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Jeffrey A. Eisenach

Richard S. Higgins

and

William F. Shughart II

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WARRANTIES, TIE-INS, AND EFFICIENT INSURANCE CONTRACTS: A THEORY AND THREE CASE STUDIES*

Jeffrey A. Eisenach
Federal Trade Commission
and
The University of Virginia

Richard S. Higgins
Federal Trade Commission

William F. Shughart II
Federal Trade Commission

I. INTRODUCTION

The Magnuson-Moss Warranty/Federal Trade Commission Improvement Act of 1975 (Public Law 93-637, 15 U.S.C. 2301-2310) established minimum disclosure standards for consumer product warranties. One of the key provisions of the law prohibits tie-in restrictions in warranties. Section 102(c) states:

> No warrantor of a consumer product may condition his written or implied warranty of such product on the consumer's using, in connection with such product, any article or service (other than article or service provided without charge under the terms of the warranty) which is identified by brand, trade or corporate name.

The Federal Trade Commission (FTC) was empowered to grant waivers of the restriction only if

> (1) the warrantor satisfies the Commission that the warranted product will function properly only if the article or service so identified is used in conjunction with the warranted product and
>
> (2) the Commission finds that such a waiver is in the public interest.

Economic theory suggests that absent market power reciprocal duties agreed to in contract are efficient. The variety of contracts observed in the market is evidence of firms' comparative advantages at supplying different mixes of contract terms and of consumers' variegated tastes and endowments. Competition among suppliers for customers seeking the most suitable combination of price and contract terms assures that the implicit prices of contract provisions reflect the marginal costs of those provisions. It is in this vein that contract terms traditionally considered

uneconomic, and therefore unconscionable, have recently been explained as instruments for controlling ex post opportunistic behavior.[1] An immediate corollary of the economic theory of contracts is that government restrictions on warranty terms will inhibit beneficial contracts between buyers and sellers, reducing the efficiency of warranties and resulting in increased costs and reduced coverage.

In this paper we develop an economic rationale for conditioning warranty performance on tie-in sales. In many cases such tie-in restrictions are an efficient response to problems of adverse selection and moral hazard. Further, we apply the theory to examine the FTC's policies in granting waivers under § 102(c). Only three waiver applications have been received by the Commission. All three were denied. In these cases and in its general statements on § 102(c), the FTC has adopted a very restrictive reading of the "function properly" standard.

Section II of this paper presents our theory of efficient warranty tie-ins. Section III looks at the waiver applications of Sohmer & Co., Inc.,[2] Harmsco, Inc.,[3] and Coleman Company, Inc.,[4] concluding that the FTC ignored possible efficiency aspects of the proposed tie-ins in all three cases. Concluding remarks and recommendations appear in Section IV.

II. A THEORY OF EFFICIENT TIE-INS IN WARRANTIES

A warranty is an insurance contract under which the seller of a product agrees to bear some or all of the risk of product failure. In return, the seller adds a premium to the price of the product. In a competitive equilibrium, and in the absence of the "market failures" discussed below, the premium reflects the expected costs of meeting the warranty terms. That is, the premium will equal the expected frequency of failure times the average cost of fulfilling the warranty, divided by the number of units sold.

A. Adverse Selection

The problem of adverse selection in insurance markets has received a good deal of attention in the economics literature. Adverse selection refers to the fact that given asymmetric information (where buyers know their true expected loss but sellers do not), low-risk buyers cannot make insurers aware of their lower expected losses.[5] If insurance is initially offered to all buyers at a premium based on the average probability of loss, low-risk buyers may find the premium too high. As a result, only high-risk buyers are able to purchase full insurance at "fair-odds" premiums. Rothschild and Stiglitz have provided an elegant proof of the nonoptimality of insurance markets under these conditions.[6]

To avoid the adverse-selection problem, insurance companies collect information about buyers that allows them to segregate their customers into risk categories and to charge appropriate

premiums.[7] Providers of warranties, by contrast, are generally unable to utilize this device; warranties are offered on equal terms to all buyers. Instead, warrantors may utilize separating devices, which work by inducing buyers to reveal their true probabilities of loss. For instance, Priest notes that optional warranties or service contracts are frequently made available for an extra charge, so that high-risk buyers who are likely to incur larger losses can be made to pay appropriate rates for the optional coverage.[8] Rothschild and Stiglitz show, however, that such separating devices cannot lead to a Pareto optimal equilibrium: Low-risk customers are still unable to purchase full warranties at fair-odds premium.

Tie-ins as Risk Meters: A Model

The following model illustrates how tie-in provisions can in some cases ameliorate, if not eliminate altogether, the adverse-selection problem. In the model there are two types of customers, high- and low-intensity users, who use a complementary input at different rates, R_H and R_L. It is assumed that the relative usage rate, R_H/R_L, is equal to the relative failure rate, π_H/π_L, where π_H and π_L are the probabilities of product failure during the warranty period for the two types of users. Although the seller cannot distinguish an H-type customer from an L-type customer, the seller knows π_H,π_L, R_H, and R_L. The seller offers a full warranty, which replaces the product if it fails, and, by assumption, the product fails no more than once during the warranty period.

