

Budget Uncertainty in the Vaccine Market

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Hypothesis:

If a market's vaccine budget decreases then the reservation price decreases.

Variables of Interest:

1. **Reservation Price:** The most a consumer is willing to pay
2. **Market Segments:** The number of markets that group consumers
3. **Bundles:** The type of vaccine produced by a provider
4. **MARR:** Provider Minimum Annual Rate of Return

Metrics of Interest:

1. Total Social Surplus (TSS): Profit + Savings
2. Total Consumer Surplus (TCS): Savings
3. Total Provider Profit (TPF): Profit
4. Consumer Market Value: $TCS / (TCS + TPF)$
5. Provider Market Value: $TPF / (TCS + TPF)$
6. Demand Satisfaction
7. Production Cost Recovery

The Experiment:

Targeting 1 market at a time in:

- 2, 4, 8, 12 market systems

Randomly reduce the reservation price by:

- 1%-12%, 13%-26%, 27%-40%

For these portion of bundles:

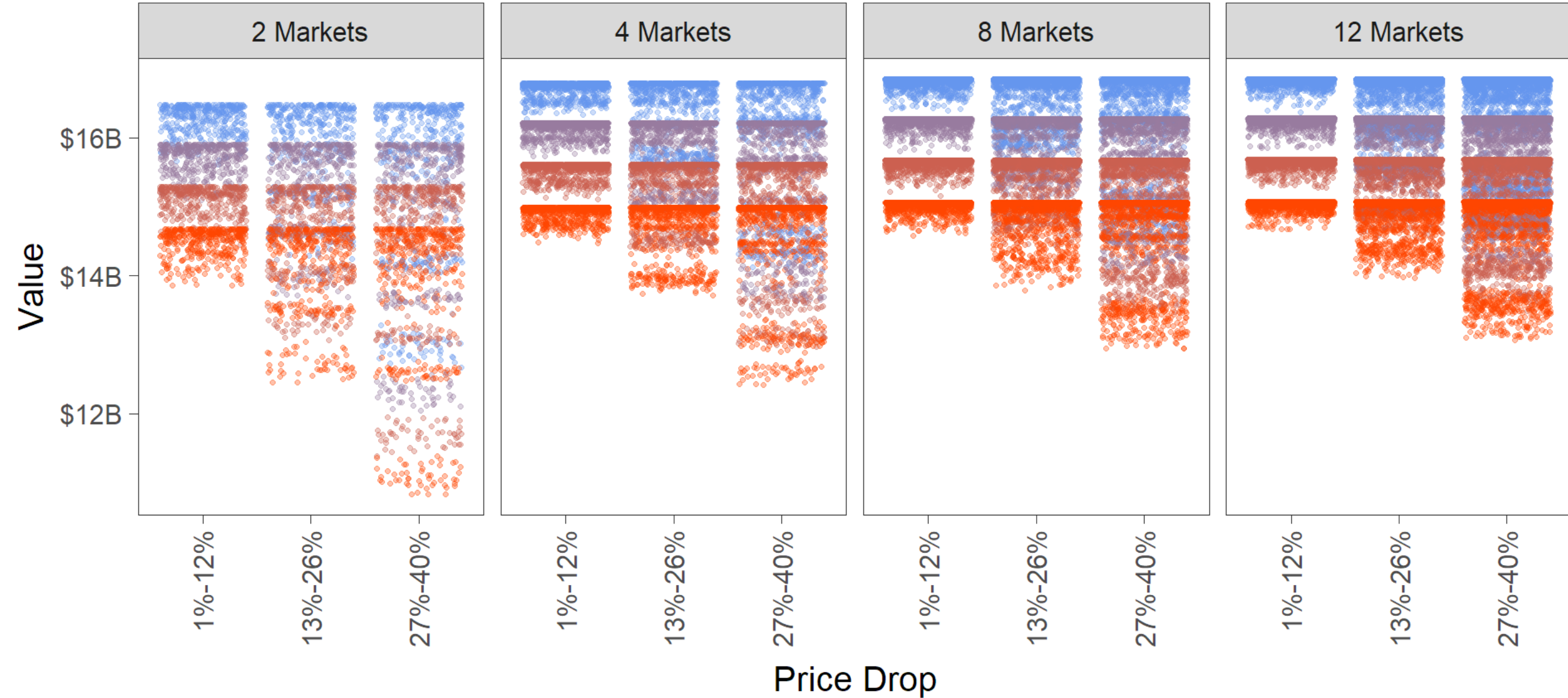
- 1%-20%, 21%-40%, 41%-60%, 100%

At MARR values of:

- 5%, 10%, 25%, 20%

Total Social Surplus

MARR 5% 10% 15% 20%



TSS Regression Model

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	1.626e+10	6.483e+06	2508.66	<2e-16	***
Markets4.Markets	5.951e+08	6.247e+06	95.25	<2e-16	***
Markets8.Markets	7.739e+08	5.703e+06	135.70	<2e-16	***
Markets12.Markets	8.160e+08	5.510e+06	148.11	<2e-16	***
Price_Drop13..26.	-1.542e+08	3.465e+06	-44.50	<2e-16	***
Price_Drop27..40.	-3.737e+08	3.465e+06	-107.83	<2e-16	***
Bundle_Impact21..40.	-4.772e+07	4.001e+06	-11.93	<2e-16	***
Bundle_Impact41..60.	-1.267e+08	4.001e+06	-31.66	<2e-16	***
Bundle_Impact100.	-6.746e+08	4.001e+06	-168.60	<2e-16	***
MARR10.	-5.678e+08	4.001e+06	-141.89	<2e-16	***
MARR15.	-1.177e+09	4.001e+06	-294.06	<2e-16	***
MARR20.	-1.785e+09	4.001e+06	-446.16	<2e-16	***

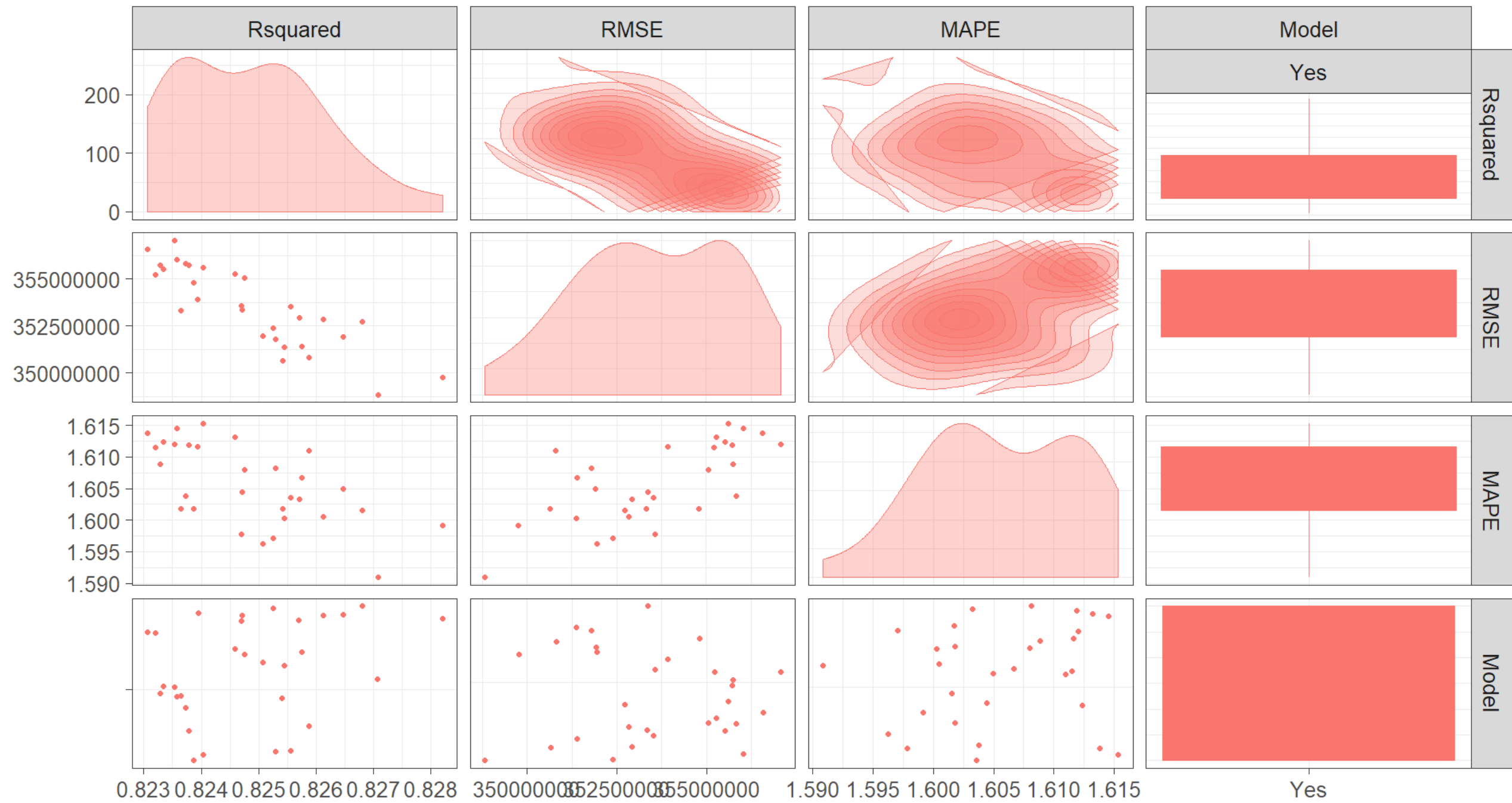
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Residual standard error: 353400000 on 62388 degrees of freedom

