	386	-5.4591	**0.0000**
Ketamine - Methohexital	-0.0837	0.0987	386	-0.8483	0.4166
Ketamine - Remifentanil	0.2803	0.0768	386	3.6476	**0.0008**
Ketamine - Saline	-0.6691	0.1424	386	-4.6981	**0.0000**
Methohexital - Remifentanil	0.3639	0.0702	386	5.1865	**0.0000**
Methohexital - Saline	-0.5854	0.1389	386	-4.2152	**0.0001**
Remifentanil - Saline	-0.9494	0.1242	386	-7.6428	**0.0000**
Note: SE = Standard Error; d.f. = Degrees of Freedom. False discovery rate adjustment to p-values.					