

Managing Gray Markets Through Tolerance of Violations: A Transaction Cost Perspective

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Exclusive territory distribution arrangements are commonly observed in many markets. Once deployed, such arrangements are often subject to gray market activity, in the form of unauthorized sales which violate assigned restrictions. Interestingly, however, firms frequently choose to tolerate violations, rather than pursuing complete enforcement (i.e., by terminating violators) or abandoning exclusivity entirely. We draw from the literature on transaction cost economics to propose that tolerance of gray market activity is a function of a firm's ability to detect violations, and of the existence of credible threats and commitments. We also draw on the traditional literature on exclusive territories to suggest that minimizing distributor free-riding on services, which influences the decision to use exclusive territories in the first place, continues to be a concern after deployment. We collect micro-level data and test our predictions through a survey of managers who were responsible for the distribution decisions in their respective companies. Our results suggest that tolerance of violations is influenced both by transaction cost and free-riding considerations. © 1998 John Wiley & Sons, Ltd.

INTRODUCTION

Exclusive territory distribution arrangements are widely used in many markets. They usually take the form of a geographical system, which assigns distributors to particular sales areas or territories (Klein and Murphy, 1988; Katz, 1989). Under such an arrangement a distributor is restricted from selling outside of a particular territory, and other distributors are restricted from selling into the territory in question.

Exclusive territories have received considerable attention both in economics and legal literature. The predominant focus of both literatures has been on the initial *deployment* of such arrangements (e.g., Mathewson and Winter, 1984; Rey and Stiglitz, 1995). Implicitly, much of this litera-

ture has assumed that once an exclusivity arrangement is in place, *ex post* management is a trivial task. Alternatively, the assumption has been made that enforcement of assigned restrictions is costless.

These assumptions are being challenged by recent evidence of gray market activity, in the form of unauthorized sales which violate established distribution restrictions. In total, it has been estimated that 'gray market' activity amounts to \$10 billion annually (Cespedes *et al.*, 1988; Fleischut, 1989) and is growing at an annual rate of 22% (Lowe and McCrohan, 1989).¹ Thus, *ex post* management of territorial arrangements can be a significant problem.

Interestingly, while a substantial literature exists on the initial deployment of exclusive territories, the topic of managing violations is poorly documented. Industry observers typically recommend the extreme options of (1) complete enforce-

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ment, involving termination of all violators, or (2) complete abandonment of restrictions. It is noteworthy, however, that many firms pursue intermediate strategies and actually tolerate violations. For instance, Banerji (1990) reports case evidence which shows that some firms enforce violations in a selective fashion.

An unresolved question, however, is what the determinants of firms' tolerance level are. We draw on transaction cost theory to propose that violating an exclusivity arrangement constitutes a form of opportunistic behavior (Williamson, 1985), and that the costs of detecting such behavior may increase a firm's tolerance level. Specifically, we argue that the higher the degree of *performance ambiguity* (e.g., Alchian and Demsetz, 1972) associated with evaluating whether assigned territorial arrangements are honored, the higher the level of tolerance.

We also argue that a firm's tolerance of violations is influenced by the presence of credible threats and credible commitments of various kinds. Specifically, when a manufacturer's existing channel arrangement makes termination of the distributor a credible threat, we predict a lower degree of tolerance. Furthermore, if distributors make credible commitments to a manufacturer by agreeing to not carry competing product lines (i.e. exclusive dealing), we expect the manufacturer to show forbearance and tolerate violations.

We also draw from the traditional literature on the deployment of exclusive territories to suggest that minimizing free-riding on services, which influences the initial decision to use exclusive territories, continues to be a concern after deployment. As such, we hypothesize that free-riding concerns will decrease a firm's tolerance of violations.

We provide evidence on these perspectives through micro-level data (e.g., Calfee and Rubin, 1993; Heide *et al.*, 1998) collected in a survey of executives who were involved in the distribution decisions in their respective firms. This data is appropriate because we: (1) selected industries for which violations of exclusive territories are common; (2) collected the data from knowledgeable parties (marketing managers and vice presidents) who were responsible for making distribution decisions; and (3) used multiple pre-tests and psychometric assessments to insure the quality of the information gathered.

The remainder of the paper is organized as follows. In the next section, we describe some theoretical perspectives on the tolerance of gray market activity. The third section describes the data, and the fourth section provides a discussion of the results. Finally, the fifth section presents our conclusions.

