Channel Construction in Emerging Markets

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This paper discusses engineering techniques in channel construction.
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Not really.
Motivating Scenario

What to market: portable ultrasound machines designed for emerging markets
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- Leveraging its global product platform
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What to market: portable ultrasound machines designed for emerging markets

- Leveraging its global product platform
- Risky and inefficient to build its own distributor channel, esp. in rural areas

Demand for Ultrasound

- China: $833 million in 2012, $1,300 million in 2019
- India: $101 million in 2012, $192 million in 2019

Dai & Ni (Johns Hopkins)
Motivating Scenario

What to market: portable ultrasound machines designed for emerging markets

• Leveraging its global product platform

• Risky and inefficient to build its own distributor channel, esp. in rural areas

• Constructing a distribution system by hiring a large number of existing, often small, distributors

Demand for Ultrasound

- China: $1,300 million (2019) vs. $833 million (2012)
“Everyone asks us, ‘How do you compete against the locals in China or India?’ When you look at the products, we’ve been pretty successful, and we’re developing architectures that are very low cost. We take our software capabilities and push it from the highest end products down to the low end and we get something that’s very cost effective but still quite powerful.”

“The analogy would be what Apple has done with the iPhone. They have taken a lot of the software capability of their OSX operating system and pushed it down to an iPad or an iPhone. They’re using low-cost architecture but giving it tremendous power because of the software capability. We’re able to do similar things in our space.”

John Dineen, President and CEO, GE Healthcare
Feature #1: Asymmetric Market Knowledge

“Small distributors are unlike the value-added distribution firms with which modern manufacturers are familiar… Gaining understanding and control in these fragmented networks has proven an easier task for domestic companies than foreign ones.”

_Selling to the Local Chinese Market: An Interview with Deepak Advani (CMO at Lenovo) and Hal Sirkin (Senior VP at BCG)_
Feature #2: Product Advantage
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Multinational manufacturers may possess product advantage that can be either
Feature #2: Product Advantage

Multinational manufacturers may possess product advantage that can be either

• Cost advantage over local competitors

or
Feature #2: Product Advantage

Multinational manufacturers may possess product advantage that can be either

- Cost advantage over local competitors

or

- Better brand power and perceived quality
Feature #3: Use of Collateral
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Collateral

noun
2 : property (as securities) pledged by a borrower to protect the interests of the lender
Feature #3: Use of Collateral

**Collateral**

*noun*

2 : property (as securities) pledged by a borrower to protect the interests of the lender

- Collateral is often associated with banking and finance
  - Causes a deadweight loss due to creditor’s and debtor’s **asymmetric** valuations (Barro 1976)
  - Such deadweight loss can be particularly high in emerging markets (Vig 2013)
Feature #3: Use of Collateral

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• Collateral is often associated with banking and finance
  • Causes a deadweight loss due to creditor’s and debtor’s asymmetric valuations (Barro 1976)
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• Collateral in channel contracting in the absence of a reputable credit system
  • In emerging markets, Collateral is often required for distributors to secure channel partnership (Zimmerman: China Law Deskbook)
Taken Together

Local Incumbent

Pool of Distributors of Different Types
Taken Together

- Multinational Entrant
- Local Incumbent

Pool of Distributors of Different Types
Taken Together

- Multinational Entrant
- Local Incumbent

Pool of Distributors of Different Types

Market knowledge advantage
Taken Together

Product advantage
Multinational Entrant

Market knowledge advantage
Local Incumbent

Pool of Distributors of Different Types
Taken Together

Product advantage

Multinational Entrant

Market knowledge advantage

Local Incumbent

Collateral

Pool of Distributors of Different Types
Questions facing the multinational entrant:
1. How to compete with local incumbent for distributors?
2. How to screen candidate distributors?
Agenda

1. Literature
2. Model
3. Analysis
   - Benchmark Scenarios
   - Domination by Separating
   - Domination by Pooling
4. Extensions
5. Concluding Remarks
• Supply chain contracting (Cachon 2003; Desai 2000; Lariviere 1998; Padmanabhan and Png 1997; Pasternack 1985; Raju and Zhang 2005)

• The first paper to study distribution contracts with collateral requirement
Literature