Multiple R-squared: 0.8251, Adjusted R-squared: 0.825

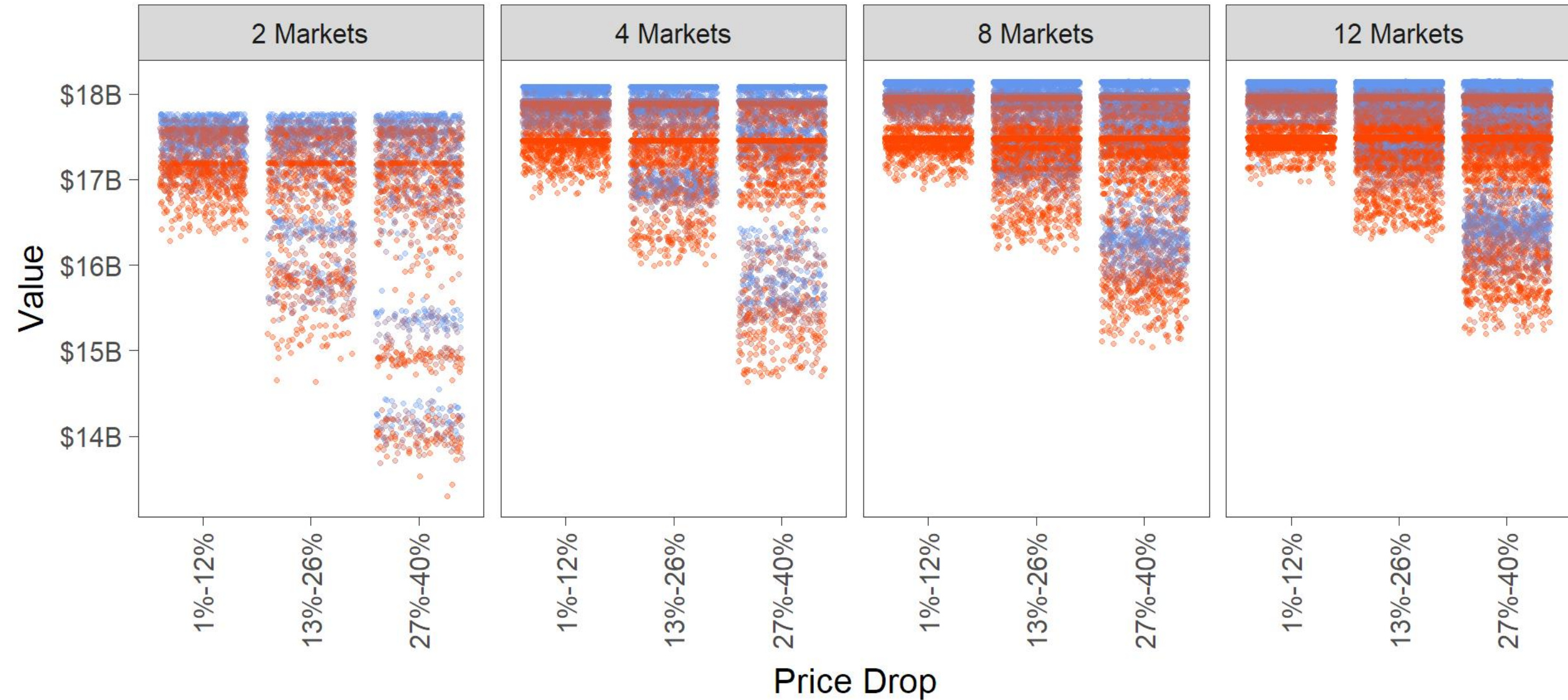
F-statistic: 2.675e+04 on 11 and 62388 DF, p-value: < 2.2e-16

TSS Regression Model



Total Consumer Surplus

MARR 5% 10% 15% 20%



TCS Regression Model

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	1.757e+10	6.862e+06	2560.27	<2e-16	***
Markets4.Markets	5.792e+08	6.612e+06	87.59	<2e-16	***
Markets8.Markets	7.498e+08	6.036e+06	124.21	<2e-16	***
Markets12.Markets	7.861e+08	5.831e+06	134.80	<2e-16	***
Price_Drop13..26.	-1.526e+08	3.668e+06	-41.60	<2e-16	***
Price_Drop27..40.	-3.857e+08	3.668e+06	-105.16	<2e-16	***
Bundle_Impact21..40.	-4.314e+07	4.235e+06	-10.19	<2e-16	***
Bundle_Impact41..60.	-1.176e+08	4.235e+06	-27.76	<2e-16	***
Bundle_Impact100.	-6.912e+08	4.235e+06	-163.21	<2e-16	***
MARR10.	-1.390e+08	4.235e+06	-32.81	<2e-16	***
MARR15.	-1.887e+08	4.235e+06	-44.56	<2e-16	***
MARR20.	-6.248e+08	4.235e+06	-147.53	<2e-16	***