THEORETICAL PERSPECTIVES ON MANAGING GRAY MARKETS

This section discusses some antecedent conditions which we expect to influence a firm's willingness to tolerate gray market activity. Recall from our earlier discussion that formal theory and conceptual arguments regarding the *management* of exclusivity arrangements is quite limited. As a consequence, we draw in part on the established literature on the *deployment* of exclusive territories. Conceptually, we view strict enforcement of established restrictions (i.e., low tolerance of violations) as a decision to continue to deploy restrictions on an on-going basis. As such, we hypothesize that factors which represent incentives for deployment in the first place represent incentives for strict enforcement. Minimizing *free-riding on distributor services* is one such factor.

We draw on transaction cost theory to identify factors which either make strict enforcement difficult, or somehow influence the desirability of strict enforcement. Specifically, we focus on *performance ambiguity* problems, and on the presence of *credible threats* and *credible commitments*. In the following, we make the assumption that absent such considerations, firms which initially assign distributors to exclusive territories will attempt to enforce in a strict fashion. In the following, we describe our hypothesized influences on the tolerance limit, starting with distributor service provision.

Distributor Services

Territorial restrictions are often originally deployed in order to ensure that the seller who provides a particular service captures its full benefits. For example, products which require extensive pre-sales assistance in the form of technical information provision or customer demonstrations (Webster, 1976; Blair and Kaserman, 1983) often require that manufacturers deploy exclusive

territories in order to protect full-service distributors from intra-brand competition.

Importantly, however, such services often continue to be free-rideable after the exclusivity arrangement has been established. To the extent that buyers who purchase in the gray market can obtain the relevant services from authorized distributors, yet ultimately buy in the gray market, a free-riding potential continues to exist (Dutta *et al.*, 1994).

Industry observers (e.g., Lowe and McCrohan, 1989) typically recommend that manufacturers take whatever steps are needed to maintain exclusivity, since a failure to do so will diminish distributors' incentives to support the manufacturer's products. According to these authors, failing to enforce in a strict fashion may undermine the integrity of the firm's distribution system.

The above discussion suggests that the greater the importance of free-rideable services, the lower the manufacturer's tolerance of violations of territorial restrictions.

Performance Ambiguity

In transaction cost terms, gray market activity is an example of opportunistic behavior. From a manufacturer's perspective, opportunism represents a problem to the extent that there are *costs* involved in detecting such behavior in the first place. More generally, *performance ambiguity* (e.g., Alchian and Demsetz, 1972) permits opportunism to take place.

In the manufacturer-distributor context, performance ambiguity refers to the ease with which violations of assigned territorial restrictions can be detected and documented by the manufacturer. Ultimately, the ability to terminate a distributor requires that violations be documented in such a fashion that they withstand legal challenges. In some cases, verifying the exact boundaries of a distributor's operation may involve making on-site visits to the distributor or to customer sites. The greater the costs to the manufacturer of gathering the relevant evidence, or the higher the level of performance ambiguity, the less desirable strict enforcement becomes.

Performance ambiguity also creates a disincentive for strict enforcement in a more indirect fashion. As shown by Dutta *et al.* (1994), manufacturers attempt to ensure adherence to territorial restrictions by crafting *self-enforcing*

agreements, which are based on paying distributors above-market or premium margins (Telser, 1980; Klein and Leffler, 1981). From the manufacturer's perspective, this premium stream makes relationship termination a credible threat, and lowers the expected value to the distributor of opportunistic behavior. However, crafting self-enforcing agreements is costly to the manufacturer in terms of the premiums paid. The greater the level of performance ambiguity, the greater the costs to the manufacturer of creating a self-enforcing agreement which lowers the expected value to the distributor of opportunistic behavior. Thus, higher levels of performance ambiguity should increase tolerance of violations.

The above discussion suggests the following prediction: The higher the level of performance ambiguity, the higher the manufacturer's tolerance of violations.

Credible Threats and Credible Commitments

Transaction cost theory (e.g., Williamson, 1991) would suggest that tolerance of gray market activity should be influenced by the presence of credible threats and commitments. The former describes the ability to punish opportunism, whereas the latter pertains to the benefit of maintaining the relationship. Consider each in turn.