• **Supply chain contracting** (Cachon 2003; Desai 2000; Lariviere 1998; Padmanabhan and Png 1997; Pasternack 1985; Raju and Zhang 2005)

  • The first paper to study distribution contracts with collateral requirement

• **Marketing channel management literature** (Chu and Desai 1995; Desai and Srinivasan 1995; Desai 1997; Coughlan 1985; Coughlan and Wernerfelt 1989; Iyer 1998; McGuire and Staelin 1983) focuses on the contracting issues faced by a single principle

  • We investigate an understudied case where two principals compete against each other through contracting
Rothschild and Stiglitz (1976)

Competitive equilibrium in the insurance market

- Setting: competition between multiple symmetrically uninformed principals under perfect competition
- Equilibrium is impacted by the entry of a new insurance company
- Key assumption: insurance contracts are exclusive
- Finding: pooling equilibria do not exist; separating equilibria may exist
Rothschild and Stiglitz (1976)

Competitive equilibrium in the insurance market

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- Key assumption: insurance contracts are exclusive
- Finding: pooling equilibria do not exist; separating equilibria may exist

Our model: multiple asymmetrically informed principals

- Contract terms are embodied and set by the market
Model

- Multinational Entrant
  - Cost: $\rho^E$
- Local Incumbent

Pool of Distributors
Model

Multinational Entrant

Cost: $\rho^E$

Local Incumbent

Cost: $\rho^I$

Pool of Distributors
Model

Without distributor type information

Multinational Entrant

Cost: $\rho^E$

Local Incumbent

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Pool of Distributors
Model

- WITHOUT distributor type information

  - Multinational **Entrant**
    - Cost: $\rho^E$

- WITH distributor type information

  - Local **Incumbent**
    - Cost: $\rho^I$

Pool of Distributors
Model

Without distributor type information

Multinational Entrant

Cost: \( \rho^E \)

Local Incumbent

With distributor type information

Cost: \( \rho^I \)

Pool of Distributors

High type (proportion \( \gamma \))

Low type (proportion \( 1-\gamma \))
Model

**Without distributor type information**

**Multinational Entrant**

Cost: $\rho^E$

**With distributor type information**

**Local Incumbent**

Cost: $\rho^I$

**Pool of Distributors**

High type (proportion $\gamma$)  Low type (proportion $1-\gamma$)

Selling probability depends on both manufacturer and distributor:

$\theta^j_i$: probability for a type $i$ distributor to successfully sell a product from Manufacturer $j$, for $i=H, L$, and $j=E, I$. 
Model

**Without distributor type information**

**Multinational Entrant**

Cost: $\rho^E$

---

**With distributor type information**

**Local Incumbent**

Cost: $\rho^I$

---

**Pool of Distributors**

- **High type (proportion $\gamma$)**
- **Low type (proportion 1-$\gamma$)**

Selling probability depends on both manufacturer and distributor:

$\theta^i_j$: probability for a type $i$ distributor to successfully sell a product from Manufacturer $j$, for $i=H, L$, and $j=E, I$.

**Assumption:** When marketed by the same distributor (high- or low-type), the product from Manufacturer $E$ would generate a higher expected channel-wide surplus, that is $\theta^E_i r - \rho^E > \theta^I_i r - \rho^I > 0$ for $i \in \{H, L\}$
Contract Structure

- A distributor acquires one unit (after normalization) of product from a manufacturer, and can sell it for a revenue of $r$
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• As a return, a payment level \( R \) (\( > 0 \)) to the manufacturer for successful resale
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- As a return, a payment level $R (>0)$ to the manufacturer for successful resale

- As a standard assumption in the collateral literature (cf. Barro 1976), we use $0 \leq \beta < 1$ to describe the difference in a manufacturer’s and a distributor’s valuations of the collateral.