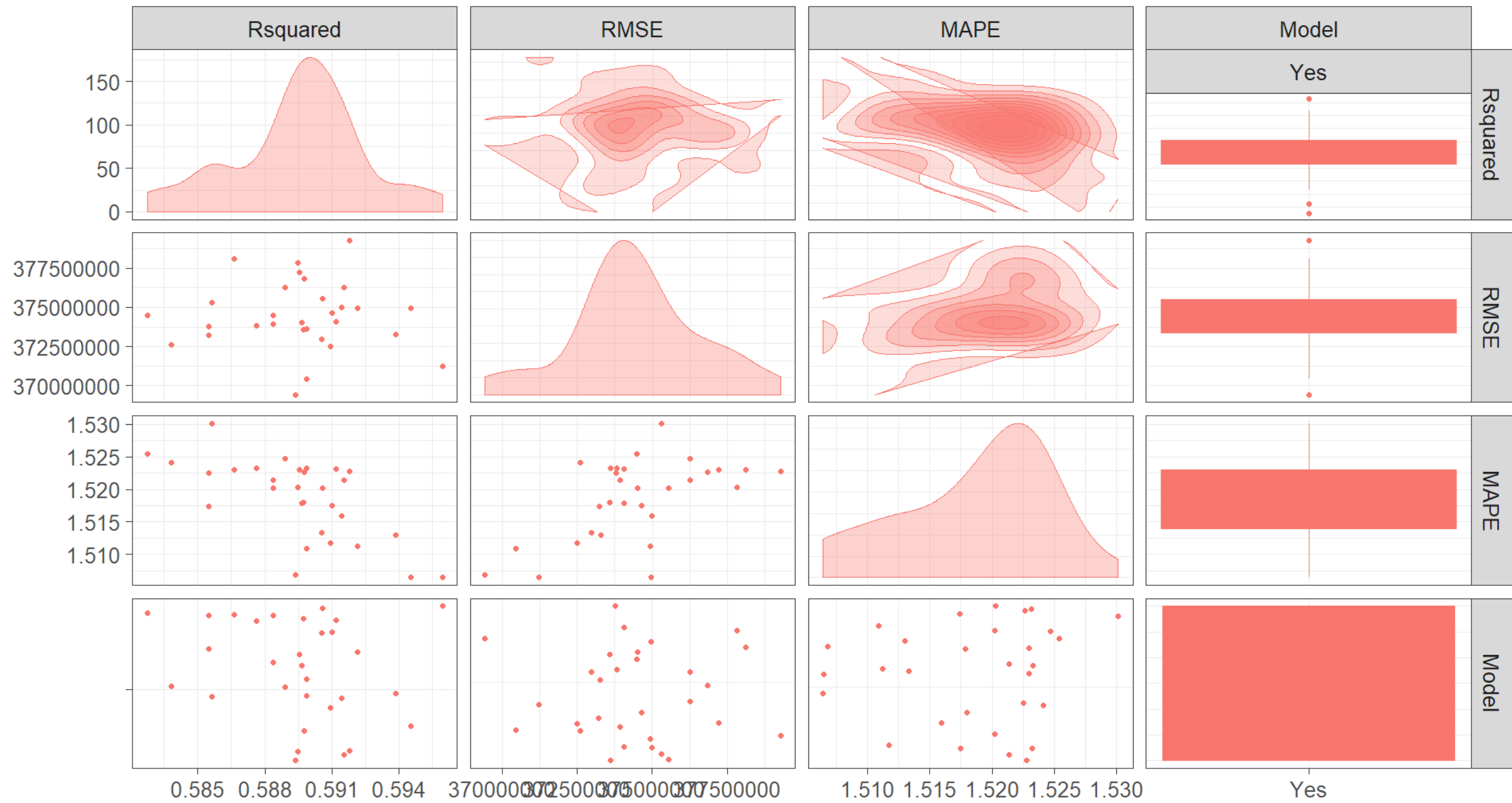
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Residual standard error: 3.74e+08 on 62388 degrees of freedom

Multiple R-squared: 0.5904, Adjusted R-squared: 0.5903

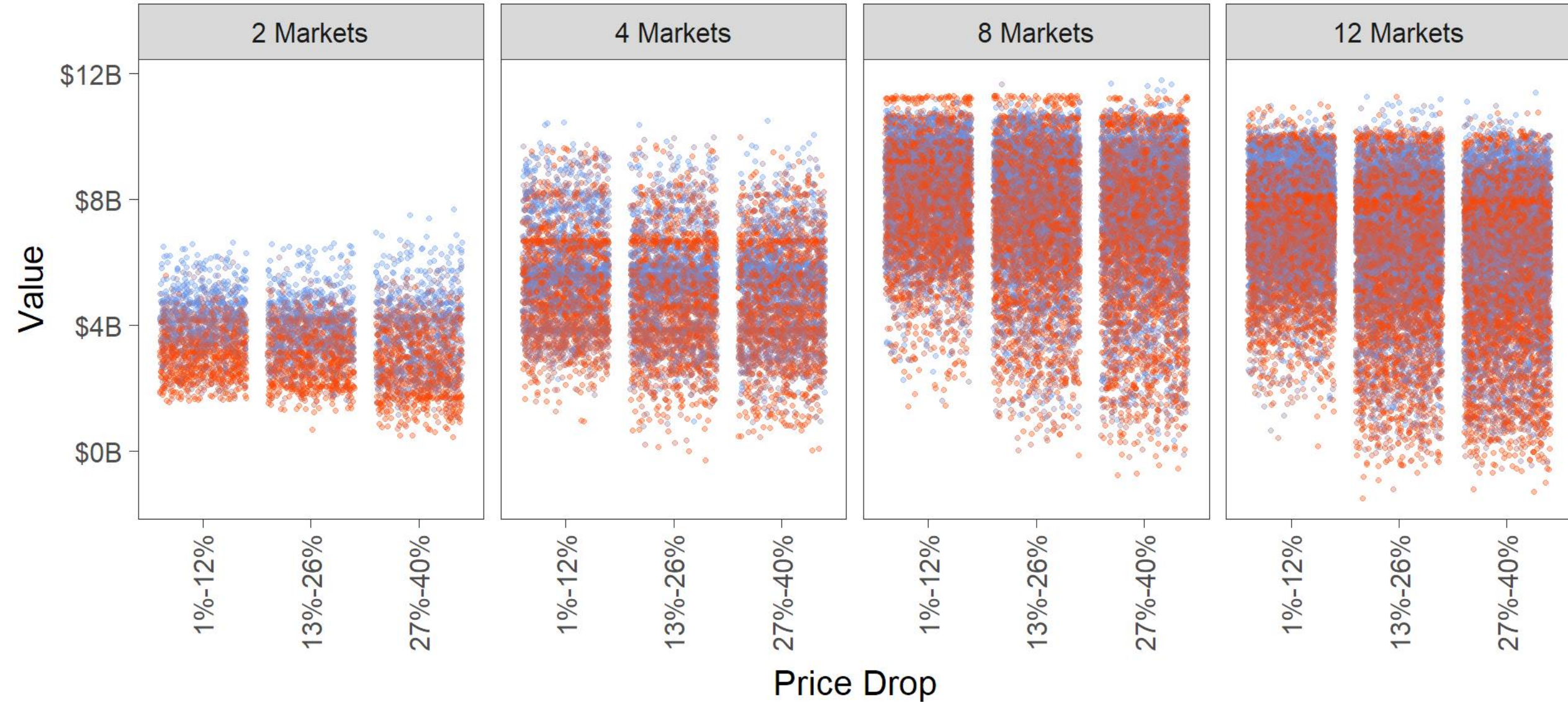
F-statistic: 8174 on 11 and 62388 DF, p-value: < 2.2e-16

TCS Regression Model



Total Provider Profit

MARR 5% 10% 15% 20%



TPF Regression Model

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	5.457e+09	3.154e+07	173.03	<2e-16	***
Markets4.Markets	1.682e+09	3.039e+07	55.33	<2e-16	***
Markets8.Markets	4.071e+09	2.774e+07	146.73	<2e-16	***
Markets12.Markets	3.218e+09	2.680e+07	120.07	<2e-16	***
Price_Drop13..26.	-6.276e+08	1.686e+07	-37.23	<2e-16	***
Price_Drop27..40.	-9.162e+08	1.686e+07	-54.35	<2e-16	***
Bundle_Impact21..40.	-5.575e+08	1.947e+07	-28.64	<2e-16	***
Bundle_Impact41..60.	-1.085e+09	1.947e+07	-55.73	<2e-16	***
Bundle_Impact100.	-1.737e+09	1.947e+07	-89.23	<2e-16	***
MARR10.	-5.721e+08	1.947e+07	-29.39	<2e-16	***
MARR15.	-1.165e+09	1.947e+07	-59.87	<2e-16	***
MARR20.	-7.218e+08	1.947e+07	-37.08	<2e-16	***

