

APPENDIX

A Background Trading Strategies

Table 1: Background trading strategies included in empirical game-theoretic analysis.

Strategy	ZI ₁	ZI ₂	ZI ₃	ZI ₄	ZI ₅	ZI ₆	ZI ₇	HBL ₁	HBL ₂	HBL ₃	HBL ₄
L	NA	NA	NA	NA	NA	NA	NA	2	3	5	8
R_{\min}	0	0	0	0	0	250	250	250	250	250	250
R_{\max}	250	500	1000	1000	2000	500	500	500	500	500	500
η	1	1	0.8	1	0.8	0.8	1	1	1	1	1

B Market Environments

Table 2: Market environments explored in empirical game-theoretic analysis.

Parameters	Low	Medium	High
Shock Var σ_s^2	10^5	5×10^5	10^6
Observation Var σ_n^2	10^3	10^6	10^9

Env	A1	A2	A3	B1	B2	B3	C1	C2	C3
σ_s^2	low	low	low	medium	medium	medium	high	high	high
σ_n^2	low	medium	high	low	medium	high	low	medium	high

C Market Surpluses and HBL Adoption Rates of Equilibria

Table 3: Each row of the tables describes the market surplus and the HBL adoption rate (rounded to the nearest integer) of every equilibrium found in a game. Surpluses marked with asterisks in games without spoofing are statistically significantly larger than surpluses achieved in the corresponding market environment with spoofing.

(a) N = 28 without spoofing (b) N = 65 without spoofing (c) N = 28 with spoofing (d) N = 65 with spoofing

Env	surplus	HBL%
A1	18198*	88
A1	18246*	98
A2	18189*	100
A3	18265*	100
B1	17947*	58
B1	16693*	0
B2	17923*	62
B2	17927*	43
B2	16726	0
B3	18266*	100
C1	16565	0
C1	17143*	0
C2	16667	0
C3	18253*	87

Env	surplus	HBL%
A1	43157*	71
A1	43102*	73
A1	43010*	95
A2	43249*	83
A2	43086*	79
A3	42946	94
B1	42804*	57
B2	42807*	56
B2	42745*	56
B3	43265*	86
C1	42455*	37
C2	42383*	37
C2	42144*	32
C3	42981	89

Env	surplus	HBL%
A1	18076	78
A2	18040	91
A3	18125	87
B1	16774	0
B2	17883	34
B2	17517	24
B2	16796	0
B3	18108	81
C1	16749	0
C2	16667	0
C3	17999	97

Env	surplus	HBL%
A1	42868	70
A1	42993	70
A2	42961	80
A3	43061	80
A3	43103	74
B1	42639	41
B1	42698	50
B2	42624	52
B3	43038	75
B3	43101	76
C1	41815	29
C1	39502	0
C2	40091	0
C3	43143	71

D Approximate Strategic Equilibria

D.1 Markets without spoofing

Table 4: Equilibria for games without spoofing, $N = 28$, calculated from the 4-player DPR approximation. Each row of the table describes one equilibrium found with its corresponding surplus, HBL adoption rate and the equilibrium mixture probabilities of strategies included.

Env	surplus	HBL	ZI ₁	ZI ₂	ZI ₃	ZI ₄	ZI ₅	ZI ₆	ZI ₇	HBL ₁	HBL ₂	HBL ₃	HBL ₄
A1	18198	0.88	0	0.12	0	0	0	0	0	0.88	0	0	0
A1	18246	0.98	0	0	0	0	0.02	0	0	0	0.92	0.06	0
A2	18189	1	0	0	0	0	0	0	0	0.82	0	0.18	0
A3	18265	1	0	0	0	0	0	0	0	1	0	0	0
B1	17947	0.58	0	0	0	0.40	0.02	0	0	0	0.40	0.18	0
B1	16693	0	0	0	0	0	0	0.74	0.26	0	0	0	0
B2	17923	0.62	0	0	0	0	0.38	0	0	0.44	0.18	0	0
B2	17927	0.43	0	0.04	0.53	0	0	0	0	0.43	0	0	0
B2	16726	0	0	0	0	0	0	0.80	0.20	0	0	0	0
B3	18266	1	0	0	0	0	0	0	0	0.74	0.24	0	0.02
C1	16565	0	0	0	0	0	0	0.73	0.27	0	0	0	0
C1	17143	0	0	0	0.53	0	0	0	0.47	0	0	0	0
C2	16667	0	0	0	0	0	0	1	0	0	0	0	0
C3	18253	0.87	0	0	0.13	0	0	0	0	0.84	0	0	0.03