Collateral valued at $K$ by the distributor is valued at $\beta K$ by the manufacturer

$\Rightarrow$ The use of collateral leads to a positive deadweight loss
Benchmark Scenario I: Monopolist Manufacturer
Benchmark Scenario I: Monopolist Manufacturer

Optimal contracting decision of a monopolist manufacturer, which can be either Manufacturer I or E
Benchmark Scenario I: Monopolist Manufacturer

Optimal contracting decision of a monopolist manufacturer, which can be either Manufacturer $I$ or $E$

- **Manufacturer $I$** (with distributor information) always sets collateral at zero
  The maximum and minimum payment levels (for $i=H, L$) are:

\[
\bar{R}_i^I = r - U^0 / \theta_i^I \\
\underline{R}_i^I (\rho^I) = \rho^I / \theta_i^I,
\]
Benchmark Scenario I: Monopolist Manufacturer

Optimal contracting decision of a monopolist manufacturer, which can be either Manufacturer I or E

• **Manufacturer I** (with distributor information) always sets collateral at zero. The maximum and minimum payment levels (for $i=H, L$) are:

  $$\bar{R}_i^I = r - \mu^0 / \theta_i^I$$
  $$\underline{R}_i^I(\rho^I) = \rho^I / \theta_i^I$$

• **Manufacturer E** (without distributor information), again, will set collateral at zero because for any separating contracts with positive collateral, one can construct a pooling contract with collateral of zero that gives E a higher payoff.
Benchmark Scenario II: Competition Under Symmetric Information

Manufacturers $I$ and $E$ compete with each other, both with full information about distributor types
Benchmark Scenario II: 
Competition Under Symmetric Information

Manufacturers $I$ and $E$ compete with each other, both with full information about distributor types

**Equilibrium:** Each manufacturer offers a menu of contracts targeting each distributor type with collateral optimally set at zero.

Manufacturer $E$ chooses a payment level that gives it a strictly positive expected profit while meeting each distributor’s outside option—utility from contracting with Manufacturer $I$.

**Lemma 2.** In the case with competition under symmetric information, Manufacturer $I$ offers a contract $(R_i^I(\rho^I), 0)$ for a type-$i$ distributor. Manufacturer $E$ offers a contract $(\underline{R}_i^E, 0)$ for a type-$i$ distributor, where $\underline{R}_i^E(\rho^I) = \left(1 - \frac{\theta_i^I}{\theta_i^E}\right) r + \frac{\rho^I}{\theta_i^E}$ for $i \in \{H, L\}$. 
Focal Scenario

Manufacturer $E$ (without distributor type information) competes with Manufacturer $I$ (with distributor type information)

- **Talent grab**: Should the multinational entrant set low payment levels to attract distributors?

- **Talent screening**: Should the multinational use contracts to screen different types of distributors? If yes, how?
Equilibrium Characterization

Manufacturer $E$ captures only type-L distributors through \textit{separating} contracts.

Manufacturer $E$ captures both types of distributors through \textit{pooling} contracts.

$\rho^E$
Equilibrium Characterization

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Our focus
Separating Contracts

**Condition 1 (composition requirement).** Proportion of high types is lower than

$$\hat{\gamma} = \frac{\theta_H^E - \theta_L^E}{[1 + (1 - \beta)(1 - \theta_H^E)]\theta_H^E - \theta_L^E}$$

**Condition 2 (cost requirement).** Multinational entrant’s cost is no higher than

$$\hat{\rho}(\gamma) = [1 - (1 - \beta)(1 - \theta_H^E)]\rho^I + \gamma r (\theta_H^E - \theta_H^I) + (1 - \beta)(1 - \theta_H^E)r \cdot \frac{\theta_H^E \theta_L^I - \theta_H^I \theta_L^E}{\theta_H^E - \theta_L^E}$$
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Separating Contracts

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\hat{\gamma} = \frac{\theta^E_H - \theta^E_L}{[1 + (1 - \beta)(1 - \theta^E_H)]\theta^E_H - \theta^E_L}
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Increases in \(\beta\)

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Increases in $\beta$
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\]

Increases in $\beta$

Increases in $\gamma$

if $\theta^E_H \geq \theta^I_H$;

decreases in $\gamma$ o.w.
Separating Contracts

**Condition 1 (composition requirement).** Proportion of high types is lower than

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\hat{\gamma} = \frac{\theta_H^E - \theta_L^E}{[1 + (1 - \beta)(1 - \theta_H^E)]\theta_H^E - \theta_L^E}
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Increases in \( \beta \)

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\]

Increases in \( \beta \)