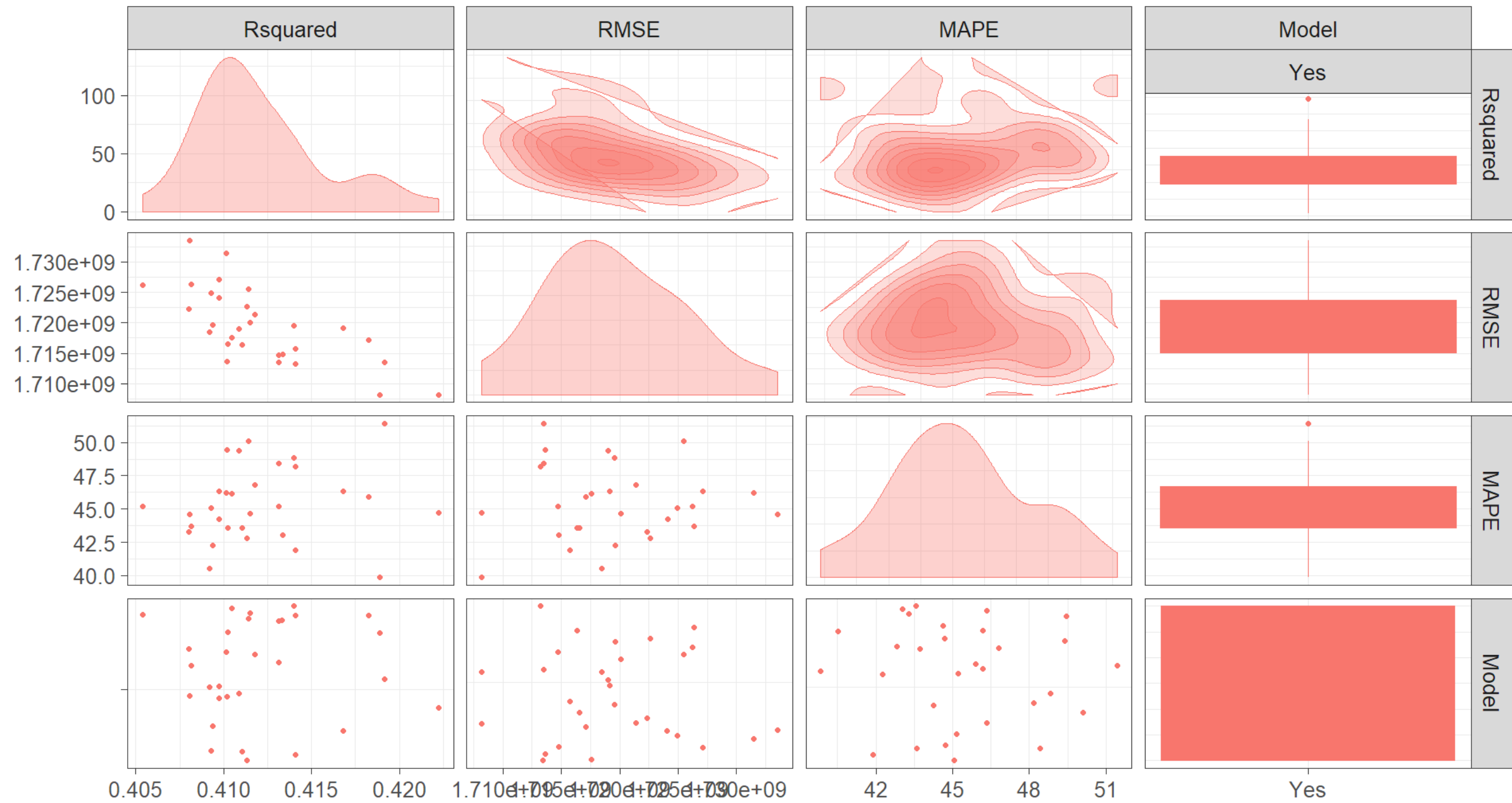
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Residual standard error: 1.719e+09 on 62388 degrees of freedom

Multiple R-squared: 0.4116, Adjusted R-squared: 0.4115

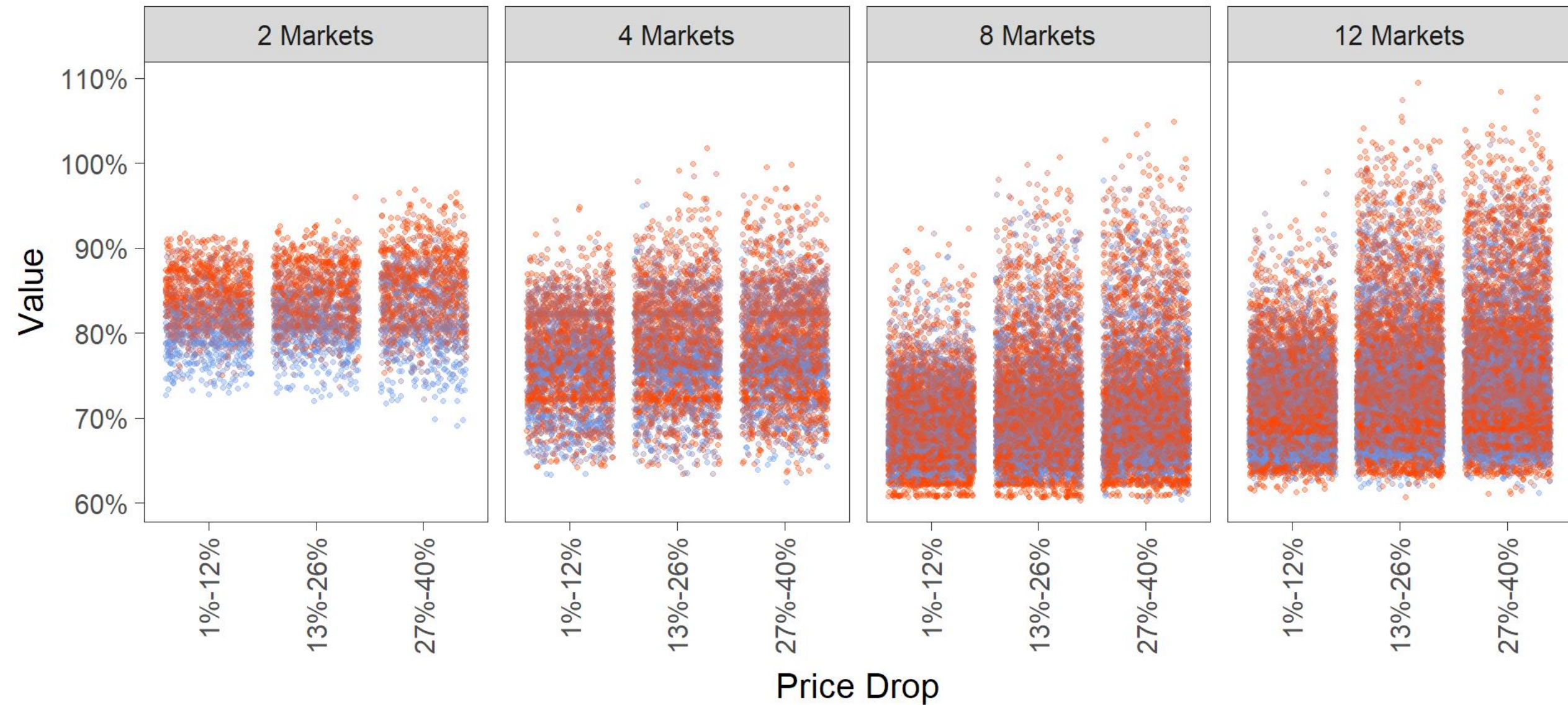
F-statistic: 3967 on 11 and 62388 DF, p-value: < 2.2e-16