With complete information, the seller would supply the product/warranty bundle to the two groups at prices $P_j = \pi_j C$ (j = H, L), where C is the constant marginal cost of production. The warranty premiums reflect the assumptions of no "loading" and no moral hazard.

In contrast, when sellers are unable to distinguish high- and low-intensity users, all buyers are charged the same pooling premium given by

$$(1) \quad w = \{[H/(H+L)]\pi_H + [L/(H+L)]\pi_L\} C,$$

where H and L are the numbers of high- and low-intensity customers respectively. The problem with the pooling premium in (1) is that some risk-averse low-intensity users may be unwilling to pay the premium necessary to shift the risk of product failure. As these customers drop out of the risk pool by turning to other products or by simply foregoing the warranty (in cases where it is purchased separately), the weighted average in (1) rises, driving still more low-intensity users out of the pool. If no other warranties are offered, a pooling equilibrium will obtain where the marginal low-intensity user is just sufficiently risk averse to pay the pooling premium. The latter premium yields zero profits for the seller, but high-intensity users are subsidized by low-intensity users. Moreover, some low-intensity users are unable to purchase warranties at fair-odds premiums.[9] Potential gains from trade remain, and a tie-in restriction may provide an effective method for sellers to differentiate between low- and high-intensity buyers.

We suppose the product is sold with a warranty as before, but that all customers are charged only the cost of production C (that is, $P_H = P_L = C$). However, for the warranty to be valid, use of the product requires the consumption of an input that must be purchased from the warrantor. To just cover the cost of the warranty, the warrantor adds a per unit premium, X, to the price of the tied good:

(2) X = total expected loss/units of input sold

$$= (\pi_H H + \pi_L L)\ C\ /\ (R_H H + R_L L).$$

The total premium paid by a low-intensity user is simply $R_L X$. But since by assumption $R_L = \pi_L R_H / \pi_H$, substitution into (2) and simple manipulation yield

(3) $R_L X = \pi_L C$.

Low-intensity users pay total input-price premiums equal to the actuarially fair warranty premium for their group. By the same logic, the high-intensity users also pay the fair-odds premium by virtue of the tie-in arrangement.

To the extent that warranty tie-ins serve to gauge the cost of warranty performance, the price of the tied product must exceed its marginal cost. Superficially, this pricing relation is identical to that resulting from tying to restrict output. Tying arrangements as a form of price discrimination, an idea that originated with Aaron Director,[10] succeeds when the buyer's demand for the tied good is a measure of his demand elasticity for the tying good. In our model, "price discrimination" is cost

justified, and market power in the tying good is not necessary for tie-ins to be imposed.

We have shown that in a stylized context tie-in provisions may be an efficient market response to adverse selection. As a practical matter, we recognize that it will often be costly to monitor buyers' compliance with the tie-in; in some cases it may be impossible. In general, tie-ins will only be used to avoid adverse selection where ex post detection of buyers' noncompliance is inexpensive. Of course, it might in some cases be profitable for sellers to institute the tie, knowing that some buyers will cheat but viewing the resulting losses as an investment in "goodwill." Sellers might institute other schemes, such as maintenance schedules tied to hours of use (or mileage), to facilitate enforcement of the tie.

B. Moral Harzard

Moral hazard is the second problem frequently encountered in insurance markets. It has been addressed in the economics literature by Pauly,[11] Spence and Zeckhauser,[12] Ehrlich and Becker,[13] Marshall,[14] and others. They have shown that insurance lessens the incentive for what Ehrlich and Becker call "self-protective behavior," and have recommended the use of coinsurance (where the insured pays a percentage of any loss) or deductibles (where the insured pays the first $X of any loss) to encourage buyers to avoid insured losses.

Another alternative means of preventing moral hazard is contractual specification of self-protective activities to be undertaken by the buyer that condition performance by the seller.[15] Klein, Crawford, and Allen have emphasized the role of contractual specification (including, in their case, ownership through vertical integration) in discouraging opportunistic behavior, which is said to occur when incomplete contracts allow one party to a contract to profit at another party's expense.[16] And Klein has specifically addressed the importance of so-called unfair contractual provisions in avoiding opportunistic behavior, arguing that (for example) exclusive-dealing and termination-at-will clauses in contracts are a means of allowing the party that could otherwise suffer from opportunistic behavior to deter such behavior.[17]

Moral hazard can easily be interpreted as what Klein refers to as a "holdup" problem--a potential for opportunistic behavior by one of the parties to a contract. In the context of warranties, moral hazard is reflected in the use of suboptimal complementary inputs. Priest suggests, for example, that consumer care in the use of a product is a complementary input, in the sense that an owner of a refrigerator, for example, can extend the life of the product by taking care in its use--for instance by restraining his children from swinging on the door. Indeed, Priest finds that warranties often exclude coverage for parts

whose probability of failure can be influenced by consumer usage habits. Excluded parts, he finds,