Credible Threats

In the context of gray markets, a credible threat is a condition which increases the manufacturer's enforcement ability, and, in turn, decreases the tolerance of gray market activity. One form of a credible threat is the presence of an alternate channel of distribution in the distributor's area. In the industries studied here, a common manufacturer practice is to sell simultaneously through independent distributors and company salespeople (Corey *et al.*, 1989; Dutta *et al.*, 1995).

With respect to violations of exclusive territory restrictions, we expect that the presence of a direct sales channel in a given area should decrease a manufacturer's tolerance level. The direct channel enhances the manufacturer's ability to replace the distributor, by virtue of having a salesperson available who has local market knowledge and is capable of taking over the distributor's customers. In other words, the presence of a dual channel makes relationship termination a credible threat.

Based on the above reasoning, we predict that the presence of a direct channel in a distributor's territory will decrease the manufacturer's tolerance of gray market activity.

Credible Commitments

The presence of credible commitments on the part of a distributor increases the value to the manufacturer of maintaining the focal relationship (Fein and Anderson, 1997). In turn, this may lead to greater forbearance or on-going tolerance (Williamson, 1991). In a channel of distribution, manufacturers can create such commitments by means of exclusive dealing arrangements which restrict a distributor from carrying competing brands (e.g., Marvel, 1982). Researchers have suggested that although multi-brand distributors are able to develop a reputation *per se*, 'when the distributor carries only one brand, his reputation is inextricably linked with the manufacturer's product. Hence, an exclusive dealing arrangement may lead to the distributor's reputation becoming a relationship-specific asset' (Katz, 1989, p. 699). The effect of such a reputation is to increase the distributor's motivation to support the manufacturer's product, and, in turn, the value of the relationship to the manufacturer. Under such conditions a manufacturer is more likely to tolerate violations of an exclusive territory arrangement, since a lack of forbearance may prompt the distributor to start carrying a competing product line (Pashigian, 1994).

The presence of exclusive dealing also creates a manufacturer incentive for tolerance due to replaceability costs. While exclusive dealing is highly beneficial to a manufacturer, due to the effort allocated to the product line, foregoing other lines imposes an opportunity cost on the distributor. As a consequence, establishing exclusive dealing in the first place may be difficult for a manufacturer, and make existing exclusive distributors difficult to replace. Ultimately, a lack of replaceability creates an incentive for maintaining the present relationship by virtue of showing tolerance.

Based on the above, we predict that exclusive dealing on the part of a distributor will increase the manufacturer's tolerance of violations.

Product Maturity

Finally, product maturity or a manufacturer's product history may influence the tolerance of gray market activity. Interestingly, however, two competing scenarios exist. First, it can be argued that market forces over time diminish the value of exclusive territories to a manufacturer, and ultimately increase the tolerance of violations. For instance, service provision tends to be less important in mature markets (Porter, 1980), and competition may over time create pressure for intensive, rather than exclusive distribution. Thus, the longer a manufacturer has been selling a product, the higher the level of tolerance of gray market activity.

On the other hand, Dutta *et al.* (1994) conjecture that tolerance is likely to be the highest for new products. From a distributor's perspective, selling a new product involves more risk, and manufacturers may need to show higher levels of forbearance or tolerance. Due to the look of a clear theoretical rationale, no formal prediction is offered for the effect of product maturity.

Our empirical predictions are summarized below in Table 1.

Table 1. Empirical Predictions

Variables	Hypothesized effect on tolerance of gray markets
Performance ambiguity	—
Dual distribution	—
Exclusive dealing	+
Distributor services	+
Product maturity	?

RESEARCH METHODOLOGY

Research Context

Our theoretical predictions were tested empirically in the context of distribution decisions made by manufacturers in two two-digit SIC codes—35 (industrial machinery and equipment) and 36 (electronic and electric equipment). These industry categories were chosen for four reasons. First, exclusive territory use is common in these two industries (Stern *et al.*, 1996). Second, initial discussion with managers and review of other published data (e.g. Banerji, 1990) suggested that violations of restrictions is widespread among dis-

tributors in these industries. Third, by restricting the sample to two industries we reduce extraneous sources of variance (Cook and Campbell, 1979). Finally, restricting the research setting to two industries helped in developing meaningful and context-sensitive measures.

The unit of analysis for the study is a particular *product* and *distributor relationship*. All of the questions pertaining to the dependent and independent variables were asked with reference to this particular distributor and product.

