

Online appendix

Online food delivery industry. The market for food delivery in the U.S. grew rapidly in recent years to an estimated \$27 billion in 2019. By mid-2020, nearly two-thirds of households had ordered food delivery online at least once. Every major fast food chain is now partnered with at least one major delivery firm such as Grubhub, DoorDash, Postmates, and Uber Eats. Yet, growth opportunities remain vast, given a still low 6% penetration rate of the \$350 billion restaurant market. The size of the opportunity has led firms to rapidly expand their networks of restaurants and cities and use aggressive price discounts to win diners and orders.

Importantly for our paper, this ongoing battle for market dominance was made possible through access to capital markets. As Figure OA1 shows, fierce competition has led to steep losses among the key players and left them without internal funds to finance growth. Total capital injections into the online food delivery industry, especially in the form of venture capital funding and initial public offerings, exceeded \$16 billion by 2020, with DoorDash alone raising new equity eight times between 2014 and 2019. With funding temporarily drying up in 2020, Waitr was forced to scale back expansion plans and lay off employees in many cities while Uber Eats stopped delivering food in South Korea and India. Uber Eats merged with Postmates in the U.S. in mid-2020.

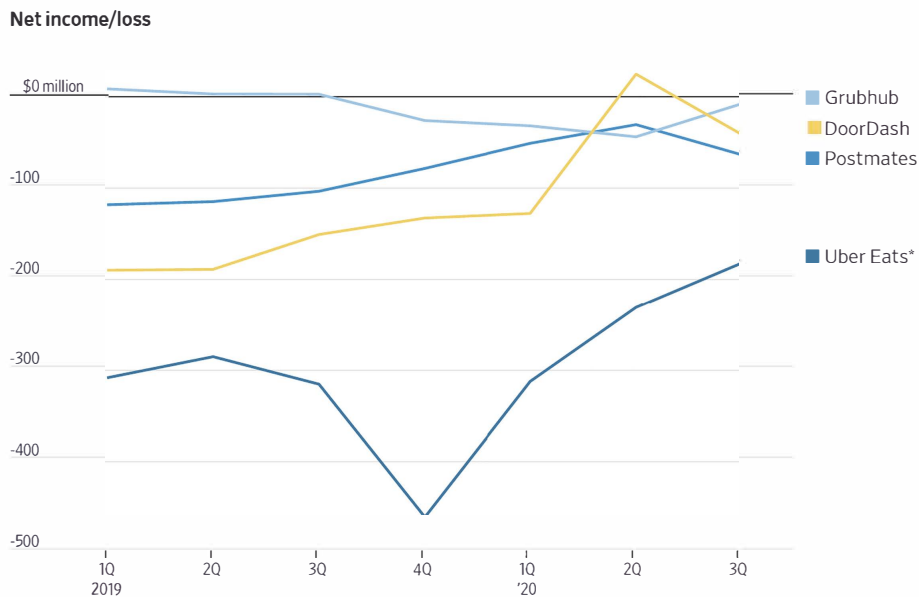


Figure OA1: Losses of largest online food delivery firms in U.S. Source: Wall Street Journal.

Additional results. The figures in this appendix supplement the main text as follows:

- Figures OA2, OA3, OA4, OA5, and OA6 pertain to the paragraph titled “Industry concentration” in Section 3.3;
- Figures OA7, OA8, OA9, and OA10 pertain to the paragraph titled “Comparative statics” in Section 3.3;
- Figure OA11 pertains to the paragraph titled “Financial frictions” in Section 3.3;
- Figures OA12, OA13, OA14, and OA15 pertain to Section 4.1;
- Figures OA16 and OA17 pertain to the paragraph titled “Profitability” in Section 4.1;
- Figures OA18, OA19, OA20, and OA21 pertain to Section 4.2.
- Figure OA22 pertains to the paragraph titled “Connection between price and investment decisions” in Section 4.2.
- Figure OA23 pertains to Section 4.3.

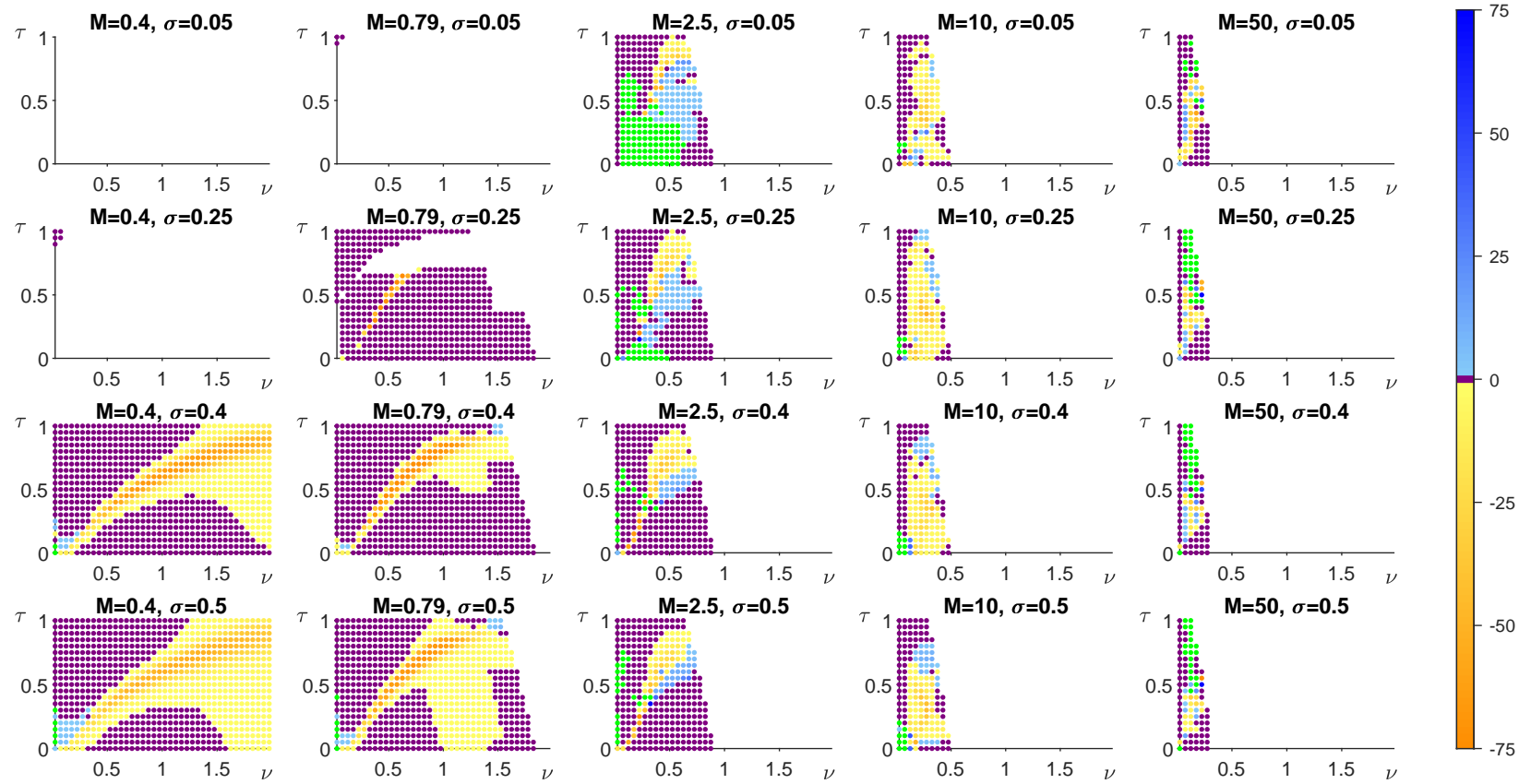


Figure OA2: Industry concentration. Finite difference of $\bar{\omega}^\infty$, averaged over equilibria within parameterizations, with respect to $\log_{10} M$. Darker shades of blue indicate a more positive change. Darker shades of orange indicate a more negative change. Purple indicates no economically meaningful change (band of width of $\frac{0.01L}{\Delta \log_{10} M}$ centered around zero). Green indicates no equilibrium and white a discarded (uninteresting) parameterization. Model with $\zeta = 1$.

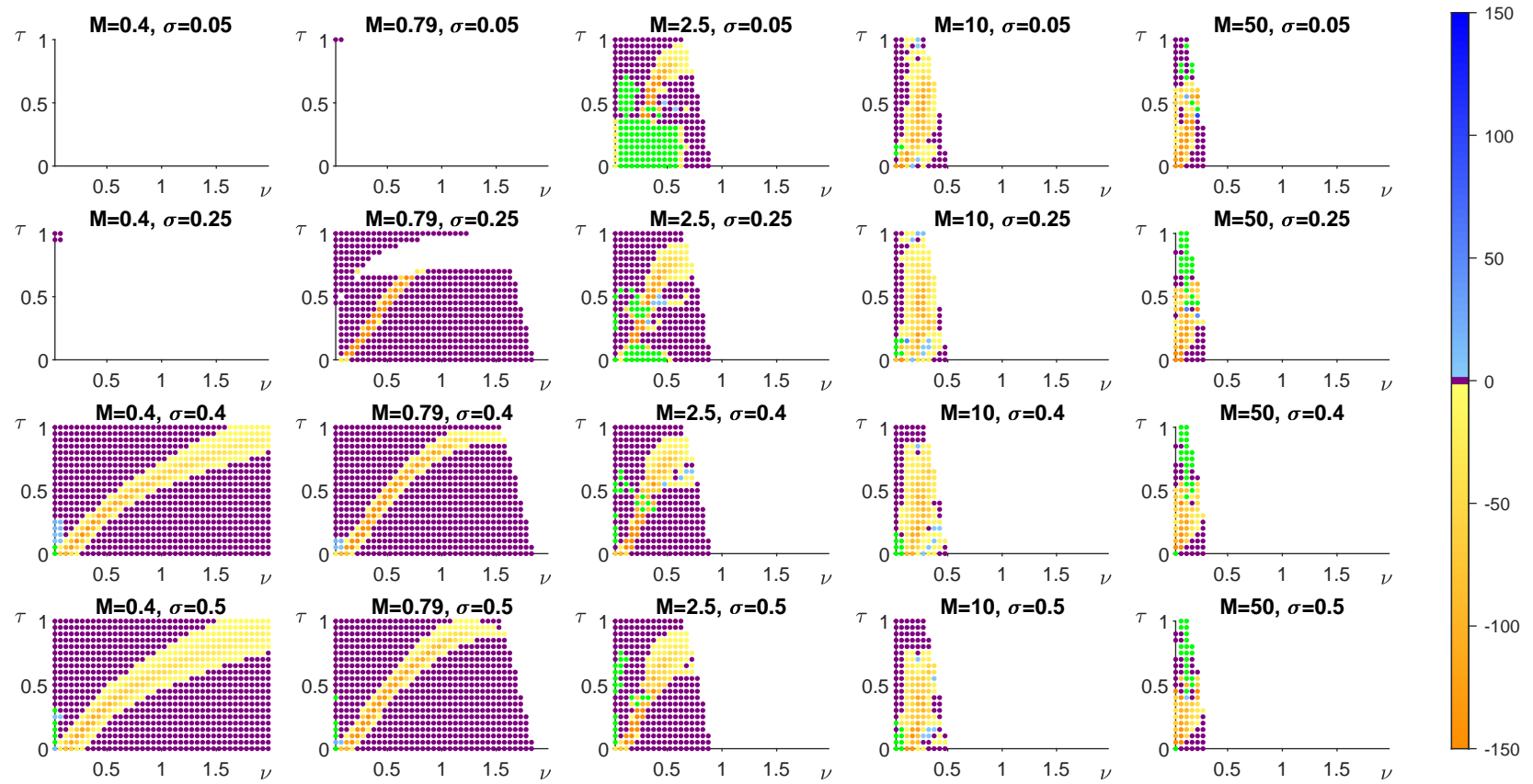


Figure OA3: Industry concentration. Finite difference of $\bar{\omega}^\infty$, averaged over equilibria within parameterizations, with respect to ν . Darker shades of blue indicate a more positive change. Darker shades of orange indicate a more negative change. Purple indicates no economically meaningful change (band of width of $\frac{0.01L}{\Delta\nu}$ centered around zero). Green indicates no equilibrium and white a discarded (uninteresting) parameterization. Model with $\zeta = 1$.