Increases in \( \gamma \)

if \( \theta_H^E \geq \theta_I^I \);

decreases in \( \gamma \) o.w.

\[
\frac{\theta_E^E}{\theta_L^E} - \frac{\theta_I^I}{\theta_L^I}, \quad \frac{\theta_E^E}{\theta_L^E} - 1
\]
Separating Contracts

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\hat{\gamma} = \frac{\theta^E_H - \theta^E_L}{[1 + (1 - \beta)(1 - \theta^E_H)]\theta^E_H - \theta^E_L}
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\]

Increases in \(\beta\)

Increases in \(\gamma\)

if \(\theta^E_H \geq \theta^I_H\);

\[
\frac{\theta^E_H}{\theta^E_L} - \frac{\theta^I_H}{\theta^I_L}
\]

decreases in \(\gamma\) o.w.

\[
\frac{\theta^E_H}{\theta^E_L} - 1
\]

Decreases in \(\theta^E_L\)
Separating Contracts

- Better legal enforcement (implied by a higher $\beta$) has a two-fold effect in facilitating the entry of the multinational manufacturer—it leads to increases in both these thresholds (in both proportion requirement and cost requirement)
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- Better legal enforcement (implied by a higher $\beta$) has a **two-fold effect** in facilitating the entry of the multinational manufacturer—it leads to increases in both these thresholds (in both proportion requirement and cost requirement).

- Expected result: as the proportion of high types ($y$) increases, the cost requirement for the multinational entrant to dominate the channel is lower.

The opposite may be true in the case that $\theta^E_H \leq \theta^I_H$.

Intuition: As the proportion of high-type distributors increases, multinational entrant needs a higher cost advantage to be able to contest the local incumbent’s informational advantage.
Proposition 1 If $\rho^E \leq \hat{\rho}(\gamma)$ and $\gamma < \hat{\gamma}$, then

(i) Manufacturer $I$ offers $(R^I_L(\rho^L), 0)$ to low-ability distributors, and $(R^I_H(\rho^L), 0)$ to high-ability distributors. Manufacturer $E$ offers $[(R^E_L, 0); (R^E_H, K^E_H)]$, where

\[
K^E_H = \rho^I - r \cdot \frac{\theta^E_H \theta^I_L - \theta^I_H \theta^E_L}{\theta^E_H - \theta^E_L},
\]

(8)

\[
R^E_H = \rho^I + r \left(1 - \frac{\theta^I_H - \theta^I_L + \theta^E_H \theta^I_L - \theta^I_H \theta^E_L}{\theta^E_H - \theta^E_L}\right), \text{ and}
\]

(9)

\[
R^E_L = R^E_L(\rho^I).
\]

(10)

(ii) If $\rho^E < \hat{\rho}(\gamma)$, Manufacturer $E$ captures all distributors and its expected profits from all contracts are strictly positive.

(iii) If $\rho^E = \hat{\rho}(\gamma)$, then high-ability distributors form channel contract with either manufacturer but low-ability distributors only sign the channel coordination contract with Manufacturer $E$. Manufacturer $E$’s profits from contracting with type-$H$ distributors are zero but those from contracting with type-$L$ distributors are strictly positive.
Separating Contracts

- A multinational entrant without local knowledge of distributors can use collateral requirement as a screening tool to contest the local incumbent’s informational advantage
Separating Contracts

• A multinational entrant without local knowledge of distributors can use collateral requirement as a screening tool to contest the local incumbent’s informational advantage

• Collateral requirement is imposed to high-type distributors but not to low-types
Separating Contracts

• A multinational entrant without local knowledge of distributors can use collateral requirement as a screening tool to contest the local incumbent’s informational advantage

• Collateral requirement is imposed to high-type distributors but not to low-types

• As $\theta_E^L$ decreases, Manufacturer $E$ offers a type-$H$ distributor a contract with a lower collateral requirement and a higher payment level

  Implication: Multinational entrant’s technical barrier can help it screen distributors and thus reduce the amount of collateral requirement
Equilibrium Characterization

Manufacturer $E$ captures only type-L distributors through **separating** contracts.