Data and Measures

We derived the measures used to test our hypotheses from two different sources. First, some variables like exclusive dealing and product maturity were readily available from company records. Others, like the measures of free-riding potential and performance ambiguity had to be developed specifically for the purpose of this study. These measures were developed by using the established psychometric procedure of Nunnally (1978). The main premise of this procedure is to develop a series of items which serve as indicators of the relevant theoretical constructs. The measures used are described below.

Dependent Variable

Tolerance of Exclusive Territory Violations. Our dependent variable describes the extent to which the manufacturer decides to tolerate violations

from assigned exclusive territory restrictions. The measure used asked managers to indicate the level of exclusive territory violations as a percentage of annual sales which would cause termination of the distributor. The higher the percentage indicated, the greater the tolerance of violations. In our sample, this ranged from 0% to 50%, with a mean of 12.8%.

Independent Variables

Performance Ambiguity. This multi-item scale describes the *ex ante* difficulty faced by the manufacturer in evaluating the specific geographic area covered by the distributor. The four items used are shown in Table 2.

Exclusive Dealing. A dichotomous question, indicating whether an agreement exists which requires the distributor to only carry the manufacturer's product in a category (1), or whether competing products are allowed (0).

Dual Distribution. A dichotomous question, indicating whether the territory is serviced only through independent distributors (0), or whether the manufacturer also sells through company salespeople (1).

Distributor Services. This multi-item scale measures the extent to which free-rideable distributor services are needed. The three items used are shown in Table 2.

Product Maturity. A measure of the number of months during which the product has been sold by the company.

Table 2. Multi-item Scales

Performance Ambiguity

7-point Likert scales, anchored by "Did not believe" to "Strongly believed."

1. There would be significant costs associated with monitoring the activities of this distributor.
2. At a given time, it would be difficult to evaluate which sales are this distributor covers.
3. Determining this distributor's specific sales are would require us to make frequent on-site inspections, and
4. It would be difficult for us to evaluate exactly who this distributor is selling to.

Reliability (coefficient alpha) = 0.71

Distributor Services

7-point semantic differential scales

No pre-sales support needed (1)—Extensive pre-sales support needed (7)

Product is easy to use (1)—Product is difficult to use (7)

Non-technical product (1)—Technical product (7)

Reliability = 0.60

Table 3. Pairwise Correlations and Descriptive Statistics

	x_1	x_2	x_3	x_4	x_5	x_6	Mean	S.D.	
% Tolerance	x_1	1.00					12.82	13.00	
Services	x_2	-0.19	1.00				4.71	0.97	
Performance ambiguity	x_3	0.33	0.33	1.00			2.12	0.92	
Exclusive dealing	x_4	0.17	0.13	-0.13	1.00		0.57	0.50	
Product maturity	x_5	0.27	0.16	0.03	0.04	1.00	176.10	153.00	
Dual channel	x_6	-0.25	0.09	-0.08	0.15	0.07	1.00	0.64	0.48

Sample and Data Collection Procedures

Two commercial mailing lists were purchased from the American List Council, containing names of Marketing Managers or Vice Presidents of Marketing for companies in SIC 35 and SIC 36, respectively. A systematic random sample of 500 names was drawn from each list, and they were subsequently contacted personally by phone in order to locate an appropriately knowledgeable person within each company.

Selection of Key Informants. According to Campbell (1955), the main criterion for key informants is knowledgeable about the phenomenon being studied. Since the quality of a given informant is not necessarily correlated with formal job titles or organizational positions, the names from the mailing list were personally contacted by phone with the objective of locating a person within each firm who met the knowledge criteria in the context at hand.

The telephone contacts were designed to establish (1) whether the company used independent distributors, (2) whether the company used exclusive territories, and (3) whether the individual in question was knowledgeable about how the relationship with a particular distributor was being managed.²

In total, 460 individuals were identified using the above procedure. In the remainder of the 1000 firms contacted, the relevant individual refused to participate in the study, or the company did not use independent distributors and thus was inappropriate for the study.

Response Rates and Sample Size. After callbacks and second mailings, we received 147 questionnaires (32% of 460). Of the 147 firms in the sample, 69 used exclusive territories. Of these 69 firms which used exclusive territories 37 firms were willing to answer questions pertaining to gray market activity and tolerance of violations.