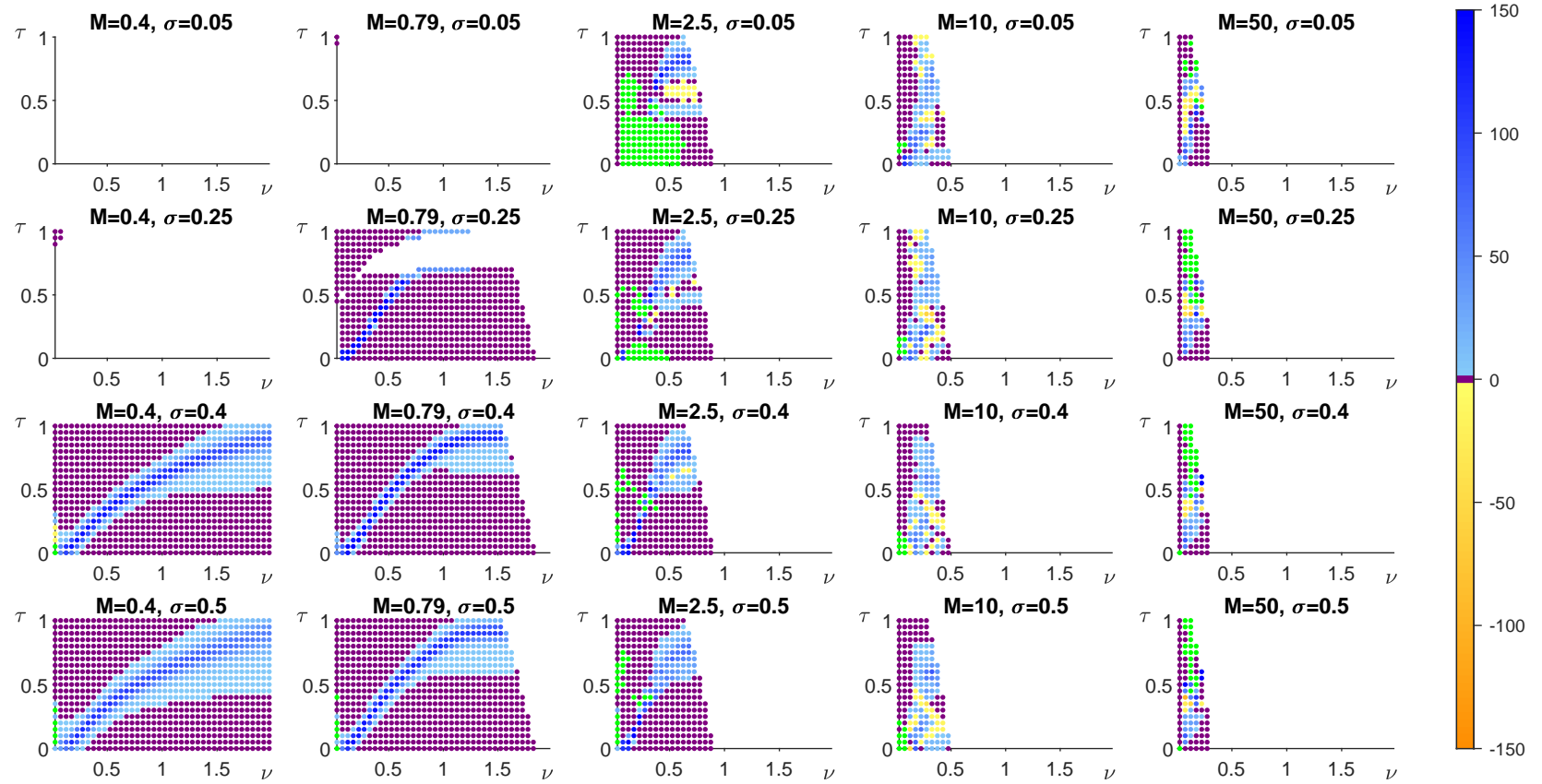


Figure OA4: Industry concentration. Finite difference of $\bar{\omega}^\infty$, averaged over equilibria within parameterizations, with respect to τ . Darker shades of blue indicate a more positive change. Darker shades of orange indicate a more negative change. Purple indicates no economically meaningful change (band of width of $\frac{0.01L}{\Delta\tau}$ centered around zero). Green indicates no equilibrium and white a discarded (uninteresting) parameterization. Model with $\zeta = 1$.

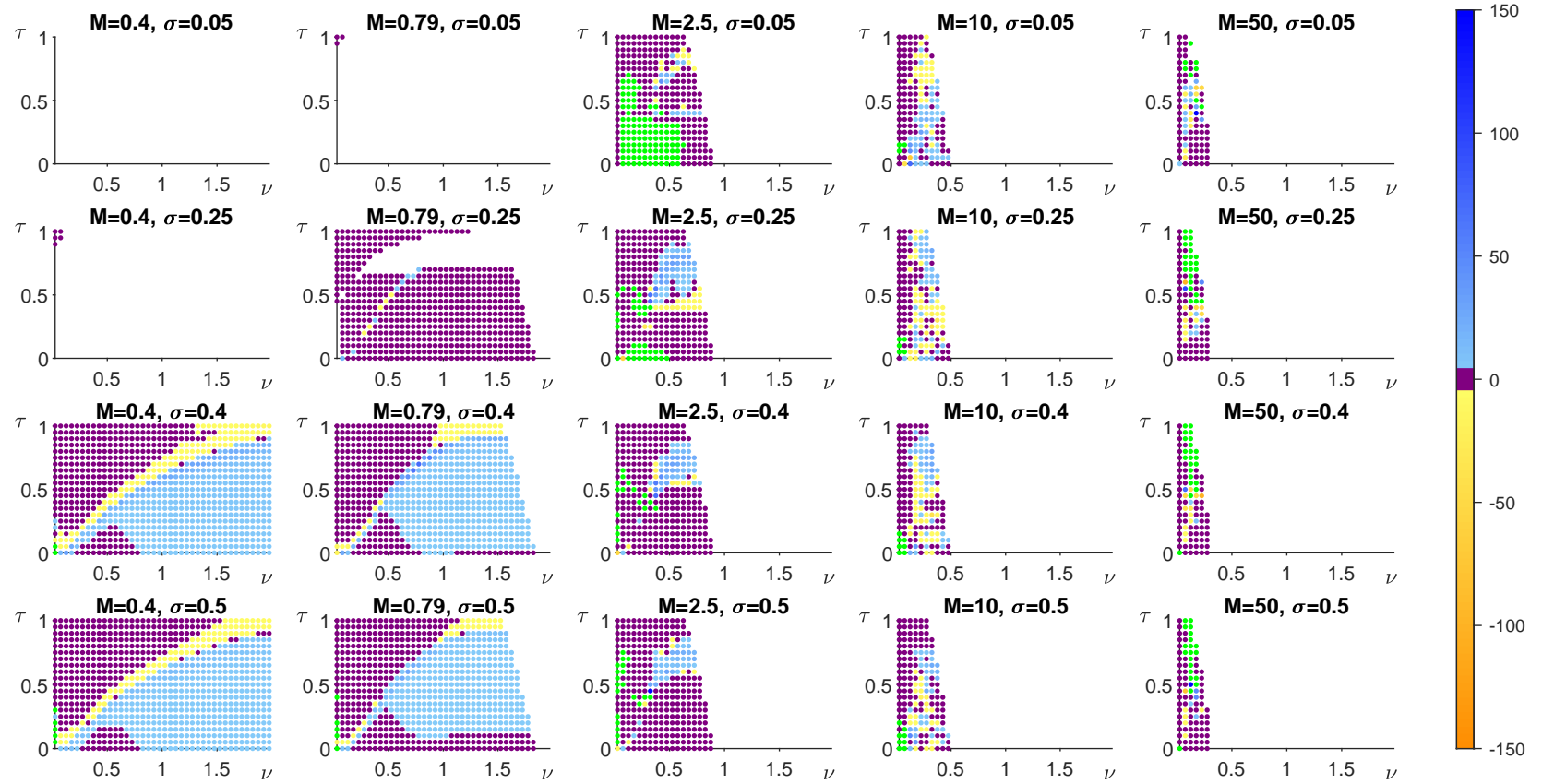


Figure OA5: Industry concentration. Finite difference of $\bar{\omega}^\infty$, averaged over equilibria within parameterizations, with respect to σ . Darker shades of blue indicate a more positive change. Darker shades of orange indicate a more negative change. Purple indicates no economically meaningful change (band of width of $\frac{0.01L}{\Delta\sigma}$ centered around zero). Green indicates no equilibrium and white a discarded (uninteresting) parameterization. Model with $\zeta = 1$.

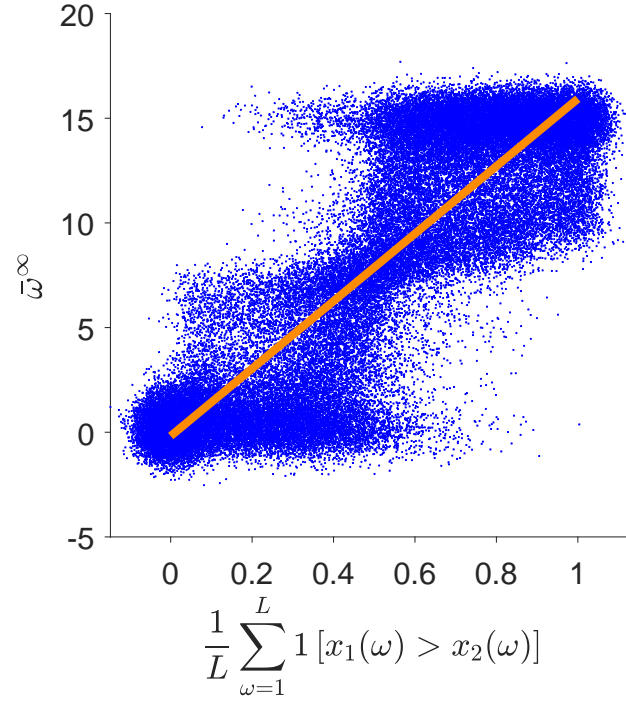


Figure OA6: Industry concentration. Scatter plot of $\frac{1}{L} \sum_{\omega=1}^L 1[x_1(\omega) > x_2(\omega)]$, averaged over equilibria within parameterizations, versus $\bar{\omega}^\infty$, similarly averaged, overlayed by trend line. Noise added to improve visibility. Model with $\zeta = 1$.

