Who Benefits from Supplier Encroachment in the Presence of Cost Learning?

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Motivation: Encroachment

Unicorn: Apple Reseller in India

Apple Store in India (launched in 2020)

Encroachment: Opening an alternative direct channel to sell one’s products, which competes with one’s own supply chain retailers.
Motivation: Encroachment

HUL: traditionally sold through retailers

Can encroachment Benefit a Retailer?

https://www.theushop.in/
Research Questions

- Can encroachment Benefit a Retailer?
  - Yes (under certain conditions) – Bright Side of Encroachment (Arya, et al., 2007)

\[
p = a - b(q^R + q^S)
\]
Research Questions

❑ Can encroachment **Benefit a Retailer?**
  • Yes! (under certain conditions) – Bright Side of Encroachment (Arya, et al., 2007)

❑ Can encroachment **Hurt a Supplier?**
  • Existing Literature: **No!**
  • Our Study: **Yes**, in the presence of cost learning!
Modeling Assumptions

- **Literature:**
  - Manufacturing Cost, $c = 0$

- **Our Study**
  - Manufacturing Cost, $c \neq 0$
  - $c + d > p \Rightarrow$ Encroachment not profitable

\[ p = a - b(q^R + q^S) \]
Motivation: Cost Learning

According to an MIT study, costs of lithium-ion batteries dropped by 20%-31% (depending on the shape) with every doubling of the production (Ziegler and Trancik, 2021).

Cost learning in manufacturing industries is common, whereby opportunities for improvements leading to a reduction in the manufacturing cost are identified and implemented.

\[ c_2 = c_1 - \delta q \]
Cost learning in manufacturing industries is common, whereby opportunities for improvements leading to a reduction in the manufacturing cost are identified and implemented.

Ziegler and Trancik, 2021

Akkaya et al., 2021
Levitt et al., 2013
Model: Encroachment with Cost Learning

Period 1

Supplier sells at $w$

Retailer orders $q^R$

Market buys at price $p$

$\Delta c_1 = c_1 - \delta q^R$

Period 2

Supplier sells at $w$

Retailer orders $q^R$

Market buys at price $p$

$\Delta c_2 = c_2 - \delta q^R$

Direct Channel sells $q^S$

$\Delta c_2 = c_2 - \delta q^R$

$d$

$\Delta c_2 = c_2 - \delta q^R$
Modeling Assumptions

- **Literature:**
  - Manufacturing Cost, $c = 0$
  - No Cost Learning, $\delta = 0$
  - $c_1 + d > p \Rightarrow$ Encroachment not profitable
  - $c_2 = c_1 - \delta q^R$

- **Our Study**
  - Manufacturing Cost, $c \neq 0$
  - Cost Learning, $\delta \neq 0$ ($c_2 = c_1 - \delta q^R$)
  - $c_1 + d > p \Rightarrow$ Encroachment not profitable
  - $c_1 + d > p$ initially but $c_2 + d < p$ later with cost learning $\Rightarrow$ Encroachment profitable
Retailer’s Dilemma

\[ q_1^R \uparrow \rightarrow c_2 = c_1 - \delta q_1^R \downarrow \]

Encroachment

\[ \pi_2^R = q_2^R (p_2 - w_2) \uparrow \]

\[ \pi_2^R = q_2^R (p_2 - w_2) \downarrow \]

Hurts Retailer

Benefits Retailer

Direct Selling Cost, \( d \rightarrow \)

Encroachment

No Encroachment

Should the Retailer Increase or Decrease \( q_1^R \) ?
Supplier’s Dilemma

Research Questions

Should the Supplier Decrease or Increase $w_1$?

\[ \pi_1^S = q_1^R (w_1 - c_1) \]

\[ c_2 = c_1 - \delta q_1^R \]

\[ \pi_2^S = q_2^R (w_2 - c_2) + q_2^S (p_2 - (c_2+d)) \]
Model

Supplier offers wholesale price $w_1$

Retailer decides order quantity $q_1^R$

Period 1

- $p_1 = 1 - q_1^R$
- $\pi_1^S = q_1^R (w_1 - c_1)$
- $\pi_1^R = q_1^R (p_1 - w_1)$

Retailer decides order quantity $q_2^R$

Supplier offers wholesale price $w_2$

Period 2

- $p_2 = 1 - (q_2^R + q_2^S)$
- $\pi_2^S = q_2^R (w_2 - c_2) + q_2^S (p_2 - (c_2 + d))$
- $\pi_2^R = q_2^R (p_2 - w_2)$

