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Electronic Companion—“Getting Big Too Fast: Strategic Dynamics with Increasing Returns and Bounded Rationality” by John D. Sterman, Rebecca Henderson, Eric D. Beinhocker, and Lee I. Newman, *Management Science* 2007, 53(4) 683–696.

Online Supplement

This supplement provides full documentation of the model described in the paper and instructions for accessing and running the model, allowing the results to be replicated and the model to be extended. For completeness, we present here the entire model, including those formulations presented in the paper, and we number the equations consecutively here as EC1, EC2, etc. Next we discuss parameters and sensitivity analysis. Finally, we provide details on the simulation software used and instructions for downloading the model and replicating all the simulations presented in the paper.

Model Formulation

Diffusion and Industry Orders. The total industry order rate, Q^O , is the sum of initial and replacement orders, Q^I and Q^R :

$$Q^O = Q^I + Q^R. \quad (\text{EC1})$$

Initial orders are given by the product of the rate at which households choose to adopt the product and the average number of units ordered per household, μ . The adoption rate is the rate of change of the number of adopters, M , thus:

$$Q^I = \mu(dM/dt). \quad (\text{EC2})$$

Households are divided into adopters of the product, M , and potential adopters, N . Following the standard Bass diffusion model (Bass 1969), adoption arises from an autonomous component, representing the impact of advertising and other external influences, and from social exposure and word-of-mouth encounters with those who already own the good:

$$dM/dt = N(\alpha + \beta M/POP), \quad (\text{EC3})$$

where α captures the strength of external influences such as advertising and β is the strength of social exposure and word of mouth arising from encounters with adopters. The ratio M/POP is the probability that a nonadopter encounters an adopter (POP is the total number of households).

The number of potential adopters, N , is the difference between the number of people who will ever adopt the product, M^* , and the number that have adopted the product to date:

$$N = \text{MAX}(0, M^* - M). \quad (\text{EC4})$$

The number of people who will eventually choose to adopt, M^* , is the equilibrium industry demand and is a function of the price of the product. The MAX function in Equation (EC4) ensures that N remains nonnegative even in the case where M^* falls below M , e.g., because price suddenly rises. For simplicity we assume a linear demand curve between the constraints $0 \leq M^* \leq POP$:

$$M^* = \text{MIN}(POP, POP^r * \text{MAX}(0, 1 + \sigma(P^{\text{min}} - P^r)/POP^r)), \quad (\text{EC5})$$

where σ is the slope of the demand curve, P^{min} is the lowest price currently available in the market, and the reference price P^r is the price at which M^* equals the reference population POP^r . For ease of

calibration the demand curve slope is calculated from the elasticity of demand at the reference point (POP^r, P^r), denoted ε_d :

$$\sigma = -\varepsilon_d(POP^r/P^r). \quad (\text{EC6})$$

(Of course, in a linear demand curve the elasticity of demand is not constant: it rises in magnitude as prices rise, and falls as prices fall.)

The replacement order rate, Q^R , is the discard rate of old units from the installed base of each firm's product, D_i , summed over all firms in the industry. For simplicity we assume first-order discards from the installed base of each firm; a higher-order discard process is easily incorporated (Sterman 2000, Chapter 11):

$$Q^R = \sum_i D_i, \quad (\text{EC7})$$

$$D_i = \delta I_i, \quad (\text{EC8})$$

where I_i is the installed base of firm i 's product and δ is the fractional discard rate. The installed base of each firm's product is increased by shipments, Q_i , and decreased by discards:

$$dI_i/dt = Q_i - D_i. \quad (\text{EC9})$$

Market Share. Each firm receives orders, O_i , equal to a share, S_i^O , of the industry order rate:

$$O_i = S_i^O Q^O \quad (\text{EC8})$$

The firm's order share is determined by the standard logit choice model where product attractiveness, A_i , depends on both price and availability. Availability is measured by the firm's average delivery delay, given (by Little's Law) by the ratio of backlog, B_i , to shipments, Q_i :

$$S_i^O = A_i / \sum_j A_j, \quad (\text{EC10})$$

$$A_i = \exp(\varepsilon_p P_i/P^r) \exp(\varepsilon_a (B_i/Q_i)/\tau^r). \quad (\text{EC11})$$

The parameters ε_p and ε_a are the sensitivities of attractiveness to price and availability, respectively. Both price and delivery delay are normalized by reference values, P^r and τ^r , respectively, so that the sensitivities ε are comparable dimensionless quantities. Note that because this is a disequilibrium model, orders and shipments need not be equal. Market share, defined as each firm's share of industry shipments,

$$S_i = Q_i / \sum_j Q_j, \quad (\text{EC12})$$

will in general equal the firm's order share only in equilibrium.