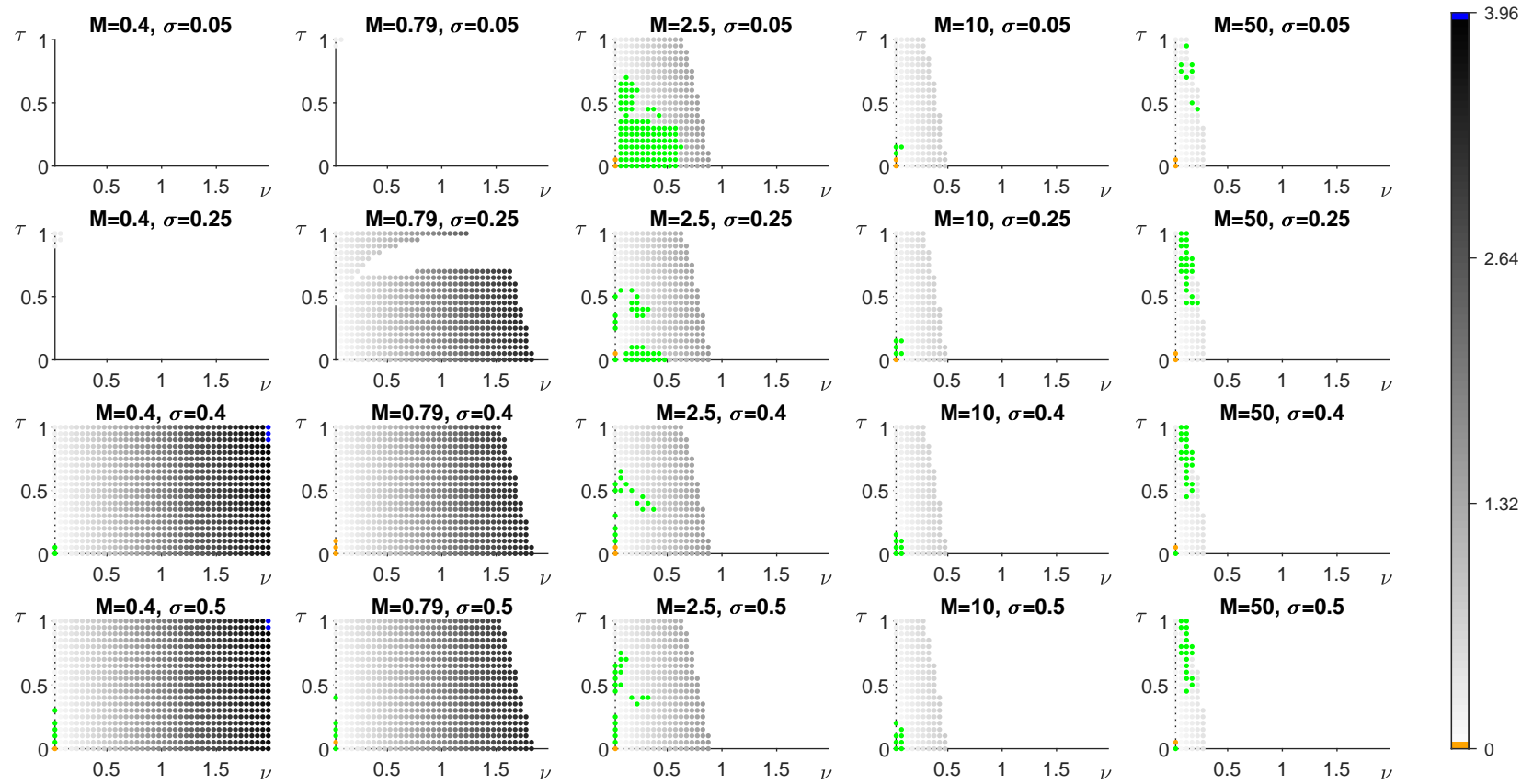


Figure OA7: Comparative statics. Average price charged by firm $\bar{p}_1 = \frac{1}{2L+1} \sum_{\omega=-L}^L p_1(\omega)$, averaged over equilibria within parameterizations. Orange indicates values below 0.01 of range of computed prices and blue values above 0.99. In-between darker shades indicate larger values. Green indicates no equilibrium and white a discarded (uninteresting) parameterization. Model with $\zeta = 1$.

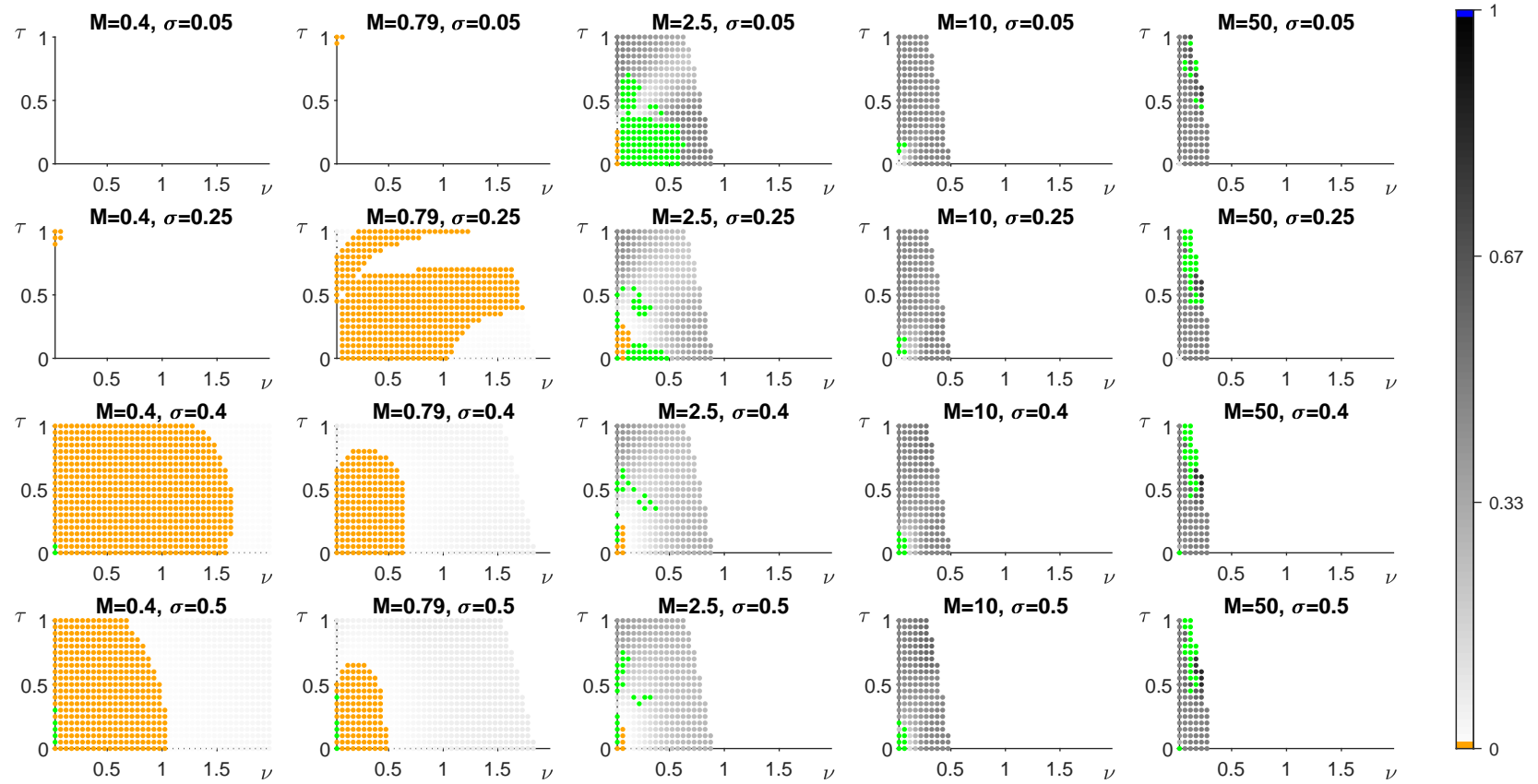


Figure OA8: Comparative statics. Average investment probability $\bar{x}_1 = \frac{1}{2L+1} \sum_{\omega=-L}^L x_1(\omega)$, averaged over equilibria within parameterizations. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades indicate larger values. Green indicates no equilibrium and white a discarded (uninteresting) parameterization. Model with $\zeta = 1$.