Manufacturer $E$ captures both types of distributors through **pooling** contracts.

\[ \rho^E \]

\[ \gamma \]
Pooling Contracts

- **Condition 1 (composition requirement):** Proportion of high types is higher than

\[ \hat{\gamma} = \frac{\theta_H^E - \theta_L^E}{[1 + (1 - \beta)(1 - \theta_H^E)]\theta_H^E - \theta_L^E} \]

- **Condition 2 (cost requirement):** Multinational manufacturer’s cost is no higher than

\[ \tilde{\rho}_P(\gamma) = \left[ \gamma + (1 - \gamma) \cdot \frac{\theta_L^E}{\theta_H^E} \right] \cdot [(\theta_H^E - \theta_H^I)r + \rho^I] \]
Pooling Contracts

**Proposition 2** If $\rho^E \leq \tilde{\rho}_P(\gamma)$ and $\gamma \geq \tilde{\gamma}$, Manufacturer $E$ offers a pooling contract of $(R^E_{H}(\rho^I),0)$. Manufacturer $I$’s best response is to offer $(R^I_{H}(\rho^I),0)$ to each type-$H$ distributor and $(R^I_{L}(\rho^I),0)$ to each type-$L$ distributor. Manufacturer $E$ captures all distributors and its expected profit is non-negative.

- Under a moderate cost advantage and a large proportion of high-ability distributors, multinational entrant can dominate the channel by using a pooling contract
Benchmark Scenario I: Monopolist Manufacturer
Benchmark Scenario I: Monopolist Manufacturer

Optimal contracting decision of a monopolist manufacturer, which can be either Manufacturer $I$ or $E$
Benchmark Scenario I: Monopolist Manufacturer

Optimal contracting decision of a monopolist manufacturer, which can be either Manufacturer \( I \) or \( E \)

- **Manufacturer \( I \)** (with distributor information) always sets collateral at zero

The maximum and minimum payment levels (for \( i=H, L \)) are:

\[
\bar{R}_i^I = r - U^0 / \theta_i^I \\
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Benchmark Scenario I: Monopolist Manufacturer

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- **Manufacturer $E$** (without distributor information), again, will set collateral at zero because for any separating contracts with positive collateral, one may always construct a pooling contract with collateral of zero that gives $E$ a higher payoff.
Benchmark Scenario II: Competition Under Symmetric Information
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Manufacturers $I$ and $E$ compete with each other, both with full information about distributor types
Benchmark Scenario II: Competition Under Symmetric Information

Manufacturers $I$ and $E$ compete with each other, both with full information about distributor types

**Equilibrium:** Each manufacturer offers a menu of contracts targeting each distributor type with collateral optimally set at zero.

Manufacturer $E$ chooses a payment level that gives it a strictly positive expected profit while meeting each distributor’s outside option—utility from contracting with Manufacturer $I$.

**Lemma 2.** In the case with competition under symmetric information, Manufacturer $I$ offers a contract $(\overline{R}_i(\rho^I),0)$ for a type-$i$ distributor. Manufacturer $E$ offers a contract $(\underline{R}_i^E,0)$ for a type-$i$ distributor, where $\underline{R}_i^E(\rho^I) = \left(1 - \frac{\theta_i^I}{\theta_i^E}\right) r + \frac{p_i^I}{\theta_i^E}$ for $i \in \{H, L\}$. 

Dai & Ni (Johns Hopkins)
Comparing Across Scenarios
Comparing Across Scenarios

- Under either Benchmark Scenario I (Monopolist Manufacturer) or Benchmark Scenario II (Competition Under Symmetric Information), multinational entrant never uses collateral in its contracts with distributors
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- Under either Benchmark Scenario I (Monopolist Manufacturer) or Benchmark Scenario II (Competition Under Symmetric Information), multinational entrant never uses collateral in its contracts with distributors

  - The use of a collateral causes a deadweight loss to the whole channel
Comparing Across Scenarios

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• The interaction between (1) adverse selection and (2) competition for talents drives the use of collateral as a screening tool
Comparing Across Scenarios

• Under either Benchmark Scenario I (Monopolist Manufacturer) or Benchmark Scenario II (Competition Under Symmetric Information), multinational entrant never uses collateral in its contracts with distributors