The Firm

Profits and Revenue. Firm profits are revenue, R , less fixed and variable costs, C^f and C^v , respectively (the firm index i is deleted for clarity):

$$\pi = R - (C^f + C^v). \quad (\text{EC13})$$

Revenue is determined by price, P , and shipments, Q . Because it takes time to process and fill orders, the price of the product may change between the time customers place an order and receive the product. We assume customers pay the price in effect at the time they place their order. Revenue is thus the product of the quantity shipped and the average value of each order in the backlog. The average value of each order in the backlog is the total value of the order book, V , divided by the number of units on order:

$$R = Q(V/B). \quad (\text{EC14})$$

The value of the order backlog accumulates the value of new orders, determined by price P and orders O , less the revenues received for orders shipped:

$$dV/dt = PO - R. \quad (\text{EC15})$$

Costs and Learning. Fixed costs depend on unit fixed costs, U^f , and current capacity, K . Unit fixed costs include overhead (assumed to be proportional to capacity) and the firm's required return on capital. Variable costs depend on unit variable costs, U^v , and production, Q .

$$C^f = U^f K, \quad (\text{EC16})$$

$$C^v = U^v Q. \quad (\text{EC17})$$

We assume learning applies equally to both fixed and variable costs, which fall as cumulative production experience, E , grows, according to a standard learning curve:

$$U^f = U_0^f (E/E_0)^\gamma, \quad (\text{EC18})$$

$$U^v = U_0^v (E/E_0)^\gamma, \quad (\text{EC19})$$

where U_0^f and U_0^v are the initial values of unit fixed and variable costs, respectively, E_0 is the initial level of production experience and γ is the strength of the learning curve. Production experience accumulates shipments:

$$dE/dt = Q. \quad (\text{EC20})$$

Production. In general, output, desired output, and firm capacity are not equal. Production, Q , is the lesser of desired production, Q^* , and capacity, K :

$$Q = \text{MIN}(Q^*, K). \quad (\text{EC21})$$

As described in the paper, we consider a make-to-order system and do not portray the firm's finished goods inventory or the upstream supply chain (including WIP inventories) or downstream supply chain (including inventories in distribution channels). The inclusion of such additional structures will further amplify the overshoot of output and capacity over the product lifecycle through the bullwhip effect (see references in the paper). Hence the exclusion of inventories and the supply chain constitutes an a fortiori assumption that favors the aggressive get big fast (GBF) strategy and works against our hypothesis. By Little's Law, the average delivery delay (time between placing and receiving an order) is the ratio of backlog to shipments,

$$\tau = B/Q. \quad (\text{EC22})$$

To deliver on time (that is, to achieve the target delivery delay), the firm must ship at the rate determined by the backlog of unfilled orders, B , and target delivery delay τ^* :

$$Q^* = B/\tau^*. \quad (\text{EC23})$$

When capacity is ample, $Q = Q^* = B/\tau^*$ and actual delivery delay $\tau = B/Q = B/(B/\tau^*) = \tau^*$.