TPF Regression Model



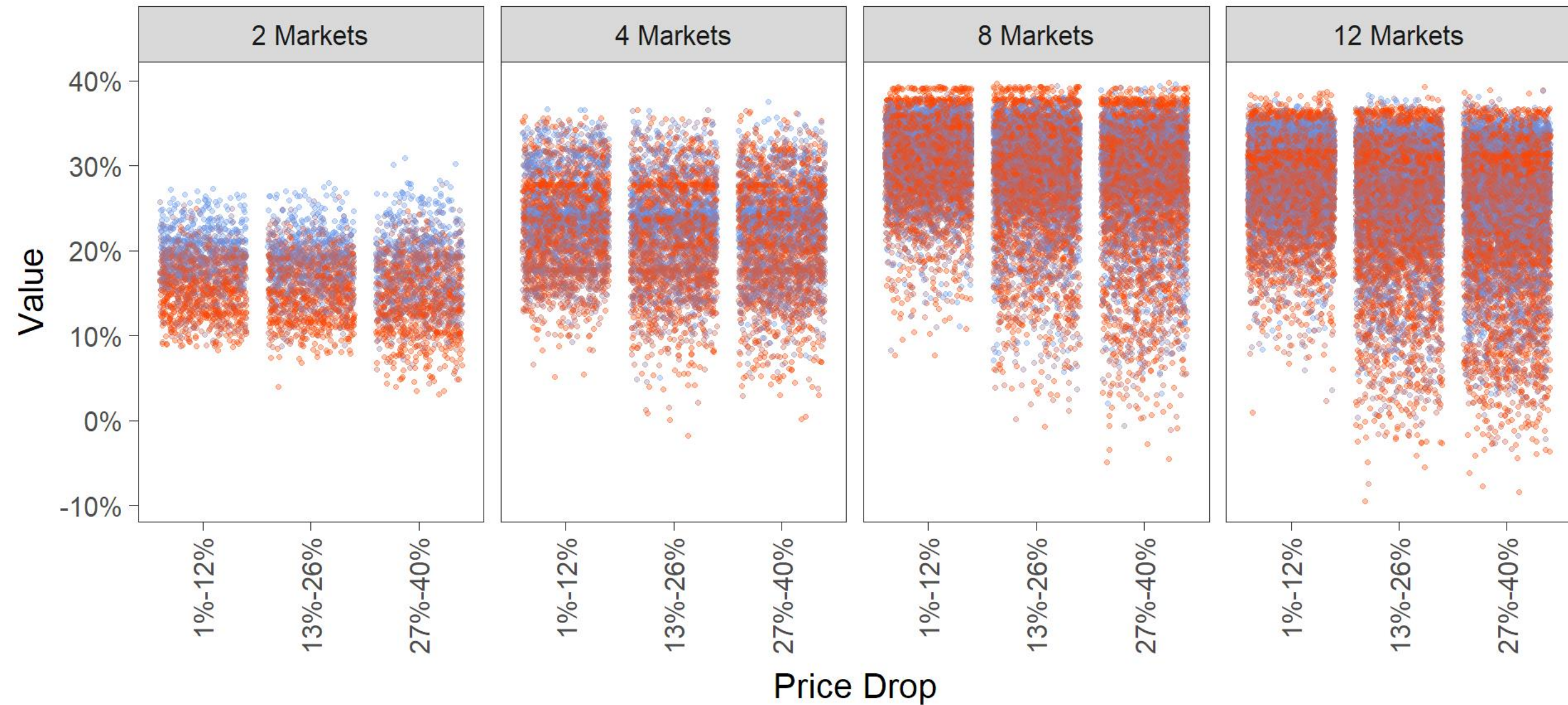
Consumer Market Value

MARR 5% 10% 15% 20%

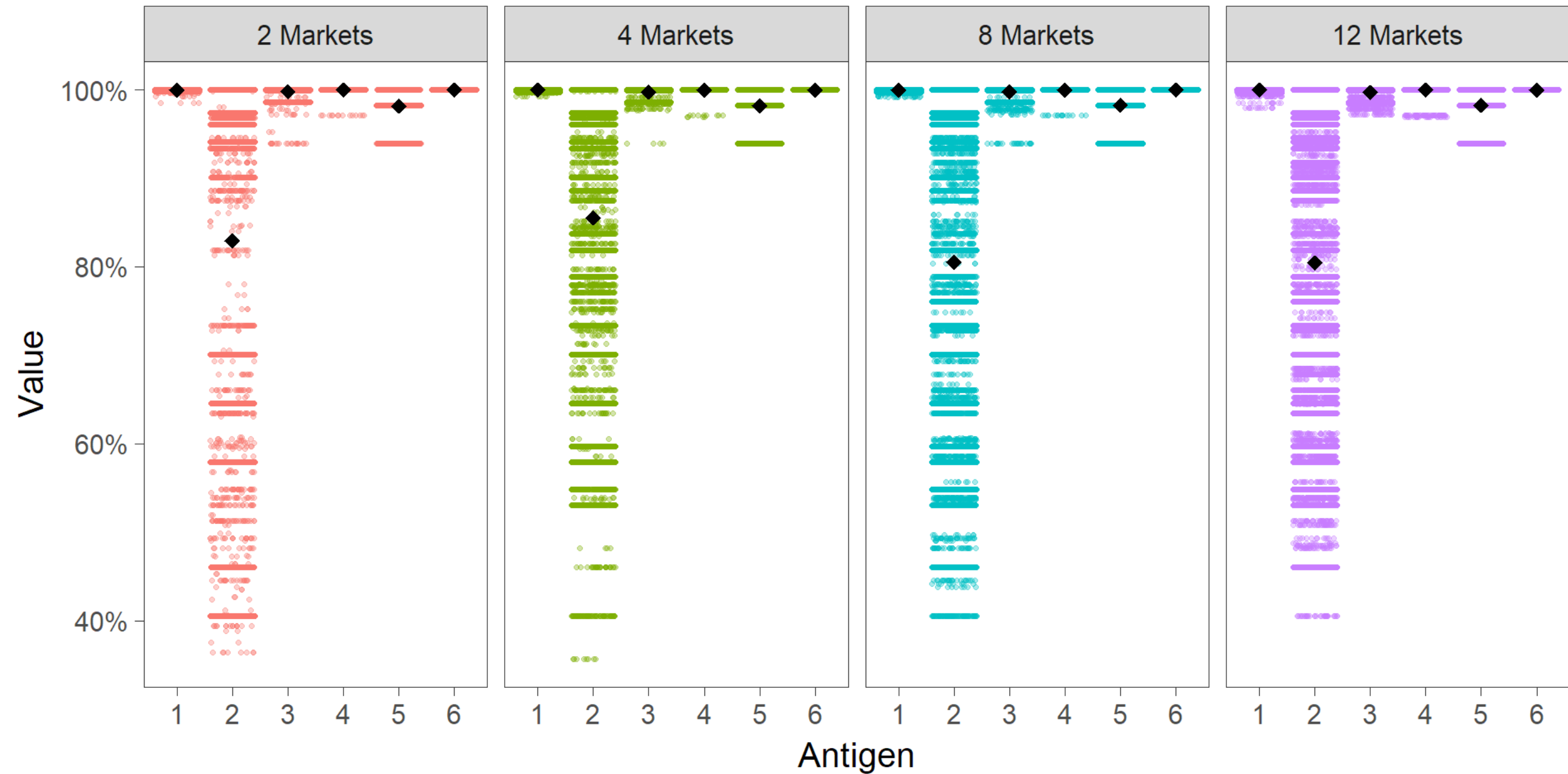


Provider Market Value