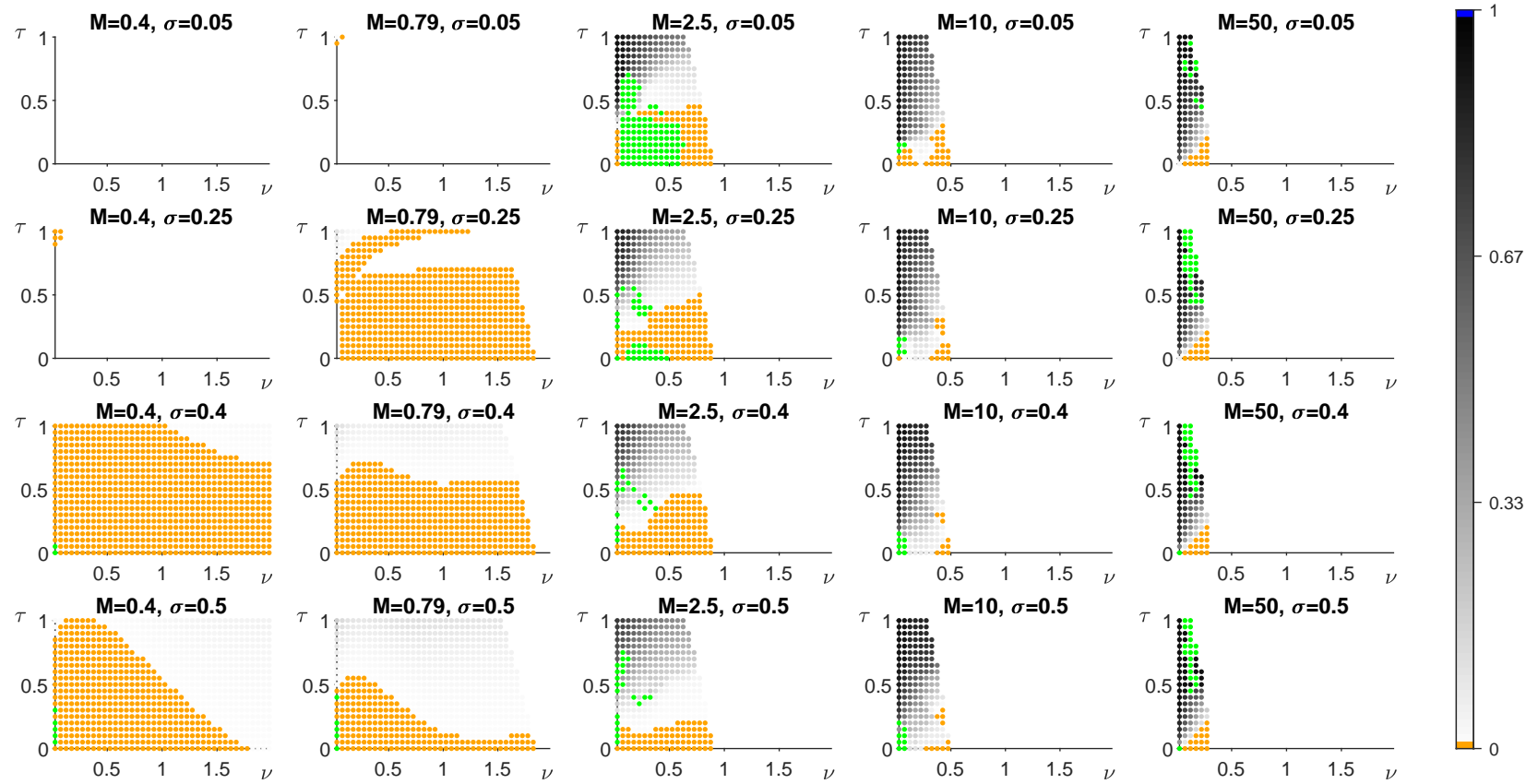


Figure OA9: Comparative statics. Average investment probability of leader $\bar{x}_1^l = \frac{1}{L} \sum_{\omega=1}^L x_1(\omega)$, averaged over equilibria within parameterizations. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades indicate larger values. Green indicates no equilibrium and white a discarded (uninteresting) parameterization. Model with $\zeta = 1$.

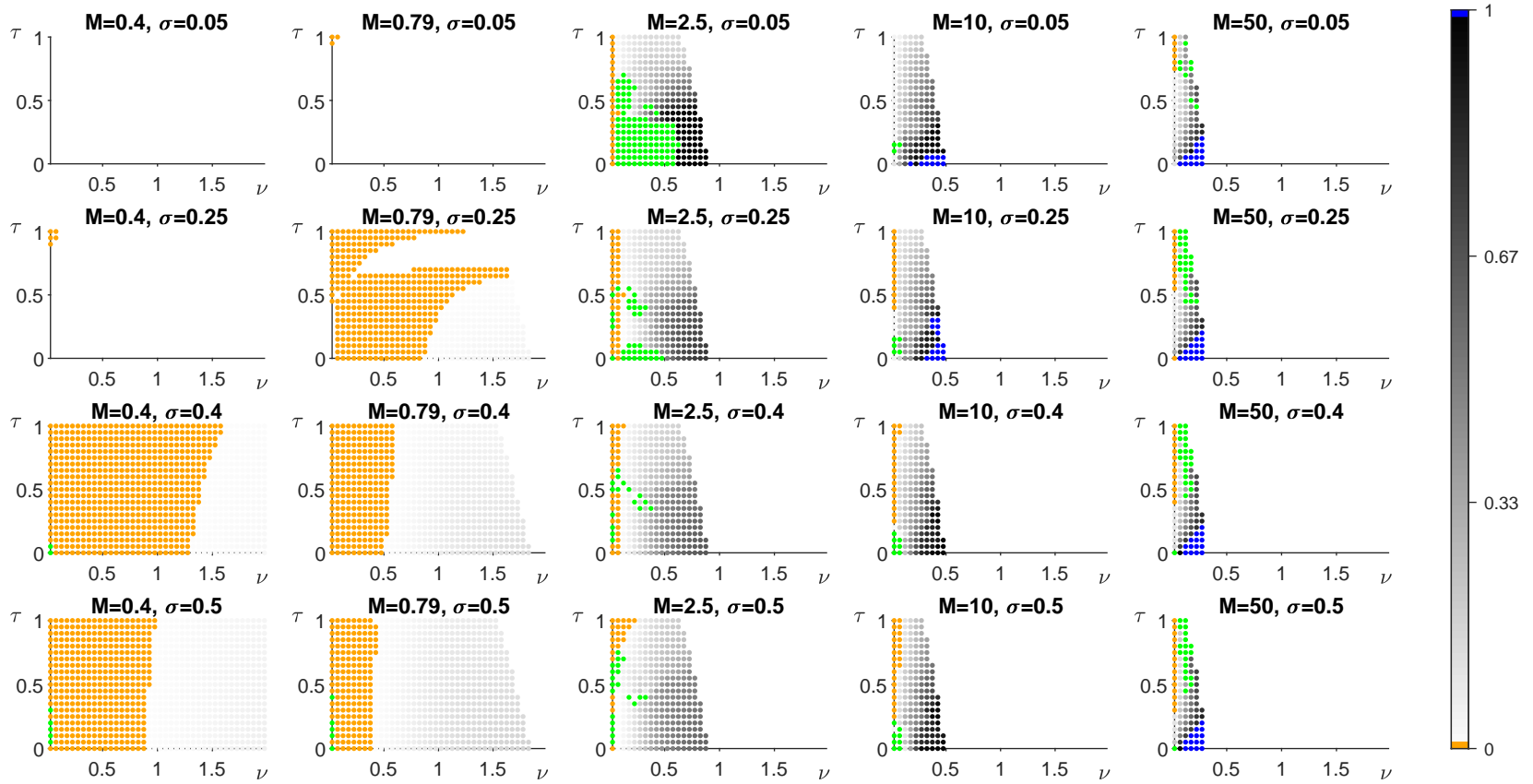


Figure OA10: Comparative statics. Average investment probability of follower $\bar{x}_1^f = \frac{1}{L} \sum_{\omega=1}^L x_1(-\omega)$, averaged over equilibria within parameterizations. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades indicate larger values. Green indicates no equilibrium and white a discarded (uninteresting) parameterization. Model with $\zeta = 1$.

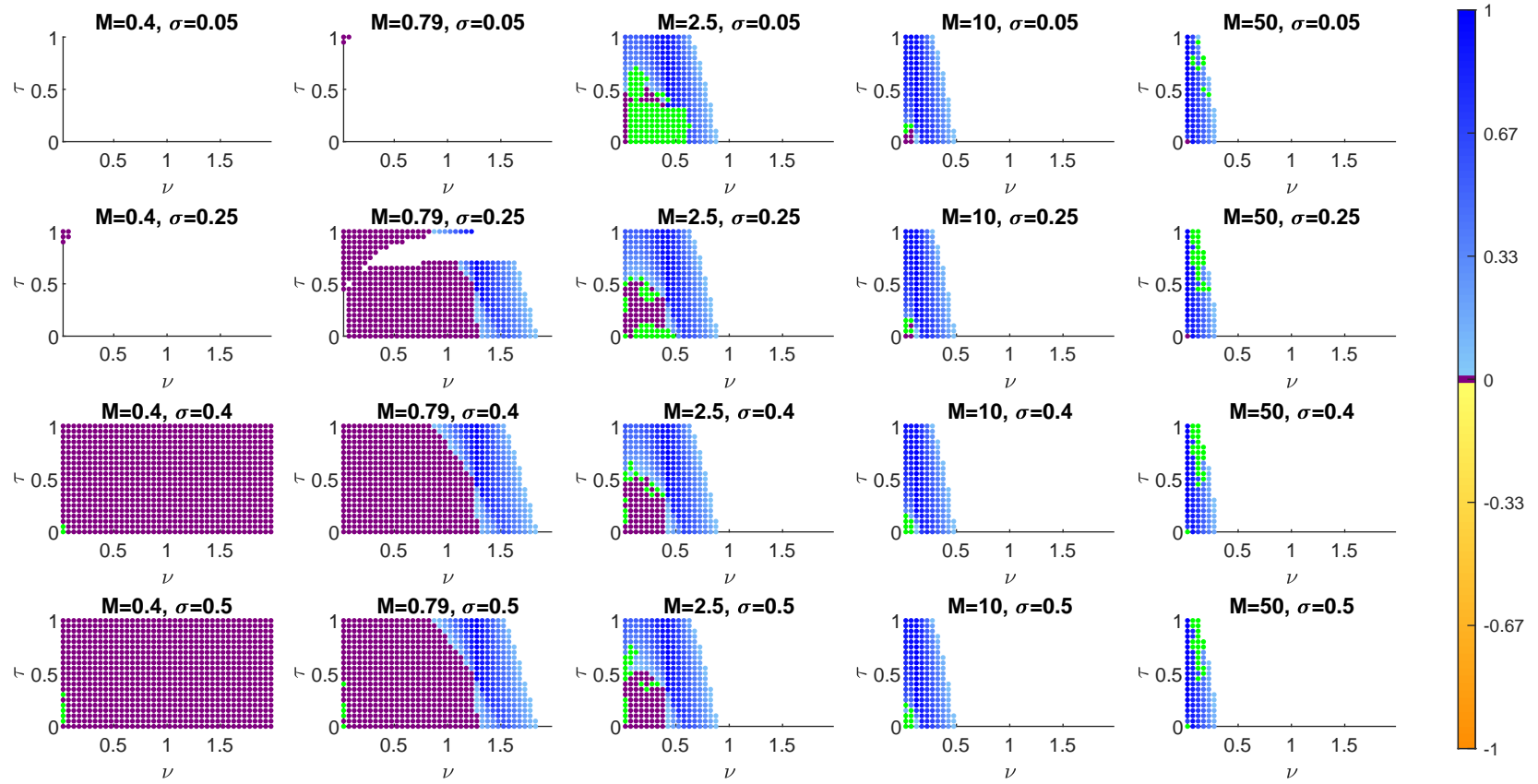


Figure OA11: Financial frictions. Differential impact of financial frictions on follower and leader as measured by $\frac{1}{L} \sum_{\omega=-L}^{-1} 1[\pi_1(\omega, p_1(\omega), p_2(\omega)) < F_0] - \frac{1}{L} \sum_{\omega=1}^L 1[\pi_1(\omega, p_1(\omega), p_2(\omega)) < F_0]$, averaged over equilibria within parameterizations. Darker shades of blue indicate a relatively more financially constrained follower than leader. Darker shades of orange indicate a relatively less financially constrained follower than leader. Purple indicates no economically meaningful difference in how financially constrained the leader and follower are (band of width of 0.01 centered around zero). Model with $\zeta = 1$.