Backlog accumulates orders, O , less production:

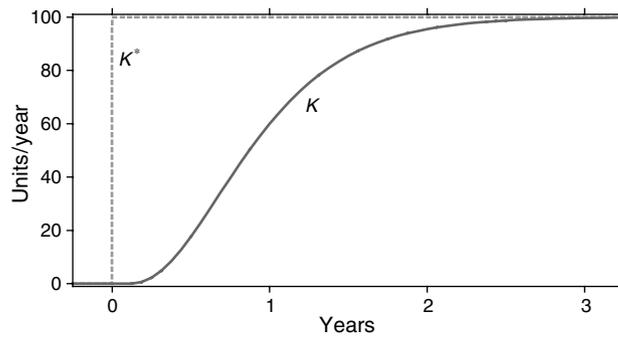
$$dB/dt = O - Q. \quad (\text{EC24})$$

Capacity. Capacity cannot be changed instantly, but adjusts to the target level K^* with an average lag λ . We assume K adjusts to K^* with a third-order Erlang lag, corresponding well to the distributed lags estimated in investment function research (e.g., Jorgenson et al. 1970, Senge 1980, Montgomery 1995).

$$K = \mathcal{L}(K^*, \lambda), \quad (\text{EC25})$$

where \mathcal{L} is the Erlang lag operator. For simplicity the lag is symmetric for the cases of increasing and decreasing capacity. Figure EC.1 shows the response of capacity to a change in desired capacity with the base-case value of the acquisition lag $\lambda = 1$ year. Capacity begins to rise after about one quarter year, and reaches 95% of the final value in 2 years.

Figure EC.1 Capacity Adjustment Lag



Note. The graph shows response of capacity K to a hypothetical increase in desired capacity K^* . The mean acquisition lag $\lambda = 1$ year.

Target Capacity and Demand Forecasting. Target capacity is the product of the firm's target market share, S^* , and forecast of industry demand, D^e , adjusted by the normal rate of capacity utilization u^* :

$$K^* = \text{MAX}(K^{\min}, S^* D^e / u^*), \quad (\text{EC26})$$

where K^{\min} is the minimum efficient scale of production.

The capacity-acquisition delay requires the firm to forecast demand λ years ahead. We assume firms forecast industry demand by extrapolation of recent trends in industry orders (see references in the paper). The expected growth rate in demand, g^e , is estimated from reported industry demand, D^r , over a historical horizon, h .

$$D^e = D^r \exp(\lambda g^e), \quad (\text{EC27})$$

$$g^e = \ln(D_t^r / D_{t-h}^r) / h. \quad (\text{EC28})$$

Note that this formulation yields an unbiased forecast of demand in the steady state of exponential growth in reported industry orders.^{EC1}

The instantaneous, current industry order rate is not available. Rather, firms rely on analyst reports, consultants, and industry associations to estimate current demand. It takes time to collect, analyze, and report such data, so the reported industry order rate lags current orders. For simplicity we assume first-order exponential smoothing for the data-reporting process:

$$dD^r / dt = (Q^O - D^r) / \tau^r, \quad (\text{EC29})$$

where τ^r is the data-reporting time. Note that industry orders are typically not available, so firms are often forced to rely on shipment (or revenue) data to forecast future demand. Use of shipment or revenue data is problematic and worsens the difficulties facing firms because shipment data confound demand and capacity. When capacity is insufficient, as during the rapid growth phase of the industry lifecycle, shipments measure capacity growth, not demand. The simulation model allows users to choose between orders and shipments as the basis for the demand forecast so the sensitivity of results to the information set available to firms can be tested.

Target Market Share. Target market share, S^* , depends on the firm's strategy. In the aggressive strategy, the firm seeks a dominant share of the market to exploit the positive feedbacks that contribute to increasing returns, lowering prices, and expanding capacity to achieve that share. In contrast, the conservative firm seeks accommodation with its rivals and sets a modest market share goal.

Firms also monitor the actions of their competitors. The aggressive player seeks to exploit increasing returns not only by setting an aggressive market share goal but also by taking advantage of timidity, delay, or underforecasting on the part of its rivals by opportunistically increasing its target when it

^{EC1} To see that the forecast is unbiased for the case of exponential demand growth, note that when $D^r = D_0^r \exp(gt)$, $g^e = \ln(D_0^r \exp(gt) / D_0^r \exp(g(t-h))) / h = g$. Therefore $D_{t+\lambda}^e = D^r \exp(g\lambda) = D_0^r \exp(gt) \exp(g\lambda) = D_0^r \exp(g(t+\lambda)) = D_{t+\lambda}^r$. The steady-state forecast error is zero.