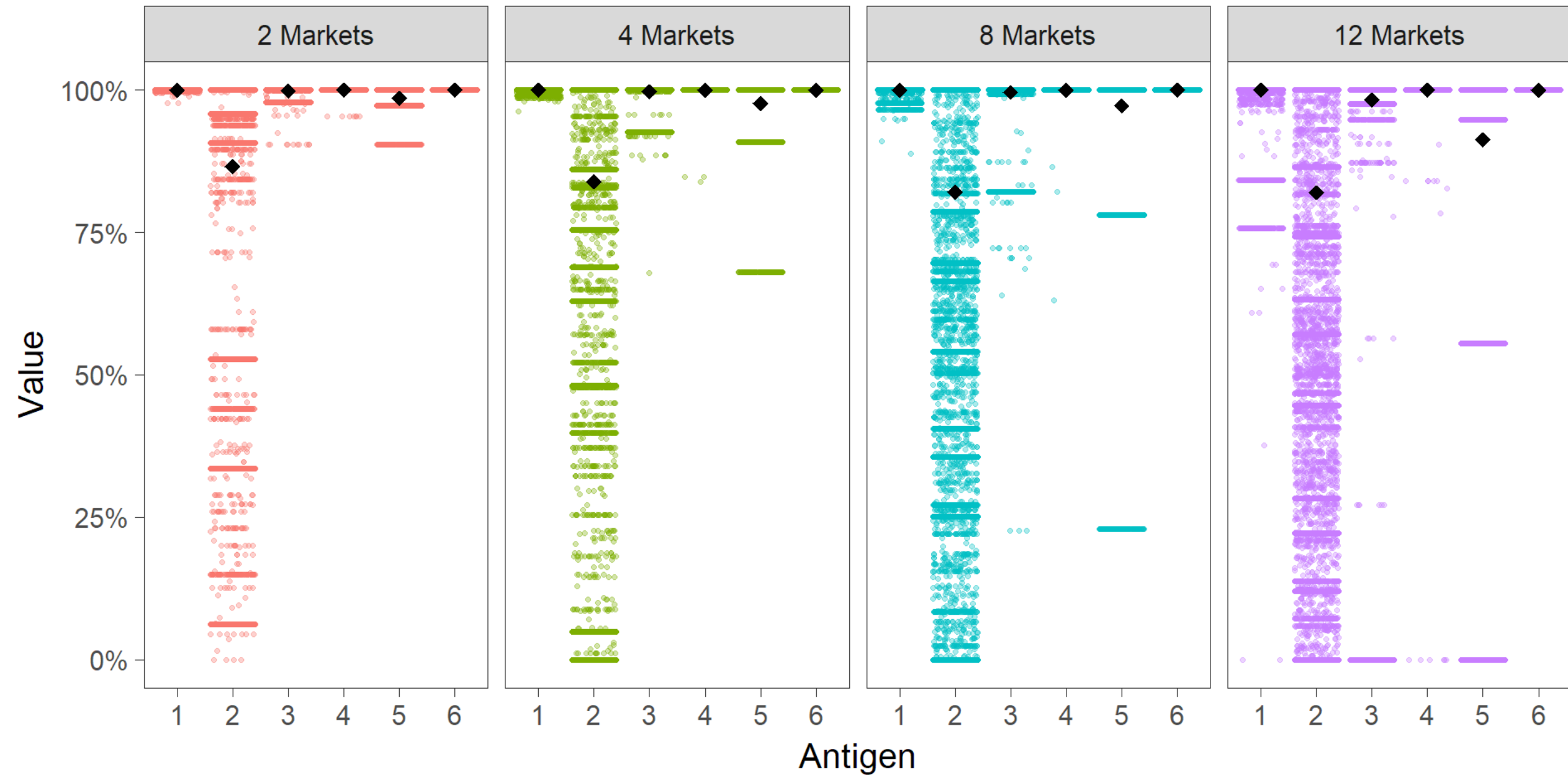
MARR 5% 10% 15% 20%



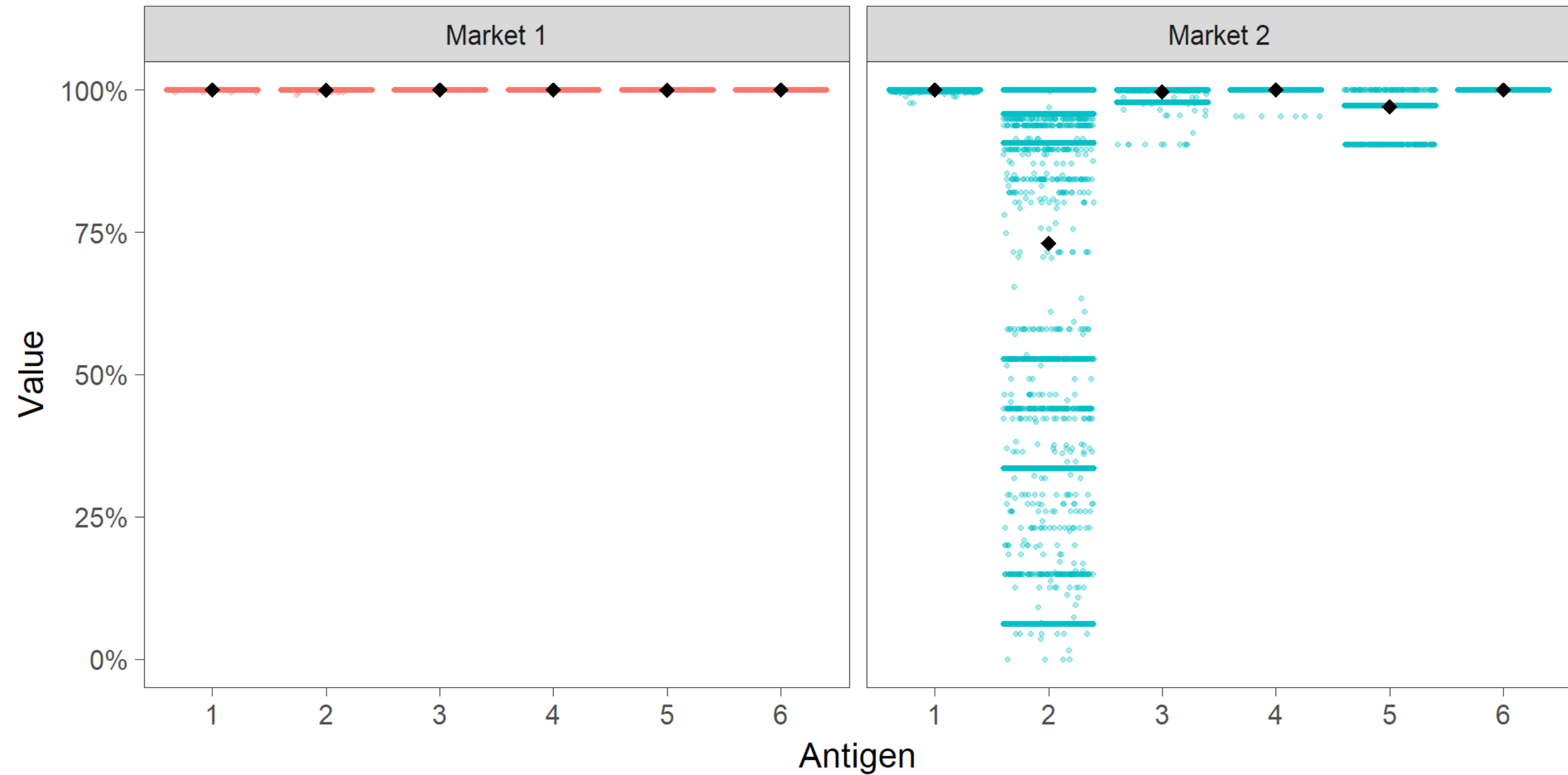
Global Demand Satisfaction



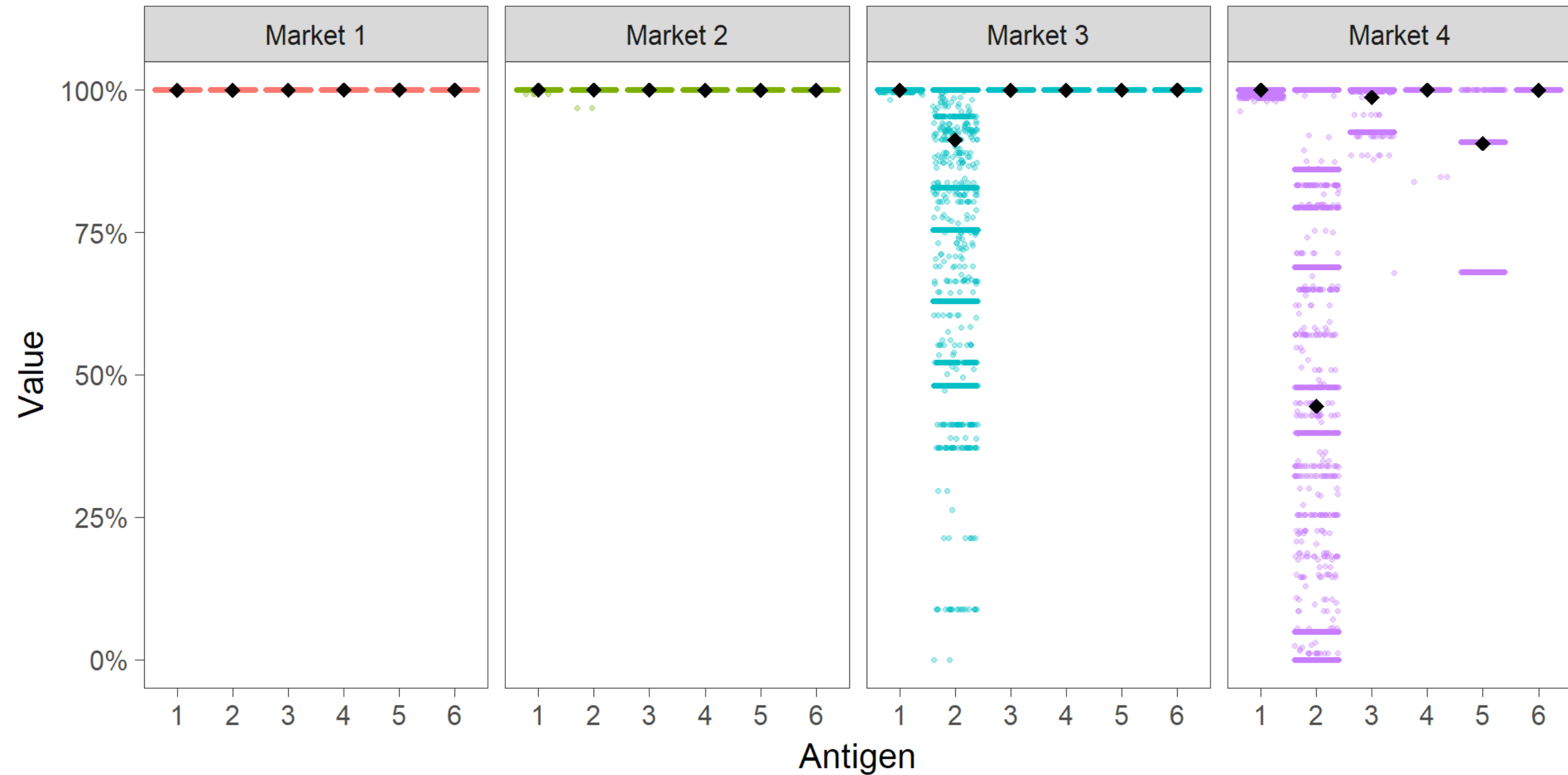