  • The use of a collateral causes a deadweight loss to the whole channel

• The interaction between (1) adverse selection and (2) competition for talents drives the use of collateral as a screening tool

  • The deadweight loss is a “necessary evil” as it allows the multinational entrant to obtain hard-to-observe distributor-specific information
Key Findings

• When the multinational entrant’s cost/product advantage is high enough, it may be able to successfully capture high-type distributors using either a screening or pooling contract depending on the composition of the market of the distributors:

  • When a large proportion of distributors are high type, the entrant may use a pooling contract to capture both types of distributors even under a moderate cost advantage

  • When a small proportion of distributor is high type, the entrant may use a menu of contracts to screening the distributors but would need a significant cost advantage.
Extensions

• Continuous Demand
  • Manufacturer uses a sales target that is jointly determined by the payment level $R$ and collateral $K$

• Effort-Dependent Demand
  • Moral hazard is considered in addition to adverse selection
Conclusions

This paper analyzes channel construction in an emerging market

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- Strong legal enforcement can facilitate the entry of multinational manufacturers by reducing the deadweight loss
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• Strong legal enforcement can facilitate the entry of multinational manufacturers by reducing the deadweight loss

• A large proportion of high types makes it more difficult for the multinational entrant to sort the distributors
Appendix
Manufacturer $j$, when sold through a type-$i$ distributor, has a support of $[0, \infty)$, a density function of $f_i^j(\cdot)$, a cumulative density of $F_i^j(\cdot)$, and a mean of $D_i^j$, for $i \in \{H, L\}$ and $j \in \{E, I\}$. Corresponding to Assumption 1, we assume that

$$D_i^E r - \rho^E > D_i^I r - \rho^I, \text{ for } i \in \{H, L\},$$

to focus on the interesting case where the multinational entrant may be able to leverage its product differentiation to mitigate its informational disadvantage. We further assume that $F_H^j(\xi) \leq F_L^j(\xi)$ for any $\xi$ and $j \in \{E, I\}$, meaning that the demand for either Manufacturer’s product under a type-$H$ distributor is first-order stochastically greater than the under a type-$L$ distributor.

When offering any contract with a payment level $R$ and a collateral requirement of $K$, it is in the best interests of a manufacturer to collect the collateral $K$ when the demand $\xi < \frac{\beta K}{R}$ and collect demand-dependent payment from the distributor when the demand $\xi \geq \frac{\beta K}{R}$. Thus, for $i \in \{H, L\}$ and $j \in \{E, I\}$, Manufacturer $j$’s expected payoff from offering a contract $(R, K)$ to a type-$i$ distributor is:

$$R \int_{\beta K/R}^{\infty} \xi f_i^j(\xi) d\xi + \beta K F_i^j(\beta K/R).$$

The type-$i$ distributor’s payoff is

$$(r - R) \int_{\beta K/R}^{\infty} \xi f_i^j(\xi) d\xi + r \int_{0}^{\beta K/R} \xi f_i^j(\xi) d\xi - K F_i^j(\beta K/R).$$

The channel-wide surplus is

$$r D_i^j - (1 - \beta) K F_i^j(\beta K/R),$$

which contains a deadweight loss term due to the use of collateral $K$. The deadweight loss increases in the value of $K$. We can show that several results from our model remain valid: (1) Manufacturer $I$ does not use a collateral; (2) in a separating equilibrium, Manufacturer $E$ offers a collateral only to type-$H$ distributors; and (3) in a pooling equilibrium, Manufacturer $E$ does not offer a collateral to any types of distributors.
the distributor’s disutility from choosing an effort level of 0 as zero. Without loss of generality, we specify the probability of success as follows:

\[
\theta^i_H(e) = \begin{cases} 
\theta^j_{H1}, & \text{if } e = 1, \\
\theta^j_{H0}, & \text{if } e = 0,
\end{cases}
\]

and

\[
\theta^j_L(e) = \begin{cases} 
\theta^j_L, & \text{if } e = 1, \\
0, & \text{if } e = 0,
\end{cases}
\]

for \( j \in \{E, I\} \). We assume that \( \theta^j_{H1} > \theta^j_{H0} > 0 \) and \( \theta^j_{H1} > \theta^j_L > 0 \) for \( j \in \{E, I\} \).