Table 5: Equilibria for games without spoofing, $N = 65$, calculated from the 5-player DPR approximation. Each row of the table describes one equilibrium found with its corresponding surplus, HBL adoption rate and the equilibrium mixture probabilities of strategies included.

Env	surplus	HBL	ZI ₁	ZI ₂	ZI ₃	ZI ₄	ZI ₅	ZI ₆	ZI ₇	HBL ₁	HBL ₂	HBL ₃	HBL ₄
A1	43157	0.71	0	0.29	0	0	0	0	0	0.59	0	0.12	0
A1	43102	0.73	0	0	0.27	0	0	0	0	0.73	0	0	0
A1	43010	0.95	0	0	0.05	0	0	0	0	0.22	0	0.73	0
A2	43249	0.83	0	0	0.17	0	0	0	0	0.57	0	0.26	0
A2	43086	0.79	0	0.05	0.16	0	0	0	0	0	0.79	0	0
A3	42946	0.94	0	0.04	0.02	0	0	0	0	0.75	0.19	0	0
B1	42804	0.57	0	0	0.43	0	0	0	0	0.31	0.26	0	0
B2	42807	0.56	0	0	0.44	0	0	0	0	0.31	0.25	0	0
B2	42745	0.56	0.01	0	0	0.43	0	0	0	0	0.56	0	0
B3	43265	0.86	0	0.06	0	0.08	0	0	0	0.67	0.19	0	0
C1	42455	0.37	0	0	0.63	0	0	0	0	0	0.18	0.19	0
C2	42383	0.37	0	0	0.63	0	0	0	0	0.26	0	0.11	0
C2	42144	0.32	0	0	0	0.54	0.14	0	0	0	0	0.32	0
C3	42981	0.89	0	0.08	0	0	0	0.03	0	0.89	0	0	0

D.2 Markets with spoofing

Table 6: Equilibria for games with spoofing, $N = 28$, calculated from the 4-player DPR approximation. Each row of the table describes one equilibrium found with its corresponding surplus, HBL adoption rate and the equilibrium mixture probabilities of strategies included.

Env	surplus	HBL	ZI ₁	ZI ₂	ZI ₃	ZI ₄	ZI ₅	ZI ₆	ZI ₇	HBL ₁	HBL ₂	HBL ₃	HBL ₄
A1	18076	0.78	0	0	0.22	0	0	0	0	0.78	0	0	0
A2	18040	0.91	0	0	0	0.09	0	0	0	0.91	0	0	0
A3	18125	0.87	0	0	0.13	0	0	0	0	0.87	0	0	0
B1	16774	0	0	0	0	0	0	1	0	0	0	0	0
B2	17883	0.34	0	0	0.11	0.55	0	0	0	0	0.34	0	0
B2	17517	0.24	0	0	0.54	0	0	0	0.21	0.24	0	0	0
B2	16796	0	0	0	0	0	0	1	0	0	0	0	0
B3	18108	0.81	0	0	0.12	0.07	0	0	0	0.81	0	0	0
C1	16749	0	0	0	0	0	0.04	0.96	0	0	0	0	0
C2	16667	0	0	0	0	0	0	1	0	0	0	0	0
C3	17999	0.97	0	0	0	0.03	0	0	0	0.75	0	0.22	0

Table 7: Equilibria for games with spoofing, $N = 65$, calculated from the 5-player DPR approximation. Each row of the table describes one equilibrium found with its corresponding surplus, HBL adoption rate and the equilibrium mixture probabilities of strategies included.