Market Demand Satisfaction



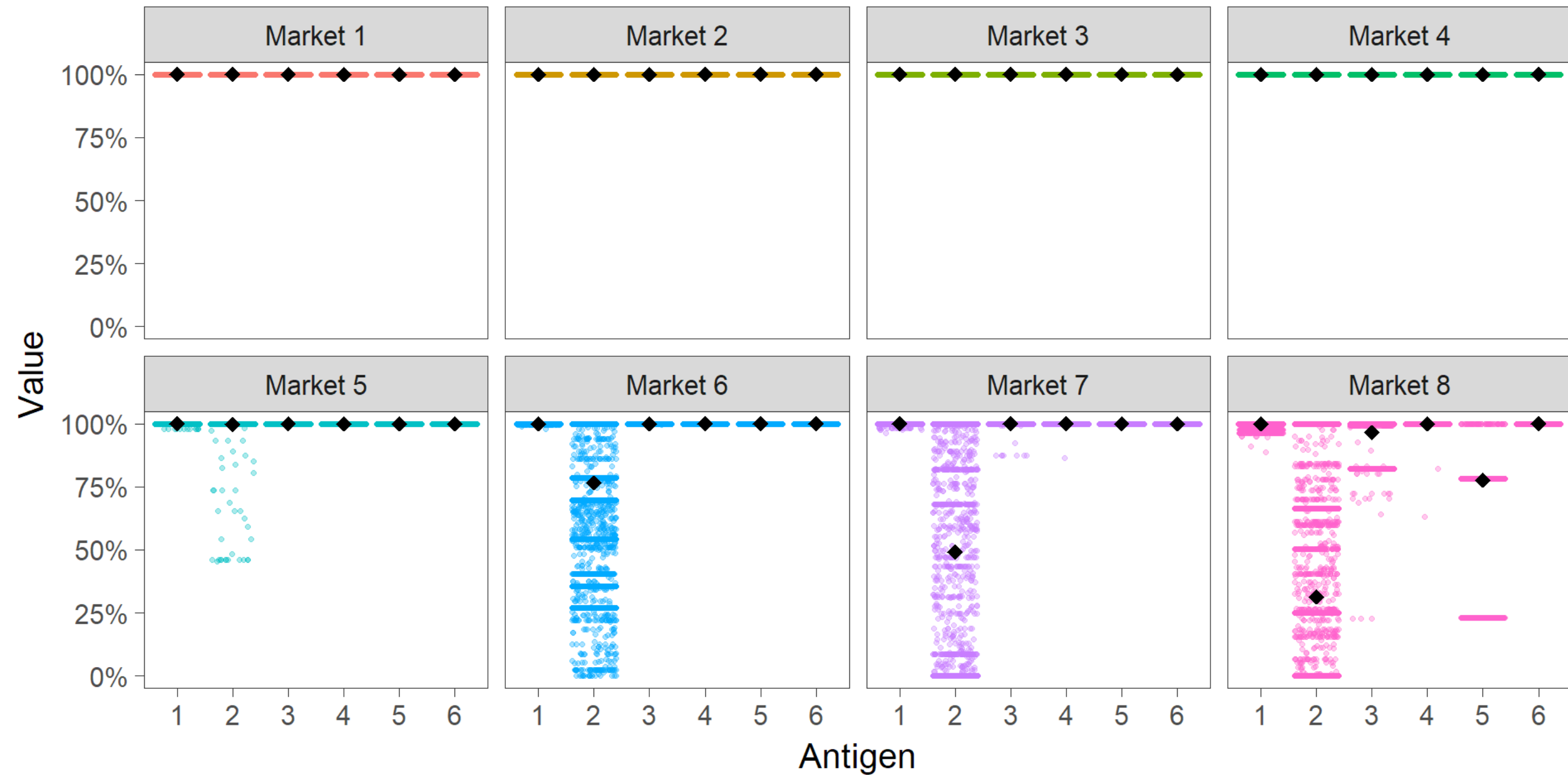
Market Demand Satisfaction



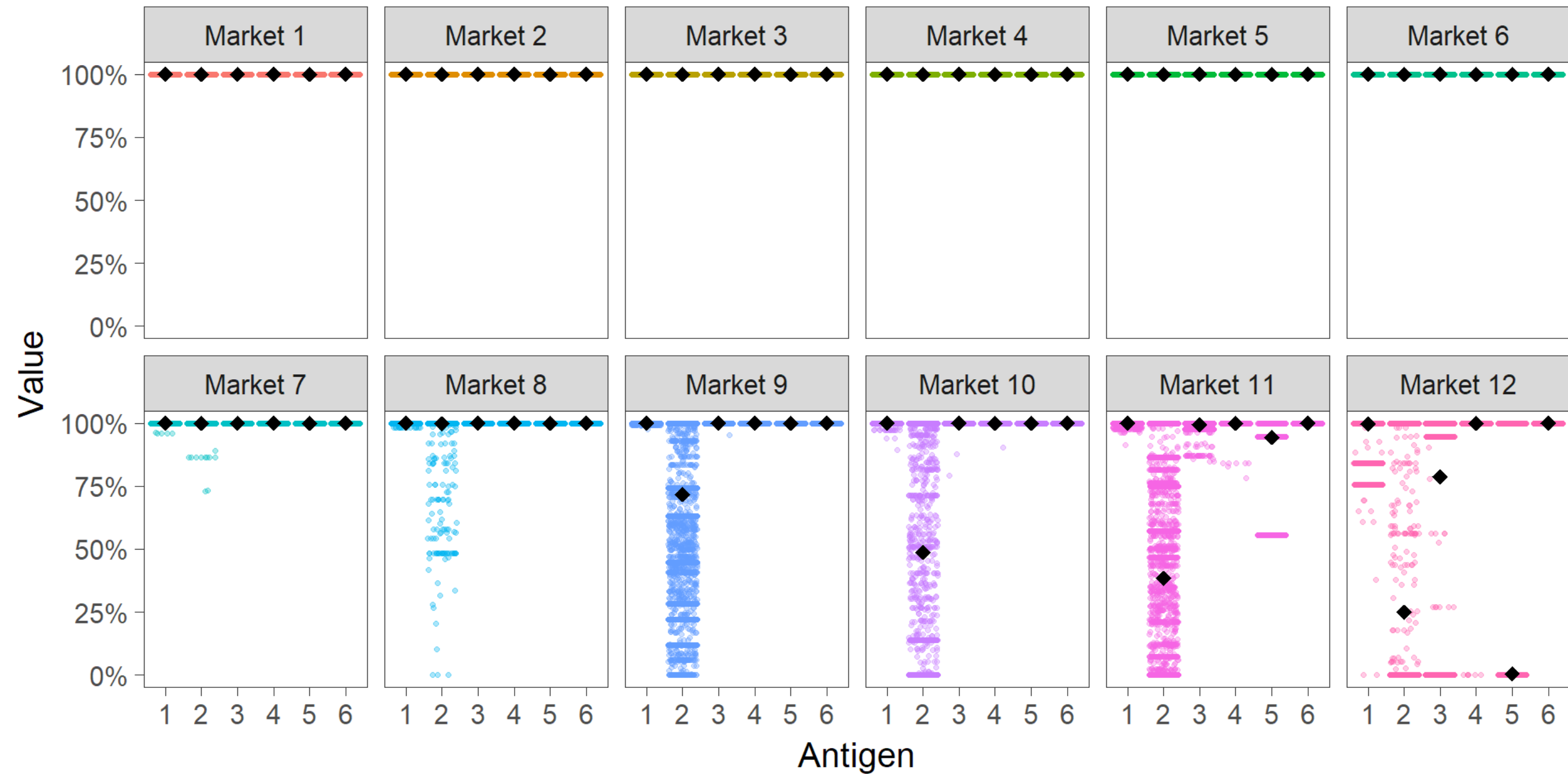