Non-response Bias. In order to evaluate the possible presence of non-response bias in our data we compared our achieved sample of firms with a sample of non-respondents with respect to annual company sales volume and number of employees. No significant differences were found, suggesting that non-response bias may not be a concern.

Measure Evaluation

Following standard psychometric practices, the quality of the two multi-item scales for performance ambiguity and distributor services were factor analyzed to verify that each item set consisted of a single dimension.³ Second, the reliability of each item set was assessed by calculating Cronbach's alpha (Nunnally, 1978). Both of these tests showed that the scales have satisfactory measurement properties.

RESULTS

Data Checks. The correlation matrix, means and S.D.s for the variable set is shown in Table 3. No serious levels of collinearity exists between any of the independent variables. Prior to estimating the statistical model, we also evaluated the correlation between dual distribution and several measures of distributor quality. While the latter is not part of our conceptual framework *per se*, a significant and negative correlation might indicate that dual distribution is a response to poorly performing dealers, and introduce a bias into our test. However, dual distribution is not significantly related to either quality of distributor pre-sales services ($r = -0.05$), post-sales services ($r = -0.031$), management strength ($r = 0.05$), nor facilities ($r = -0.004$).

Model Estimation. Our hypotheses were tested by estimating an ordinary least squares multiple

regression model with the tolerance percentage as the dependent variable. Prior to estimation, the tolerance percentage was transformed to $\text{Ln}(\%/(1-\%))$ in order to ensure that the predicted values would fall between 0 and 100 on the original scale.

The estimation results are shown in Table 4. As can be seen, the overall model is significant ($F = 4.23$, $p = 0.005$) and explains a sufficient amount of variance to justify examining the individual coefficients. In the following, we examine most of the coefficients using one-tailed tests, since the relevant predictions were directional in nature and no compelling opposite hypotheses existed. The only exception is the test of product maturity, for which two competing predictions were offered. Consequently, a two-tailed test is used for this hypothesis.

First, we found that the presence of a free-riding potential with respect to distributor services significantly reduced the level of tolerance of violations ($t = -2.20$, $p < 0.05$). Presumably, showing tolerance of violations exacerbates the free-riding problem and eventually may reduce distributors' incentives to provide services for the manufacturer's products. This finding expands the existing view of free-riding problems in the literature on vertical restraints. Our result suggests that free-riding problems are not only relevant for the initial decision to use exclusive territories but continue to be a concern over time. As such, exclusive territory arrangements which are deployed in order to protect full-service distributors from intra-brand competition may require manu-

facturers to incur on-going transaction costs in the form of monitoring. Conversely, in situations where free-riding is less of a concern, or other mechanisms than exclusivity are used by the manufacturer, violations may be relatively unproblematic. For example, if branded variants⁴ are used by a manufacturer to minimize free-riding problems (Bergen *et al.*, 1996), we would expect to see higher levels of tolerance.

Second, we found that higher levels of performance ambiguity led to significantly higher degrees of tolerance ($t = 2.76$, $p < 0.01$). This finding supports the argument that tolerance is a response to transaction cost problems under conditions of imperfect enforceability. From a managerial perspective, this suggests that firms which operate in markets whose characteristics make it difficult to document violations, may want to adopt a lenient stance. Examples of such markets may be international markets, or markets with geographically dispersed customers. However, as firms improve their information gathering capabilities, for instance due to computing and technological advances, we would expect to see lower levels of tolerance.

While the effect was weak, we found that manufacturers who established dual distribution arrangements in the distributor's sales area were less likely to tolerate gray market activity ($t = -1.35$, $p < 0.10$). Our original hypothesis was that the existence of a company salesforce in the distributor's area would enhance the ability to enforce violations of territory arrangements. In other words, the simultaneous presence of a direct sales channel was expected to serve as a credible threat to distributors. Our result confirmed this expectation.

Further, we also found that distributors who made credible commitments by virtue of becoming exclusive dealers would be permitted higher levels of violations ($t = 1.96$, $p < 0.05$). As suggested earlier, this may occur because exclusive dealing enhances the value of the distributor relationship to the manufacturer. Alternatively, greater tolerance may be observed in such situations because exclusive distributors are more costly to replace. This result provides a possible answer to the commonly asked question of why exclusive territories and exclusive dealing are used simultaneously (e.g., Scherer and Ross, 1990).