Env	surplus	HBL	ZI ₁	ZI ₂	ZI ₃	ZI ₄	ZI ₅	ZI ₆	ZI ₇	HBL ₁	HBL ₂	HBL ₃	HBL ₄
A1	42868	0.70	0.21	0	0.09	0	0	0	0	0.70	0	0	0
A1	42993	0.70	0	0.30	0	0	0	0	0	0.54	0.16	0	0
A2	42961	0.80	0	0	0.20	0	0	0	0	0.51	0.29	0	0
A3	43061	0.80	0	0	0.20	0	0	0	0	0.80	0	0	0
A3	43103	0.74	0	0.26	0	0	0	0	0	0.74	0	0	0
B1	42639	0.41	0	0	0	0.59	0	0	0	0	0.41	0	0
B1	42698	0.50	0	0	0.50	0	0	0	0	0.32	0	0.18	0
B2	42624	0.52	0	0	0.48	0	0	0	0	0	0.38	0.14	0
B3	43038	0.75	0	0.25	0	0	0	0	0	0.48	0.27	0	0
B3	43101	0.76	0	0.24	0	0	0	0	0	0.41	0.35	0	0
C1	41815	0.29	0	0	0.50	0	0	0.21	0	0	0.29	0	0
C1	39502	0	0	0	0	0	0	0	1	0	0	0	0
C2	40091	0	0	0	0	0	0	0.77	0.23	0	0	0	0
C3	43143	0.71	0.10	0	0.19	0	0	0	0	0.71	0	0	0

D.3 Markets with agents restricted to ZI strategies

Table 8: Equilibria for games where agents are restricted to ZI strategies, $N = 28$, calculated from the 4-player DPR approximation. Each row of the table describes one equilibrium found with its corresponding surplus and the equilibrium mixture probabilities of strategies included.

Env	surplus	ZI ₁	ZI ₂	ZI ₃	ZI ₄	ZI ₅	ZI ₆	ZI ₇
A1	16929	0	0	0	0	0	0.98	0.02
A2	16914	0	0	0	0	0	0.89	0.11
A3	18213	0.22	0.78	0	0	0	0	0
B1	16693	0	0	0	0	0	0.74	0.26
B2	17192	0	0	0.42	0	0	0	0.58
B2	16726	0	0	0	0	0	0.80	0.20
B3	16746	0	0	0.09	0	0	0	0.91
B3	17516	0.38	0	0	0	0	0.62	0
C1	16565	0	0	0	0	0	0.73	0.27
C1	17143	0	0	0.53	0	0	0	0.47
C2	16667	0	0	0	0	0	1	0
C3	17861	0.31	0.39	0	0	0	0.30	0

Table 9: Equilibria for games where agents are restricted to ZI strategies, $N = 65$, calculated from the 5-player DPR approximation. Each row of the table describes one equilibrium found with its corresponding surplus and the equilibrium mixture probabilities of strategies included.

Env	surplus	ZI ₁	ZI ₂	ZI ₃	ZI ₄	ZI ₅	ZI ₆	ZI ₇
A1	42938	0	1	0	0	0	0	0
A1	40779	0	0	0	0	0	1	0
A2	42972	0	0.97	0	0	0	0	0.03
A2	40557	0	0	0	0	0	0.83	0.17
A3	43327	0.44	0.56	0	0	0	0	0
A3	43173	0.11	0.89	0	0	0	0	0
B1	40444	0	0	0	0	0	1	0
B2	39622	0	0	0	0	0	1	0
B3	43140	0	0.73	0.27	0	0	0	0
C1	40523	0	0	0.28	0	0	0	0.72
C1	40038	0	0	0	0	0	0.60	0.40
C2	40458	0	0	0	0.08	0	0.73	0.19
C3	43197	0	0.88	0	0.12	0	0	0