detects uncontested demand. The conservative strategy seeks accommodation with its rivals, but fears overcapacity and will cede additional share to avoid it. Thus target share is given by

$$S^* = \begin{cases} \text{MAX}(S^{\min}, S^u) & \text{if Strategy} = \text{Aggressive} \\ \text{MIN}(S^{\max}, S^u) & \text{if Strategy} = \text{Conservative}, \end{cases} \quad (\text{EC30})$$

where S^{\min} and S^{\max} are the minimum and maximum acceptable market share levels for the aggressive and conservative strategies, respectively, and S^u is the share of the market the firm expects to be uncontested. Expected uncontested demand, D^u , is the difference between a firm's forecast of industry demand λ years from now, when capacity it orders today will be available, and its estimate of how much capacity all competitors will have at that time. The uncontested share of the market is the firm's estimate of uncontested demand as a fraction of projected industry demand:

$$S^u = \text{MAX}(0, D^u/D^e). \quad (\text{EC31})$$

The MAX function maintains nonnegativity even when there is excess industry capacity. Expected uncontested demand is the firm's forecast of industry demand less the sum of the firm's estimates of expected competitor capacity, K^e , adjusted by normal capacity utilization, u^* :

$$D^u = D^e - u^* \sum_{j \neq i} K_j^e. \quad (\text{EC32})$$

In assessing its rivals' future capacities, firms should monitor each competitors' target capacity, K^* , including capacity plans not yet publicly announced and capacity under construction. Doing so is difficult, however, as such information is generally not public. We formulate the model to allow users to capture a range of assumptions about the degree to which firms know the capacity plans of their rivals, from full knowledge to the case where firms know only the current capacity of the competitors:

$$K_j^e = wK_j^{*e} + (1-w)K_j, \quad (\text{EC33})$$

where K_j^{*e} is the firm's estimate of competitor j 's target capacity, K_j is firm j 's actual capacity, and w is the fraction of the competitor's supply line of pending capacity the firm is able to detect through competitive intelligence and other information sources.

We assume a short delay of τ^c years is required for the firm to carry out the competitive intelligence necessary to estimate the competitor's target capacity (exponential smoothing is assumed), so expected competitor capacity evolves as:

$$dK_j^{*e}/dt = (K_j^* - K_j^{*e})/\tau^c, \quad (\text{EC34})$$

where K_j^* is the firm's estimate of rival j 's target capacity. Below we show how results depend on the ability to account for the supply line of pending capacity.

Pricing. Due to administrative and decision-making lags, price, P , adjusts to a target level, P^* , with an adjustment time τ^p :

$$dP/dt = (P^* - P)/\tau^p. \quad (\text{EC35})$$

Firms do not have the ability to determine the optimal price and instead must search for an appropriate price level. We assume firms use the anchoring and adjustment heuristic to estimate target price P^* . The current price forms the anchor, which managers then adjust in response to pressures arising from unit costs, the demand-supply balance, and market share relative to the firm's target share. Specifically, managers will increase price above the current level when units costs rise, when desired production exceeds capacity, and when market share grows, and will cut price when unit costs fall, when demand falls short of capacity, and when market share falls below its share target. For simplicity we assume the target price is a multiplicatively separable function of the various adjustment factors, and that each adjustment is linear in the input variables. Finally, the firm will not price below unit variable cost U^v . Thus

$$P^* = \text{MAX} \left[U^v, P \left(1 + \alpha^c \left(\frac{P^c}{P} - 1 \right) \right) \left(1 + \alpha^d \left(\frac{Q^*}{u^*K} - 1 \right) \right) \left(1 + \alpha^s (S^* - S) \right) \right], \quad \alpha^c \geq 0; \quad \alpha^d \geq 0; \quad \alpha^s \leq 0. \quad (\text{EC36})$$