Market Demand Satisfaction



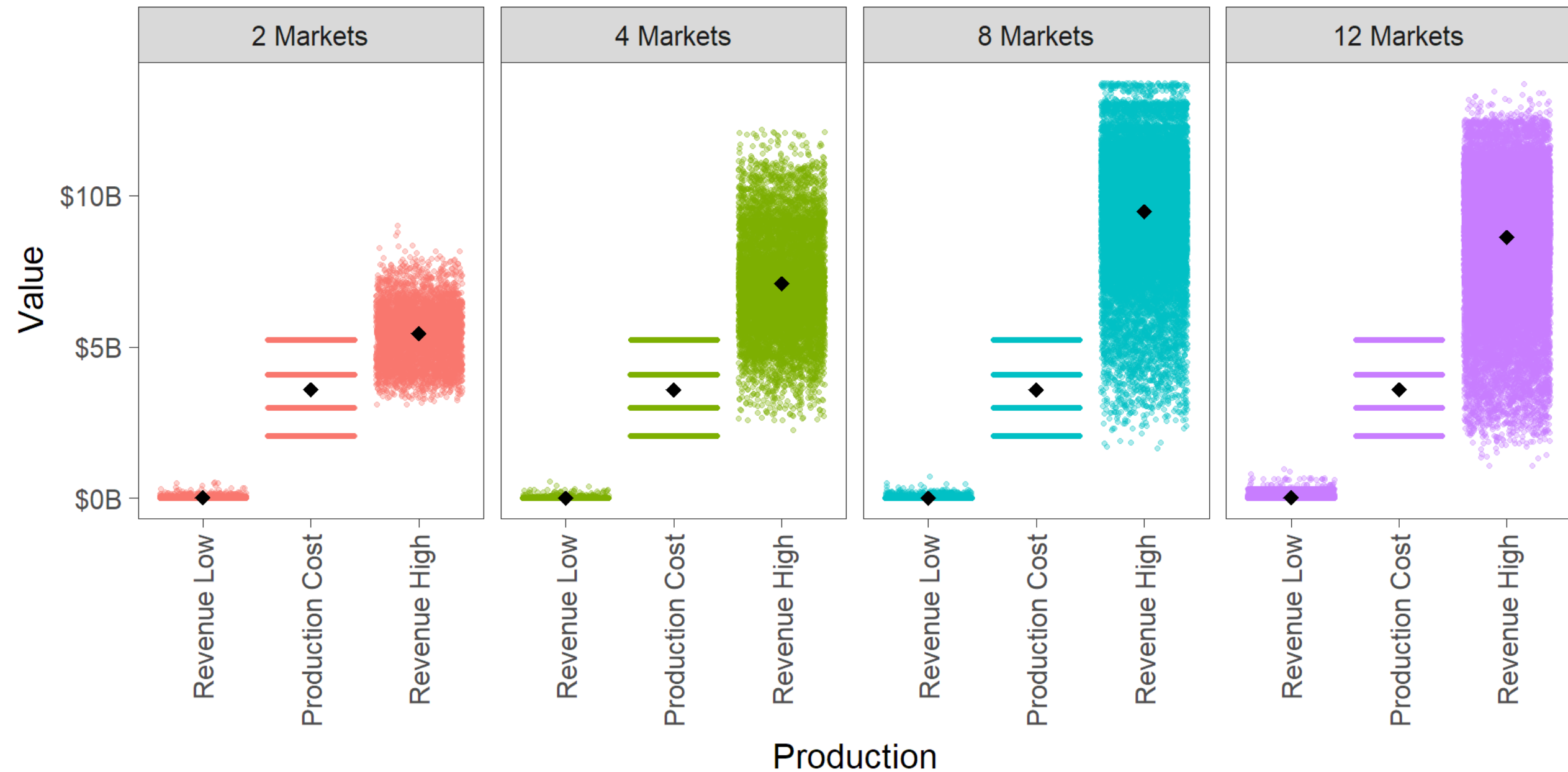
Market Demand Satisfaction



Market Demand Satisfaction



Production Cost Recovery



Dropped Constraints