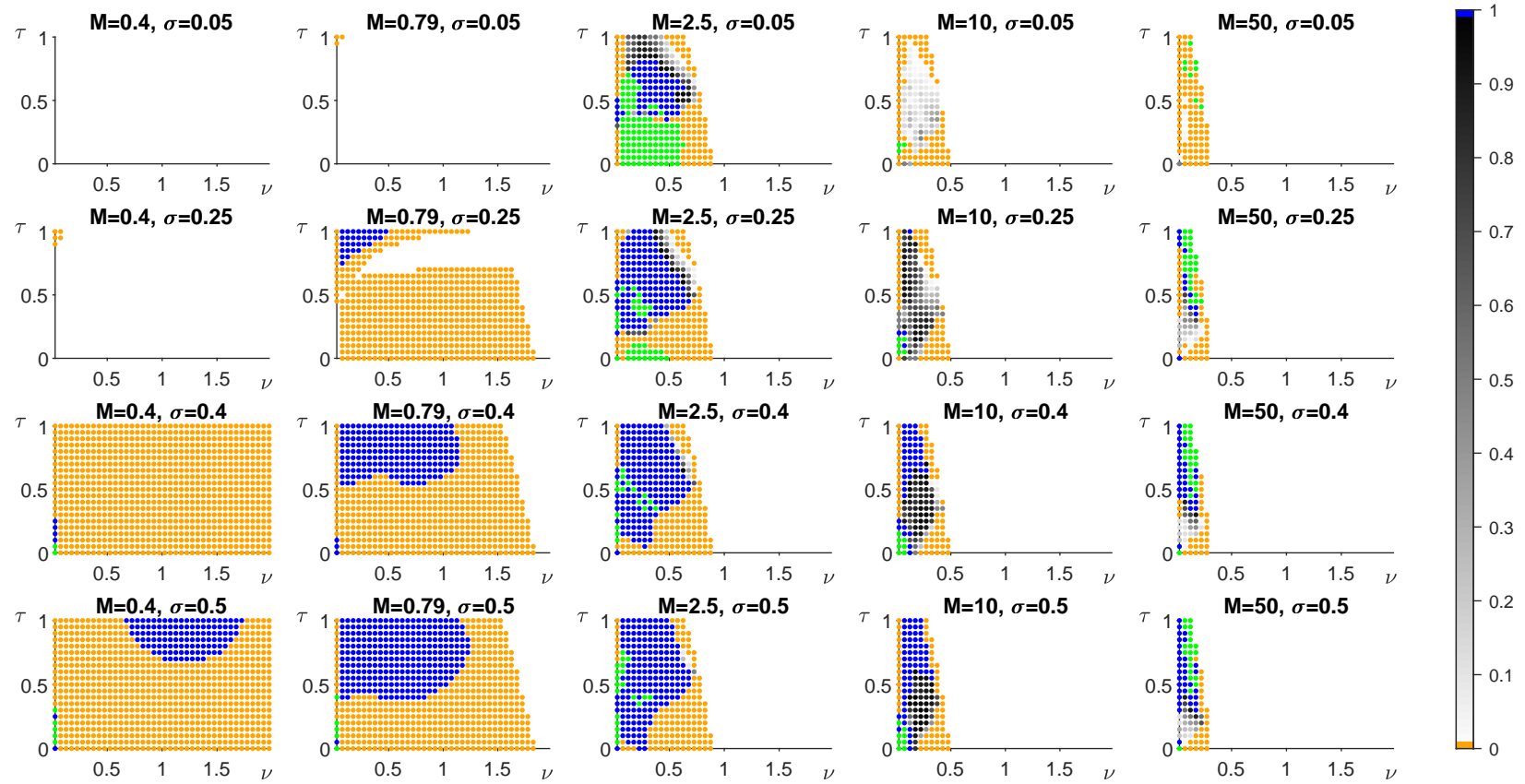


Figure OA12: Financial frictions decrease leader's price as measured by $1 [p_1^{FC}(\omega) < p_1^{NOFC}(\omega) - 0.01 ||p_1^{NOFC}|| \text{ for some } \omega > 0]$, averaged over pairs of equilibria with and without financial frictions. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

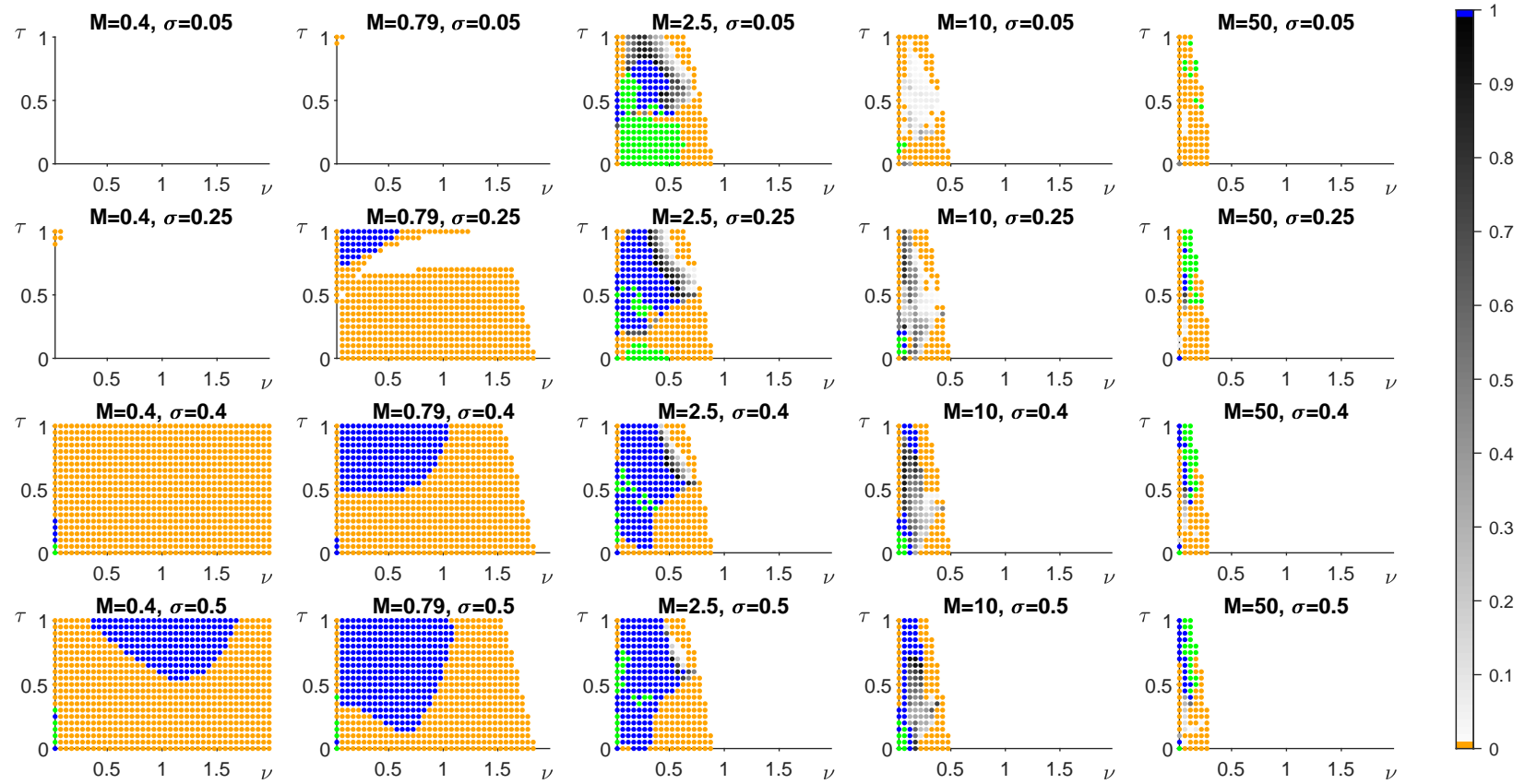


Figure OA13: Financial frictions decrease follower's price as measured by $1 [p_1^{FC}(\omega) < p_1^{NOFC}(\omega) - 0.01 ||p_1^{NOFC}|| \text{ for some } \omega < 0]$, averaged over pairs of equilibria with and without financial frictions. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

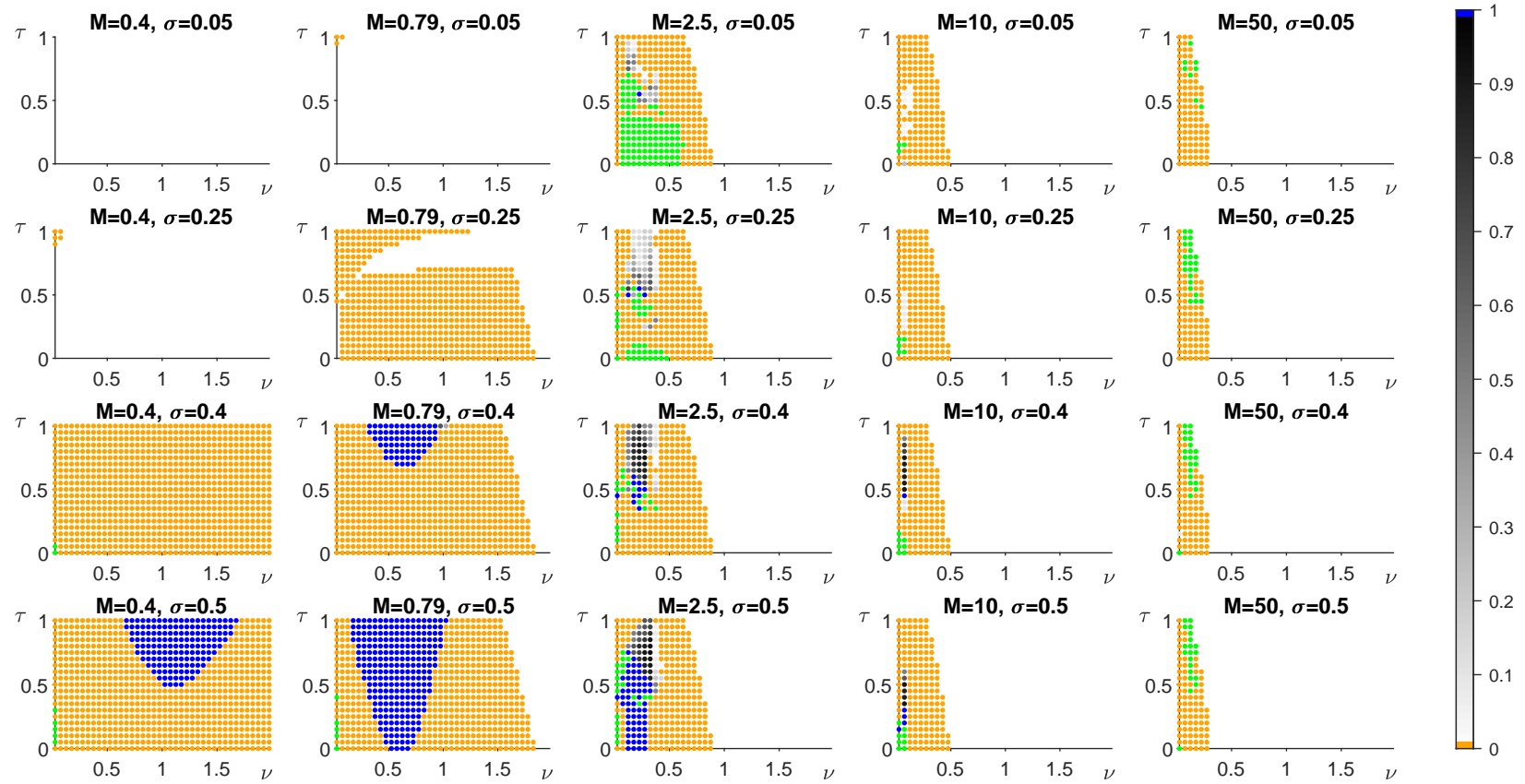


Figure OA14: Financial frictions decrease price when firms compete head-to-head as measured by $1 [p_1^{FC}(0) < p_1^{NOFC}(0) - 0.01 ||p_1^{NOFC}||]$ averaged over pairs of equilibria with and without financial frictions. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