$\Pi^S = \pi_1^S + \pi_2^S$ ; $\Pi^R = \pi_1^R + \pi_2^R$

Timeline for Decisions
### Results

\[ p_2 = 1 - (q_2^R + q_2^S) \]

<table>
<thead>
<tr>
<th>( w_2 )</th>
<th>((3 + 3c_2 - d)/6)</th>
<th>((3 + 3c_2 - d)/6)</th>
<th>((3d + 3c_2 - 1)/2)</th>
<th>((3 + 3c_2)/6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( q_2^R )</td>
<td>(2d/3)</td>
<td>(2d/3)</td>
<td>(1 - (c_2 + d))</td>
<td>((1 - c_2)/4)</td>
</tr>
<tr>
<td>( q_2^S )</td>
<td>&gt; 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>( p_2 )</td>
<td>&lt; 1 - 2d/3</td>
<td>1 - 2d/3 ((&gt; c_2 + d))</td>
<td>(c_2 + d)</td>
<td>(c_2 + d)</td>
</tr>
</tbody>
</table>

- **Active Encroachment (A)**
- **Voluntary Mute Encroachment (VM)**
- **Forced Mute Encroachment (FM)**
- **No Encroachment (N)**

New region (disappears when \(\delta = 0\))

Threat of Encroachment (Guan et al., 2019)
Results

Should the Supplier Increase or Decrease $w_1$?

\[
\begin{align*}
&w_1^E < w_1^B & & w_1^E \geq w_1^B & & w_1^E < w_1^B \\
&d_2 \text{ Direct Selling Cost, } d \rightarrow & & & & d_3
\end{align*}
\]

Should the Retailer Increase or Decrease $q_1^R$?

\[
\begin{align*}
&q_1^{R,E} > q_1^{R,B} & & q_1^{R,E} \leq q_1^{R,B} & & q_1^{R,E} > q_1^{R,B} \\
&d_4 & & d_5 & &
\end{align*}
\]

Direct Selling Cost, $d \rightarrow$

$E$: Encroachment \quad B$: Benchmark
Results

Impact of Encroachment on First Period Sales $q_1^R$

<table>
<thead>
<tr>
<th>$q_{1, E}^R &gt; q_{1, B}^R$</th>
<th>$q_{1, E}^R \leq q_{1, B}^R$</th>
<th>$q_{1, E}^R &gt; q_{1, B}^R$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$d_4$</td>
<td></td>
<td>$d_5$</td>
</tr>
</tbody>
</table>

Direct Selling Cost, d $\rightarrow$

$q_1^R \uparrow$ $\rightarrow$ $c_2 = c_1 - \delta q_1^R$

Encroachment

$w_2 \downarrow$

$\pi_2^R = q_2^R(p_2 - w_2)$

$\pi_2^R = q_2^R(p_2 - w_2)$

What is the Impact of Encroachment on the Retailer’s and the Supplier’s Profits?

$E$: Encroachment  $B$: Benchmark
Who Benefits from Supplier Encroachment?

- Can it Hurt a Supplier? Yes, in presence of cost learning!

**W-W**: Supplier Wins, Retailer Wins

**W-L**: Supplier Wins, Retailer Loses

**L-W**: Supplier Loses, Retailer Wins

**L-L**: Supplier Loses, Retailer Loses
Anecdotal Support

Can Encroachment Hurt a Supplier?

- When Compaq (now acquired by HP) opened web stores, it experienced a 12% drop in commercial PC revenues as a result of retaliation from retailers who objected to the manufacturer’s online selling (encroachment) (Tedeschi, 2000).
Can Encroachment Hurt a Supplier?

- Letter from Home Depot to its vendor

Dear Vendor, It is important for you to be aware of Home Depot’s current position on its’ [sic] vendors competing with the company via e-commerce direct to consumer distribution. We think it is short-sighted for vendors to ignore the added value that our retail stores contribute to the sales of their products... We recognize that a vendor has the right to sell through whatever distribution channels it desires. However, we too have the right to be selective in regard to the vendors we select and we trust that you can understand that a company may be hesitant to do business with its competitors.
Managerial Implications

The Learning rate, the direct selling cost, or both are low

Encroach

The Learning rate is high and the direct selling cost is intermediate

Credibly commit to No-Encroachment
Questions