Table EC.1 Parameters and Initial Conditions for the Base Case

Parameters:		
μ	Average number of units per household (units/household)	1
α	Propensity for nonadopters to adopt the product autonomously (1/years)	0.001
β	Propensity for nonadopters to adopt the product through word of mouth (1/years)	1
POP	Total population (households)	100e6
ε_d	Elasticity of demand at the reference price and population (dimensionless)	-0.2
POP^r	Population that would adopt at the reference price P^r (households)	60e6
P^r	Price at which industry demand equals the reference population POP^r (\$/unit)	1,000
δ	Fractional discard rate of units from the installed base (1/years)	0.10
ε_p	Sensitivity of product attractiveness to price	-8
ε_a	Sensitivity of product attractiveness to availability	-4
c	Ratio of fixed to variable costs (dimensionless)	3
γ	Strength of the learning curve (dimensionless)	$\log_2(0.7)$
τ^r	Reference delivery delay (years)	0.25
τ^*	Target delivery delay (years)	0.25
λ	Capacity-acquisition delay (years)	1
u^*	Target capacity utilization rate (dimensionless)	0.8
K^{\min}	Minimum efficient scale (units/year)	1e5
τ^d	Time delay for reporting industry order rate (years)	0.25
λ^h	Historic horizon for estimating trend in demand (years)	1
τ^c	Time delay for estimating competitor target capacity (years)	0.25
τ^p	Adjustment time for price (years)	0.25
α^c	Weight on costs in target price (dimensionless)	1
α^d	Weight on demand/supply balance of target price (dimensionless)	0.5
α^s	Weight on market share in target price (dimensionless)	-0.10
m^*	Target profit margin (dimensionless)	0.2
Initial conditions:		
M_0	Initial number of adopters (households)	$0.001M^*$
E_{i0}	Initial cumulative production experience of firm i (units)	10e6
P_{i0}	Initial price of firm i (\$/unit)	1,000

This formulation can be interpreted as the first-order Taylor series approximation of the more complex nonlinear underlying function relating unit costs, demand-supply balance, and market share to adjustments in price. The adjustment parameters α determine the sensitivity of price to each of these pressures. The first term moves target price to a base price determined by total unit costs and the constant target markup, m^* ,

$$P^C = (1 + m^*)(U^f + U^v). \quad (\text{EC37})$$

The second term is the firm's response to the adequacy of its current capacity, measured by the ratio of desired production Q^* to the normal rate of output, given by current capacity and normal capacity utilization, u^*K . When this ratio exceeds unity, the firm has insufficient capacity and increases price; excess capacity creates pressure to lower price.

Finally, the firm prices strategically in support of its capacity goals by adjusting prices when there is a gap between its target market share S^* and its current share S . When the firm desires a greater share than it currently commands, it will lower price; conversely, if market share exceeds the target the firm increases price, trading off the excess market share for higher profits and signaling rivals its desire to achieve a cooperative equilibrium.

Parameters

Table EC.1 shows the base-case parameters. Parameters such as the initial price and population serve to set the scale of the market and have no impact on the relative performance of the different strategies. Parameters such as the sensitivities of product attractiveness to price and availability, and the ratio of fixed to variable costs, do affect the relative performance of the aggressive and conservative strategies; these are varied in the sensitivity analysis, along with behavioral parameters such as the response of price to unit costs, demand-supply balance, and market share. The model is initialized in equilibrium such that each firm has 50% share of the initial demand. The parameters have been chosen to favor the performance of the aggressive GBF strategy: We assume firms have access to industry order data and their rivals' capacity plans with short delays in the reporting of these data (one quarter year).

Table EC.2 Sensitivity Analysis

Parameter	β^{CRIT}	Parameter	β^{CRIT}
σ : Demand curve slope		u^* : Normal capacity utilization	
0.0(POP^r/P^r)	1.4	0.6	1.2
−0.2(POP^r/P^r) [†]	1.3	0.8 [†]	1.3
−1.0(POP^r/P^r)	1.1	1.0	1.6
ε_p : Sensitivity of product attractiveness to price		τ^d, τ^c : Information reporting delays	
−4	<0.5	0.25, 0.25 [†]	1.3
−8 [†]	1.3	0.0625, 0.0625	1.7
−12	2.0	α^c : Strength of cost adjustment in price	
δ : Fractional discard rate of products		1.0 [†]	1.3
0.10 [†]	1.3	0.5	1.2
0.20	1.6	α^d : Strength of demand/supply effect on price	
0.50	1.4	0.50	1.1
c : Ratio of fixed to variable cost		0.25 [†]	1.3
3 [†]	1.3	0.00	1.0
1	1.5	α^s : Strength of market share effect on price	
1/3	1.9	0.00	1.3
λ : Capacity adjustment delay		0.10 [†]	1.3
1.0 [†]	1.3	0.20	1.3
0.5	1.9	0.50	1.3
γ : Learning curve strength		S^{min} : Minimum market share target for aggressive strategy	
$\log_2(0.8)$	1.3	1.00	1.0
$\log_2(0.7)$ [†]	1.3	0.80 [†]	1.3
$\log_2(0.5)$	1.6	0.60	0.8