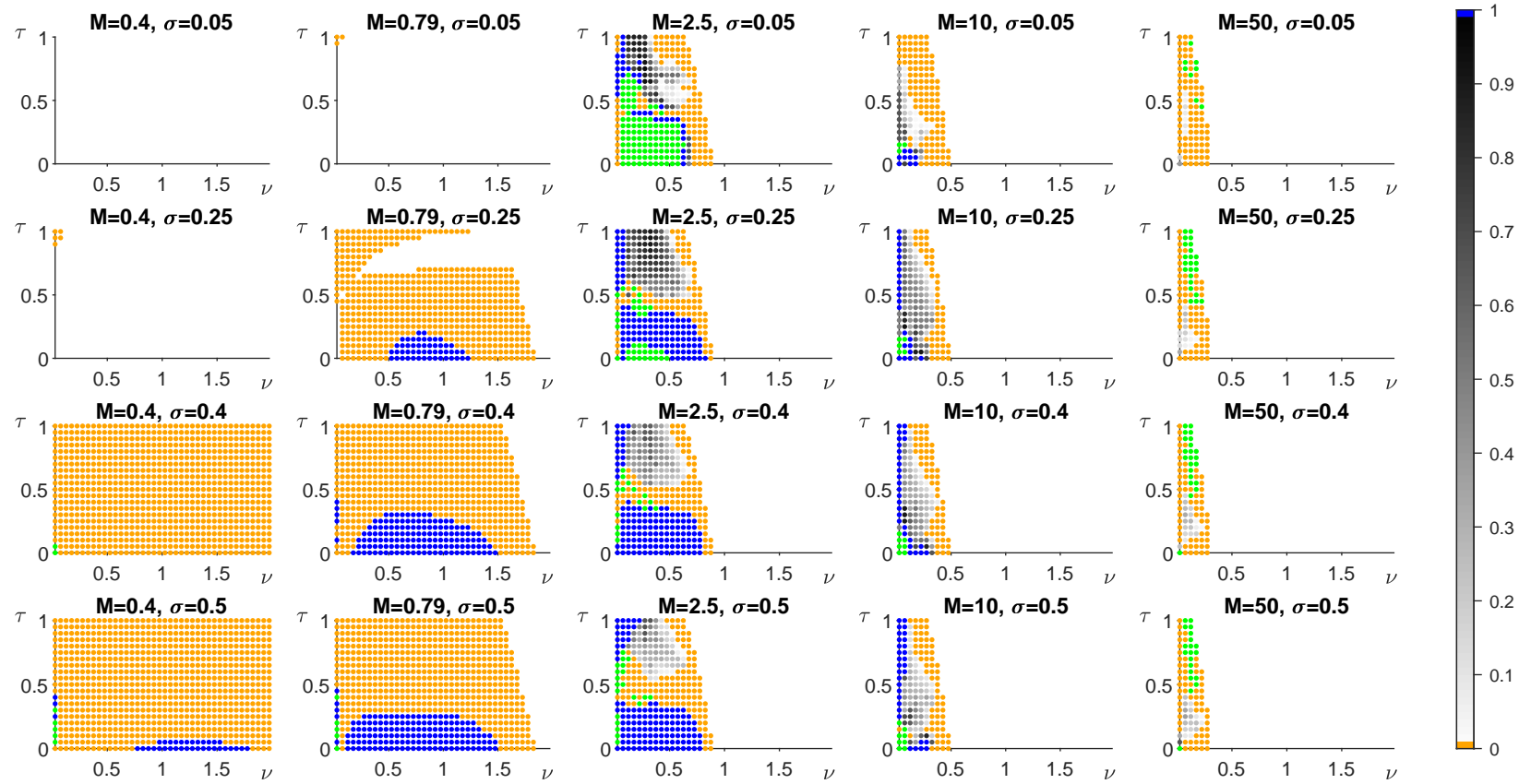


Figure OA15: Financial frictions increase price as measured by $1[p_1^{FC}(\omega) > p_1^{NOFC}(\omega) + 0.01\|p_1^{NOFC}\| \text{ for some } \omega]$, averaged over pairs of equilibria with and without financial frictions. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

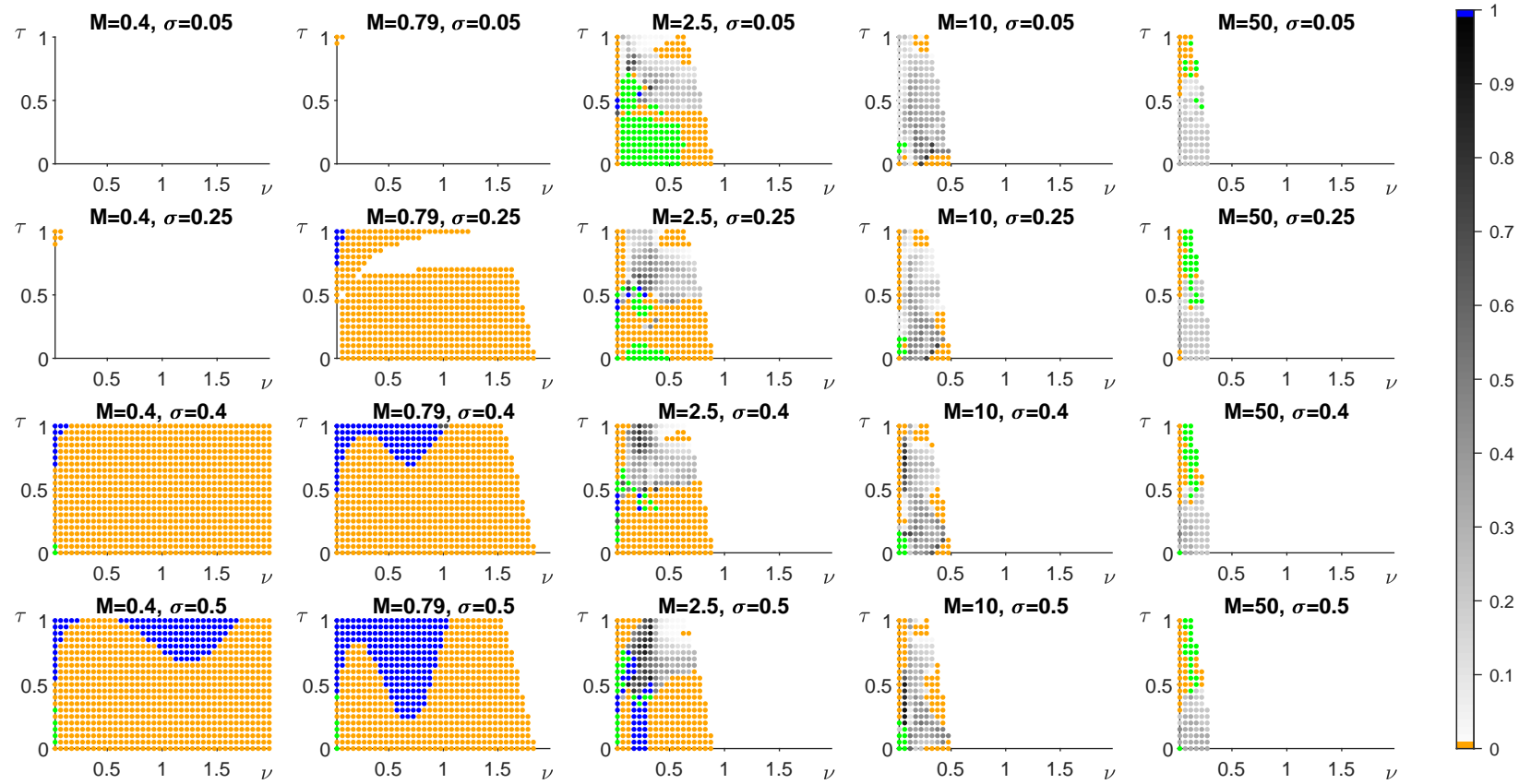


Figure OA16: Profitability. Financial frictions decrease profitability of product market competition as measured by $1 \left[\Pi^{\infty, FC} < \Pi^{\infty, NOFC} - 0.01 \frac{\|\pi_1^{NOFC} + \pi_2^{NOFC}\|}{1-\beta} \right]$, averaged over pairs of equilibria with and without financial frictions. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

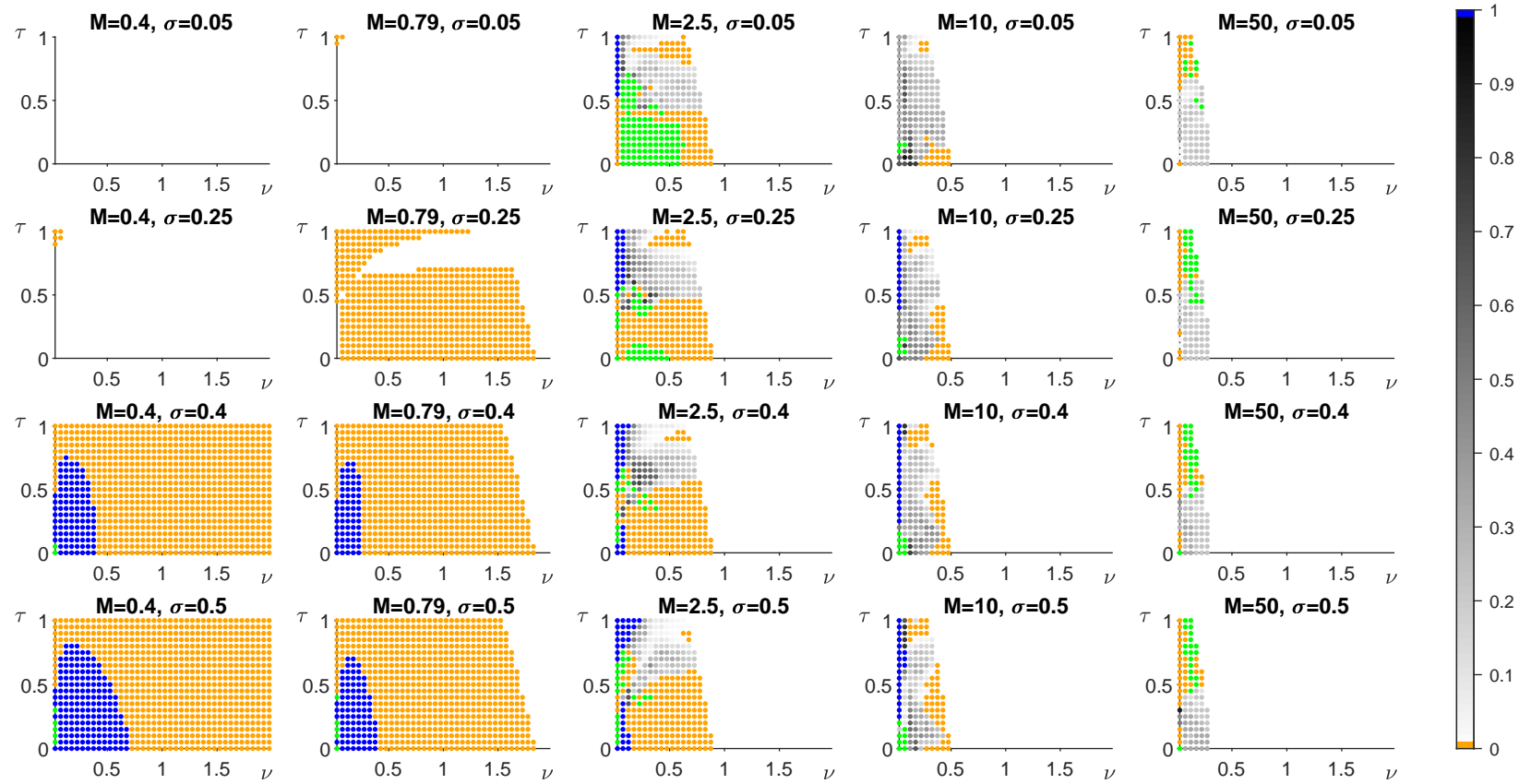


Figure OA17: Profitability. Financial frictions increase profitability of product market competition as measured by $1 \left[\Pi^{\infty, FC} > \Pi^{\infty, NOFC} + 0.01 \frac{\|\pi_1^{NOFC} + \pi_2^{NOFC}\|}{1-\beta} \right]$, averaged over pairs of equilibria with and without financial frictions. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