Finally, the longer the product has been sold by the manufacturer, the higher the tolerance of vio-

Table 4. Model for Tolerance of Territorial Restriction Violation

Dependent variable: $\text{Ln}(\text{tolerance of \% violation}/(1 - \text{tolerance of \% violation}))$

Independent variable	Coefficient	t-value
Constant	-2.43	-2.70****
Services	-0.43	-2.20***
Performance ambiguity	0.63	2.76****
Dual channels	-0.56	-1.35**
Exclusive dealing	0.77	1.96***
Product maturity	0.01	3.00*

$R^2 = 0.41$.

R^2 adjusted = 0.31.

$F(5, 31) = 4.23$ ($p = 0.005$).

**** $p < 0.01$ (one-tailed test), *** $p < 0.05$ (one-tailed test), ** $p < 0.10$ (one-tailed test), * $p < 0.01$ (two-tailed test).

lations ($t = 3.00, p < 0.01$).⁵ This finding is consistent with the literature which suggests that the gains from exclusivity are less in more mature markets. From a theoretical perspective this suggests the importance of studying the dynamics of distribution systems as they evolve over time. From a managerial perspective, it suggests that strategic choices made early in a product-market may need to be revisited over time because the value of those choices may change.

CONCLUSIONS

The original objective of this paper was to challenge two commonly held beliefs about exclusive territories. First, in contrast with much of the extant literature which has limited its focus to the initial *deployment* of exclusive territories, we wanted to highlight some of the relevant *ex post management* problems. Deploying exclusivity does not guarantee that the restrictions will be honored. In fact, gray market activity is widespread in many industries and poses a considerable problem.

Second, we wanted to challenge the past literature's mechanical view of gray market management as a dichotomous choice between (1) termination of all violators, and (2) complete abandonment of all restrictions (i.e., full intra-brand competition). In challenging this view, we drew upon transaction cost theory and the existing literature on the deployment of exclusive territories to identify factors which influenced firms' *tolerance* of violations. Consistent with our hypotheses, our results showed that a firm's degree of tolerance is influenced both by the ability to detect violations (i.e., performance ambiguity) and by the need to minimize the risk of free-riding on distributor services.

Our results should be interpreted in light of the limitations of the research design used. First, while restricting the sample to two industries provided a degree of homogeneity which is desirable for theory testing purposes, it limits our ability to generalize the results to other industries. Second, the relatively small sample size available for testing our hypotheses requires that caution be used in judging the results. Recall that our initial sample of firms had to be trimmed due to (1) the existence of firms which didn't use exclusivity in the first place, and (2) a lack of response to the

gray market measures. Presumably, the latter was due to the sensitive nature of these questions. We note, however, that our achieved sample size is comparable with those obtained in other transaction cost studies (e.g. Masten *et al.*, 1991).

Third, other determinants of gray market tolerance than those studied here should be considered. For instance, it is conceivable that showing tolerance of violations may benefit manufacturers to the extent that it opens new markets for the firm's products. In circumstances where violations open new markets or somehow serve demand enhancement purposes, we would expect to see higher levels of tolerance. Thus, our present study does not constitute an exhaustive list of explanatory variables.

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NOTES

1. In this study a gray market refers to sales by distributors of genuinely branded products outside the geographical area or channel authorized by the manufacturer. It does not refer to the selling of counterfeit goods. See Higgins and Rubin (1986) for a discussion of counterfeit goods.
2. A check on informant quality was administered as part of the questionnaire. Specifically, two questions were included at the end of the questionnaire which asked: 'How involved are you personally in your company's dealings with this distributor?' and 'How knowledgeable are you in general about your company's dealing with this distributor?' On 7-point scales, the mean responses to the involvement and knowledge questions for these key informants were 5.7 (S.D. = 1.3) and 6.3 (S.D. = 0.9), respectively, providing evidence of the quality of our key informants.
3. The complete factor analysis results are available upon request.
4. Manufacturers frequently offer numerous variations of branded product. For example, Seiko brand watches come with different colored bands, in digital or analogue, etc. Bergen *et al.* (1996) argue that these variations make it harder for consumers to make comparisons of products across retailers, which in turn reduces free-riding problems.
5. The model was also estimated with a quadratic term for product maturity. However, this term was not significant ($t = 0.44$).

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