[†]Denotes the base case value of each parameter.

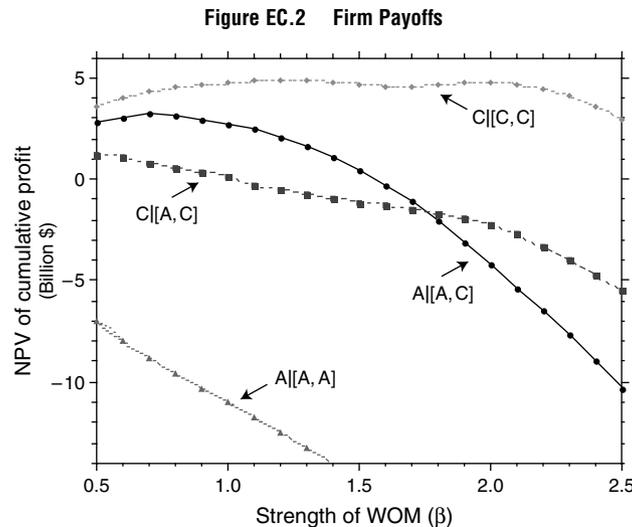
The sensitivity of order share to price is high, implying that nonprice factors such as product features, distribution channels, brand equity, etc. are of only modest importance, and increasing the strength of the positive feedback created by the learning curve. The capacity-acquisition delay is only one year, and capacity can be altered without any adjustment cost.

Sensitivity Analysis

Table EC.2 shows sensitivity analysis for the key parameters. The critical value of the word-of-mouth parameter, β^{CRIT} , is the value of β such that the aggressive strategy is inferior for values of $\beta > \beta^{\text{CRIT}}$. The smaller the value of β^{CRIT} , the less robust is the aggressive strategy to a rapid product lifecycle. Many of the impacts are consistent with intuition. The aggressive strategy is less robust with lower sensitivity of order share to price (a smaller firm-level demand elasticity), because the aggressive firm must cut prices more relative to its rival to gain a given share advantage. Shorter product lifetimes favor the aggressive strategy because a higher replacement purchase rate raises equilibrium sales and moderates the drop after the market saturates. A higher ratio of fixed to variable costs is harmful because capacity overshoot has greater impact on profitability. A longer capacity-acquisition lag is harmful as it leads to greater forecasting error and excess capacity.

The impact of several parameters runs counter to the intuition gained from equilibrium models. The stronger the learning curve and steeper the industry demand curve, the less robust is the aggressive strategy. In equilibrium theory stronger increasing returns and more elastic demand benefit aggressive players by lowering costs faster with experience and expanding the market faster as prices drop. These effects do operate in the model, but they are overwhelmed by the costs of greater forecasting error and capacity overshoot. Specifically, faster demand growth (caused by either stronger increasing returns or more elastic industry demand) causes total demand to grow faster during the boom phase, leading to greater capacity overshoot when boom turns to bust. Hence the costs of disequilibria overwhelm the benefits of increasing returns.

The adjustment factors in the behavioral pricing equation have little impact. The critical value β^{CRIT} is quite insensitive to wide variation in these parameters, indicating that uncertainty in the value of these behavioral factors does not compromise the results.



Note. As they depend on the speed of the product lifecycle when competitor capacity is estimated without regard to the supply line of pending capacity. The aggressive strategy is inferior for $\beta \geq 0.5$.