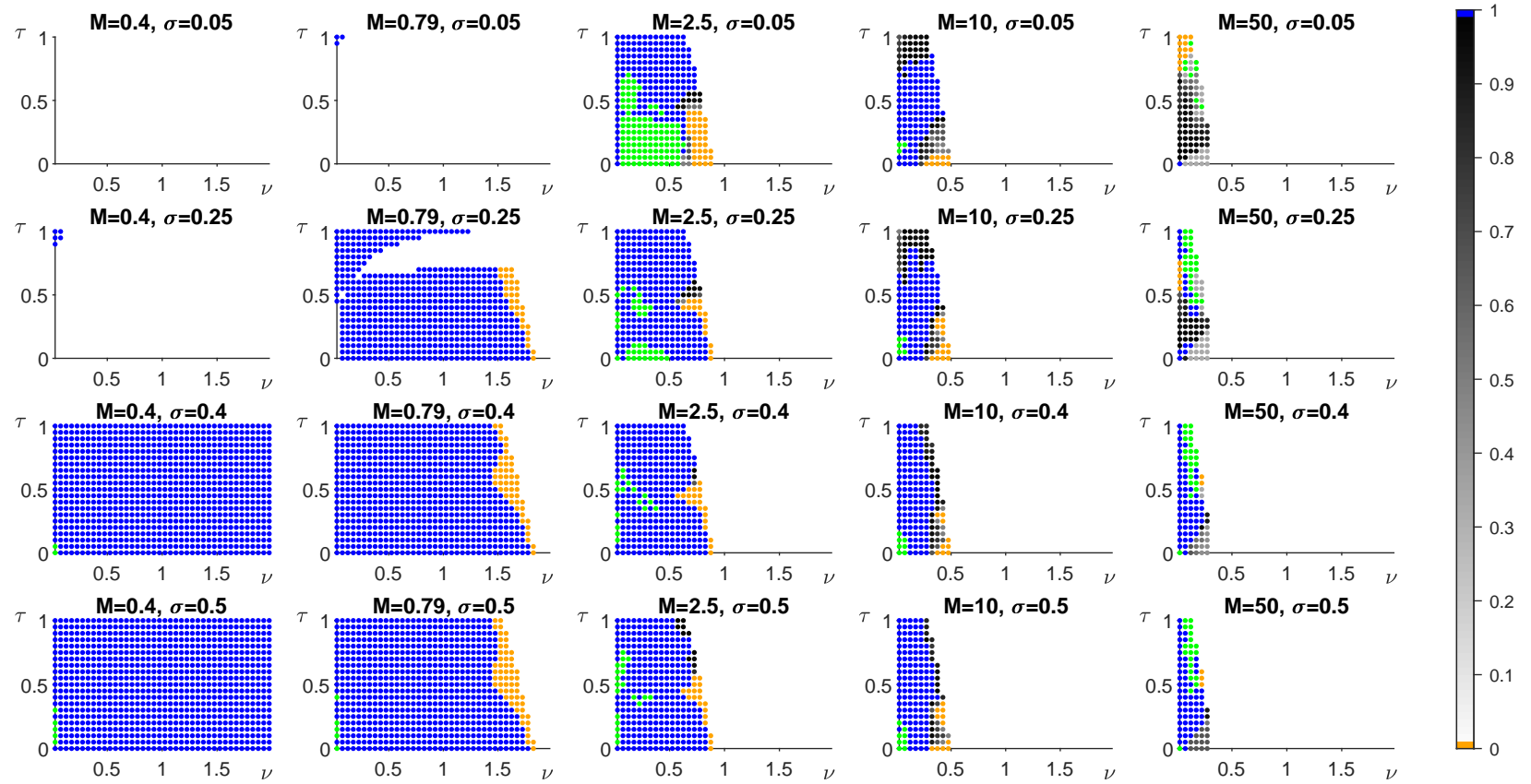


Figure OA18: Financial frictions decrease investment as measured by $1 [x_1^{FC}(\omega) < x_1^{NOFC}(\omega) + 0.01 \|x_1^{NOFC}\| \text{ for some } \omega]$, averaged over pairs of equilibria with and without financial frictions within parameterizations. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

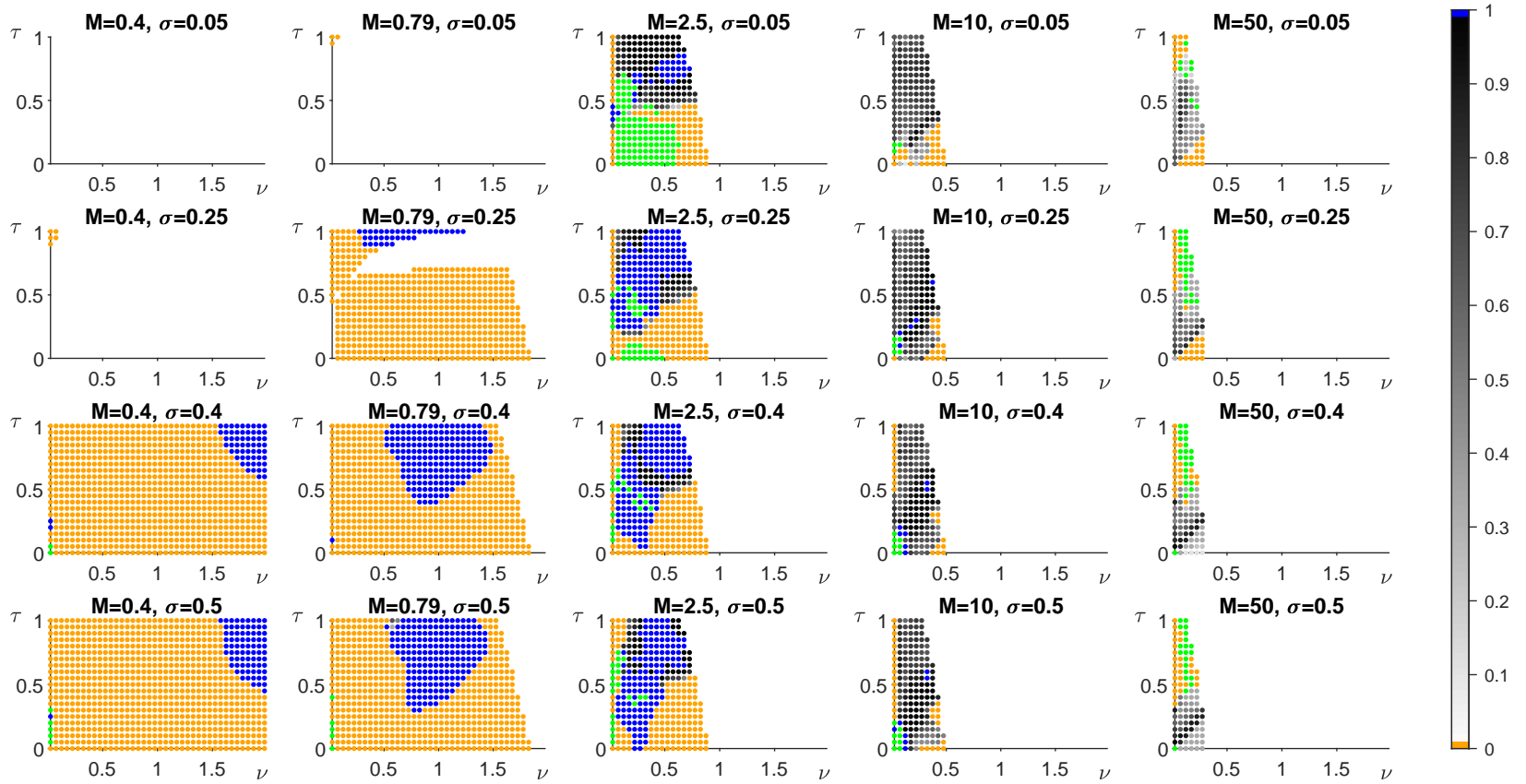


Figure OA19: Financial frictions increase leader's investment as measured by $1 [x_1^{FC}(\omega) > x_1^{NOFC}(\omega) + 0.01||x_1^{NOFC}|| \text{ for some } \omega > 0]$, averaged over pairs of equilibria with and without financial frictions. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

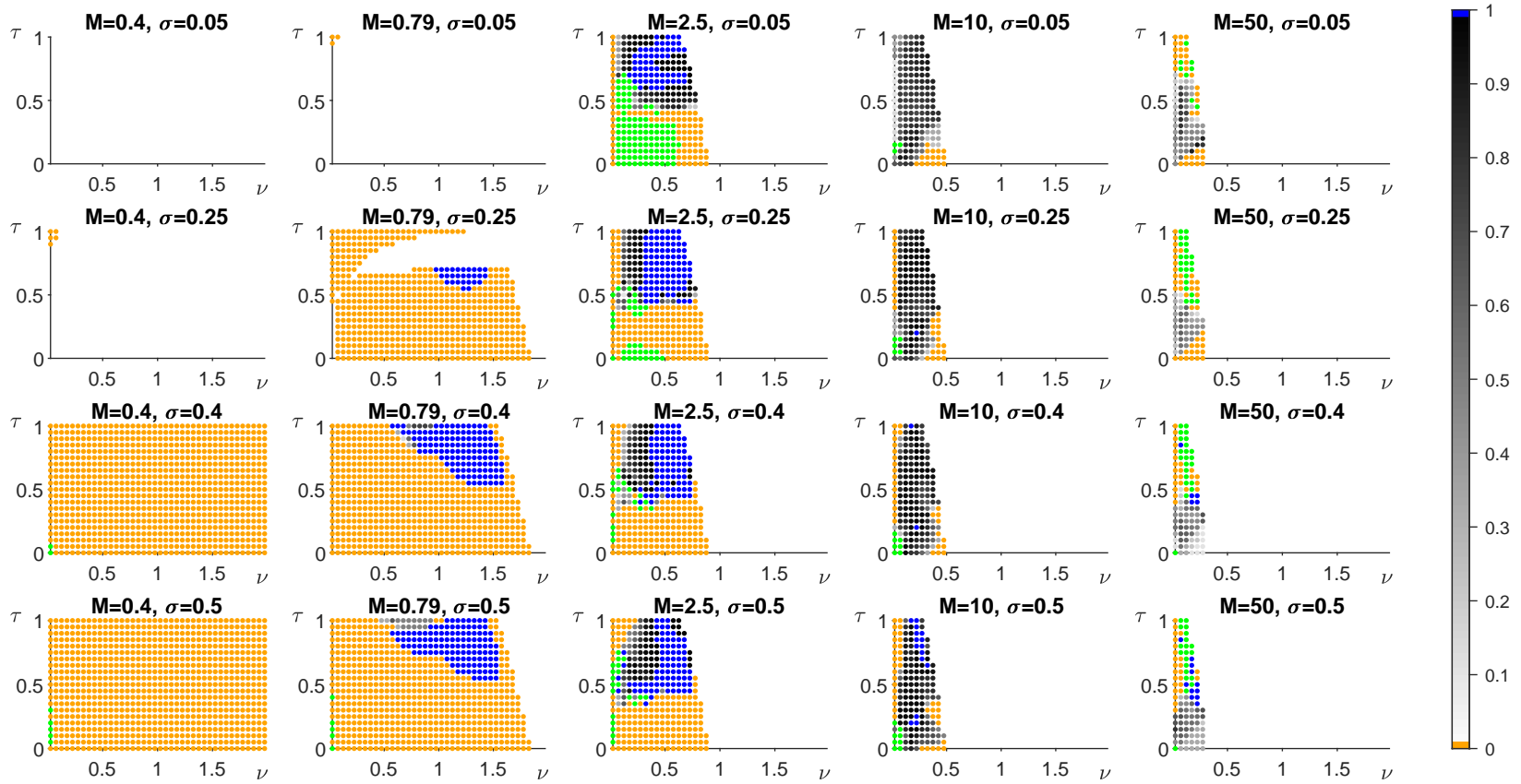


Figure OA20: Financial frictions increase follower's investment as measured by $1 [x_1^{FC}(\omega) > x_1^{NOFC}(\omega) + 0.01 \|x_1^{NOFC}\| \text{ for some } \omega < 0]$, averaged over pairs of equilibria with and without financial frictions. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

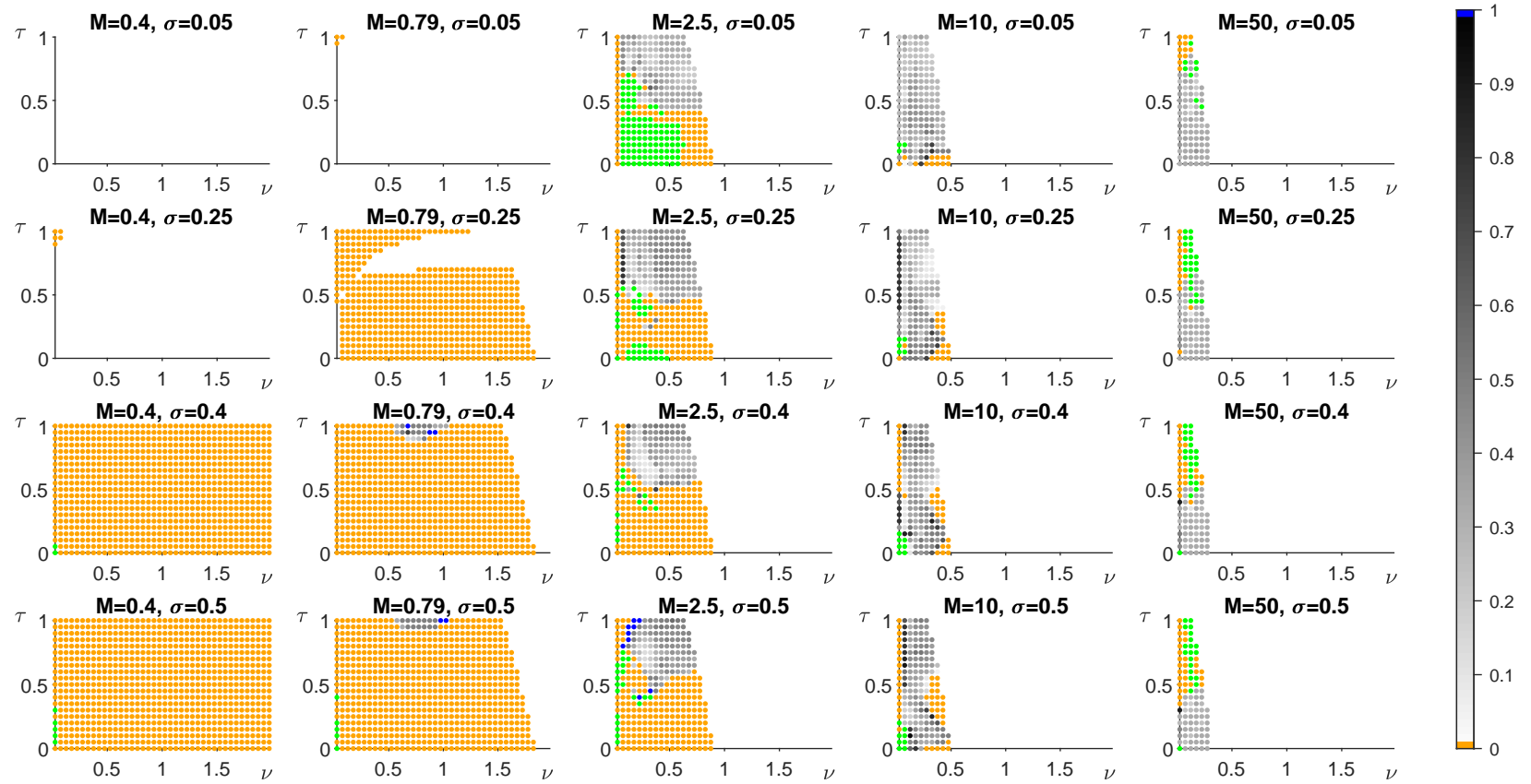


Figure OA21: Financial frictions increase investment when firms compete head-to-head as measured by $1 [x_1^{FC}(0) > x_1^{NOFC}(0) + 0.01||x_1^{NOFC}||]$ averaged over pairs of equilibria with and without financial frictions. Orange indicates values below 0.01 and blue values above 0.99. In-between darker shades of gray indicate larger values. Green indicates no pair of equilibria with and without financial frictions and white a discarded (uninteresting) parameterization.

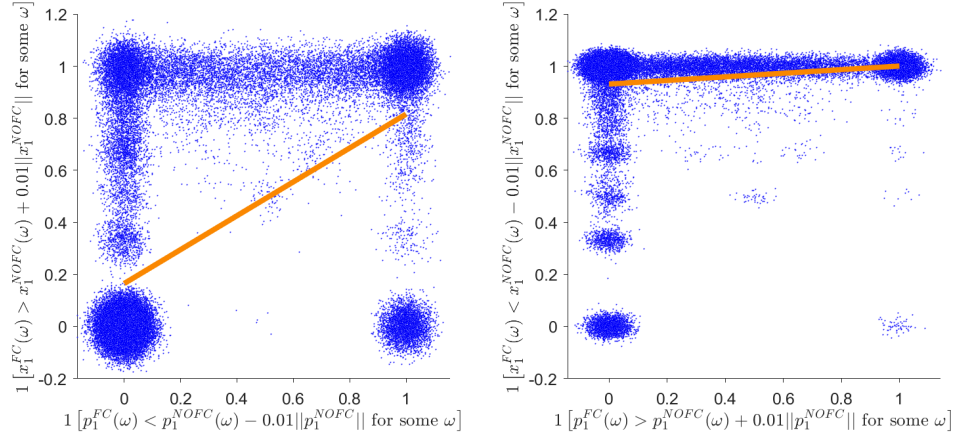


Figure OA22: Connection between price and investment decisions. Scatter plot of $1 [p_1^{FC}(\omega) < p_1^{NOFC}(\omega) - 0.01 \|p_1^{NOFC}\| \text{ for some } \omega]$, averaged over pairs of equilibria with and without financial frictions within parameterizations, versus $1 [x_1^{FC}(\omega) > x_1^{NOFC}(\omega) + 0.01 \|x_1^{NOFC}\| \text{ for some } \omega]$, similarly averaged, overlayed by trend line (left panel) and $1 [p_1^{FC}(\omega) > p_1^{NOFC}(\omega) + 0.01 \|p_1^{NOFC}\| \text{ for some } \omega]$ versus $1 [x_1^{FC}(\omega) < x_1^{NOFC}(\omega) - 0.01 \|x_1^{NOFC}\| \text{ for some } \omega]$ (right panel). Noise added to improve visibility.

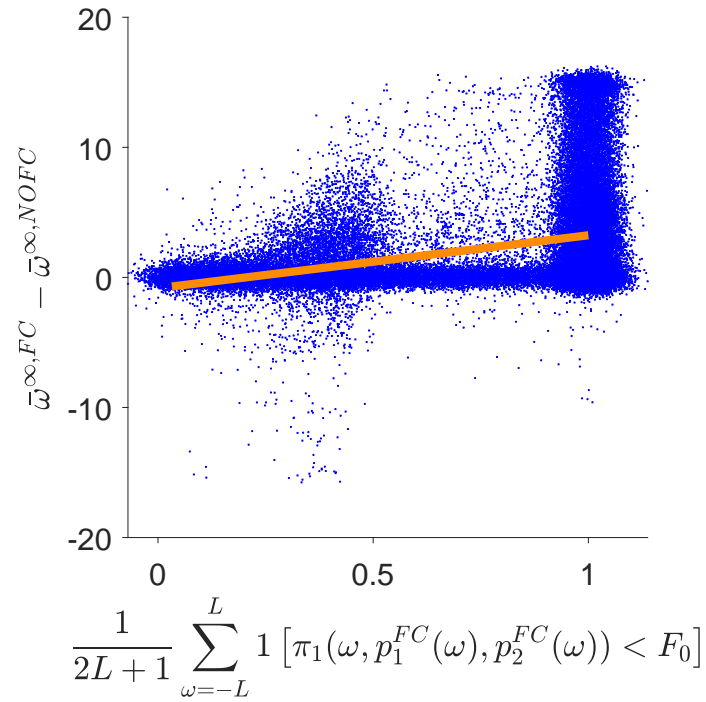


Figure OA23: Industry concentration. Scatter plot of $\frac{1}{2L+1} \sum_{\omega=-L}^L 1 [\pi_1(\omega, p_1^{FC}(\omega), p_2^{FC}(\omega)) < F_0]$, averaged over equilibria with financial frictions within parameterizations, versus $\bar{\omega}^{\infty, FC} - \bar{\omega}^{\infty, NOFC}$, averaged over pairs of equilibria with and without financial frictions within parameterizations, overlayed by trend line. Noise added to improve visibility.