The assumption that firms know their rivals' planned capacity levels bears closer examination. Extensive experimental studies (Sterman 1989a, b; Paich and Sterman 1993; Diehl and Sterman 1995; Kampmann 1992; Croson et al. 2006) show in a wide range of experimental markets that people ignore or give insufficient weight to the supply line of pending capacity or production. The tendency to ignore the supply line (and more generally, failing to account for delays, e.g., Brehmer 1992) is robust: It occurs even in settings where the contents of the supply line are available costlessly and at all times, are prominently displayed, and are highly diagnostic, and where subjects have financial incentives to perform well. Failure to account for time delays and supply lines appears to be common in real markets as well. Studies show few real estate developers, for example, take account of the supply line of projects under development (Sterman 2000, Chapter 17), leading to periodic overbuilding followed by falling prices and contraction. Figure EC.2 shows the payoffs in the case where we assume firms do not account for the supply line of pending capacity but instead use the competitors' current capacity to estimate uncontested demand, that is, we set the weight on planned capacity in Equation (EC33) to zero, which means

$$K_j^e = K_j. \quad (\text{EC38})$$

When the supply line is ignored the aggressive strategy is inferior for all the market environments tested. Ignoring the supply line ensures that during the growth phase each firm erroneously believes its rival is expanding capacity much less than it actually is, and overestimates uncontested demand. The aggressive player opportunistically increases its target capacity still further and the conservative player fails to cede sufficiently, leading to a much larger overshoot of capacity and much larger losses when the market saturates. The aggressive strategy is dominated by the conservative strategy in all cases.

Replicating the Simulations in the Paper

We used the Vensim software to simulate the model.^{EC2} Readers can download the model from <http://web.mit.edu/jsterman/www/BLC.html> and can simulate it using the Vensim model reader, available free of charge from <http://www.vensim.com/download.html>. Click on "Free Downloads" and select Model Reader for your operating system.

To replicate the results, open the model using the model reader. The model is displayed in a set of views, or pages, organized by sector. These sectors and their functions are shown in Table EC.3. Use the graphical interface to set parameters and simulate. The strategy of firm $i = \{F1, F2\}$ is set to

^{EC2} The model is solved by Euler integration with a time step of 0.0625 years. The results are not sensitive to the use of smaller time steps or higher-order integration methods.

Table EC.3 Model Sectors

Sector	Function
Parameters	Set parameters
Diffusion	Adoption and diffusion of the product
Industry demand	Initial and replacement orders
Market	Product attractiveness and market share
Orders	Firm orders, backlog, and shipments
Price	Firm-price decision
Learning curve	Cumulative experience and unit costs
Capacity	Capacity acquisition
Target capacity	The target capacity decision
Expected industry demand	Demand forecasting
Net income	Firm profit and NPV

aggressive or conservative by setting the value of the *switch for capacity strategy* and the parameter designated *desired market share*. To simulate the [A, A] case, set

Switch for capacity strategy [F1] = 1

Switch for capacity strategy [F2] = 1

Desired market share [F1] = 0.8

Desired market share [F2] = 0.8

For the [C, C] case set

Switch for capacity strategy [F1] = 2

Switch for capacity strategy [F2] = 2

Desired market share [F1] = 0.5

Desired market share [F2] = 0.5

For the [A, C] case, set

Switch for capacity strategy [F1] = 1

Switch for capacity strategy [F2] = 2

Desired market share [F1] = 0.8

Desired market share [F2] = 0.5

The [C, A] case is symmetrical to the [A, C] case.

In the base case capacity adjusts to target capacity with a lag as specified in Equation (EC25). To run the “perfect-capacity” case in which capacity always equals desired output, set

Switch for perfect capacity [F1] = 1

Switch for perfect capacity [F2] = 1

The speed of diffusion is set by varying the strength of word of mouth, β . Choose the value of β you desire by setting the value of the parameter “WOM strength.” In the base case WOM Strength = 1.0. For the Fast market scenario, set WOM Strength = 2.0; for the Slow scenario, set WOM Strength = 0.5.

Use the Doc tool on the left hand toolbar to examine the equations. The other tools activate graphs and tables of output, along with other functions.

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See references list in the main paper.

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