> typically appear to be either easily breakable--glass and plastic parts, porcelain, phonograph needles--or exterior parts sensitive to scratching, abrasion or rough use--paint, cabinets, the finish or trim. Differences between consumers in volume of use may affect some of the parts, such as batteries and fuses.[18]

For the present purpose we are more concerned with more traditional complementary inputs, such as maintenance services, replacement parts, and complements such as filters for coffee machines and oil filters for automobiles. Where use of a sub-optimal oil filter, for example, can lead to (warranted) engine failure, the potential for moral hazard is likely to be limited by contractual terms conditioning warranty performance on use of an appropriate oil filter. The question is when, if ever, these contractual terms should take the form of explicit ties (forbidden by the FTC) as opposed to quality specifications (which are, at least theoretically, allowed).[19]

To understand why explicit ties will sometimes be preferred, it is useful to consider the analogy of tie-ins in contracts where warranties are not present. The courts have sometimes recognized "quality control" arguments in favor of tie-ins, allowing ties of cable-television maintenance services to equipment and of grain silos to unloading equipment, on the grounds that the tied product was important for the proper functioning of the tying product and that failure of the tying product to function properly could

reflect negatively on the seller.[20] Bowman argued convincingly that such ties are not efficient, since the buyer has an incentive to use optimal-quality parts and incur an optimal breakdown rate: Sellers need only inform buyers of the appropriate complementary inputs and their characteristics and let them choose for themselves.[21]

Craswell, however, has argued that in some instances buyers would prefer brand-name tie-ins to specifications:

> Information [about the quality of complementary inputs] is costly to communicate and may be of little use without additional information as to why the seller recommended the products or services he did . . . . In the production and sale of any good or service, there will always be some point at which the customers prefer to have certain decisions made by the sellers.[22]

Consumers may prefer to have the seller provide specific brand names of suitable replacement parts rather than specifications, especially if the necessary specifications are very technical and difficult for consumers to understand. Ties can thus be an efficient means of reducing consumer search costs.

The significance of this debate for the present issue is apparent. The FTC's willingness to allow sellers to condition warranties on the use of parts meeting certain specifications, as long as no brand or corporate names are used, does not address the issue of information costs: In some instances, buyers would prefer to be told what brand of parts to buy in order not to invalidate their warranties to incurring search costs to discover what brands meet complicated specifications.

A second advantage of explicit ties over specifications is that it may be costly to discover and specify the characteristics that lead to a given level of performance. An auto manufacturer may know, for example, that his cars run well with his own brand of oil filter; but to test each available model in conjunction with each type of filter may be costly relative to the gains to consumers, who would prefer to pay less for the car and be told to use only the manufacturer's oil filter. A further result of these specification and testing costs is likely to be vague or incomplete specification of relevant parts characteristics, leading to ex post disputes between buyer and seller as to whether parts actually used meet the specifications provided. Brand-name identification, by contrast, is unambiguous and avoids such disputes in enforcing warranty provisions.

To summarize, it is clear that tie-ins may be efficient responses to adverse selection, moral hazard, or both. The conditions to which the theory applies are not universal. First, it may be nearly as difficult to enforce outright ties as to enforce parts specifications, therefore limiting the utility of the risk-metering scheme. Second, parts specifications may be relatively cheap to provide and easy to understand, limiting the information-cost arguments. However, it is apparent that ties can be efficient in cases where (a) use of a complementary input may serve as an accurate measure of the probability of discovering a warranty defect, and/or (b) the costs of communicating relevant characteristics of complementary inputs to consumers in a useful

form are high. As it happens, both of these characteristics appear to be present in at least two of the three waiver-application cases we next consider.

III. CASE STUDIES

It is worth emphasizing at the outset that the prohibition of tying contained in the Magnuson-Moss Act is far more restrictive than the standards applied to other tying arrangements under the Sherman and Clayton Acts.[23] Magnuson-Moss prohibits all ties except those necessary for the warranted product to "function properly." In its consideration of the three waiver applications it has received, the FTC has developed an extremely restrictive interpretation of this standard.[24]

A. Sohmer & Co.

On July 28, 1975, Mr. Harry J. Sohmer Jr., the president of Sohmer & Co., wrote to the FTC asking for a waiver of § 102(c) for the following warranty clause:

> It is understood that this guarantee is valid only upon condition that Sohmer & Co., Inc., or their accredited representatives are employed for all tuning or servicing of said piano.[25]

In support of his company's request, Mr. Sohmer made the following arguments:

> There are hundreds of unqualified piano tuners in this country whose work on our product can cause severe damage to the actions and strings of the instruments. We have dealers in all fifty states of the Union. Many of these firms have their own service departments; the

> ones who do not have one know which local tuners are qualified to do good work. In the rare case, in a rural area for example, that our dealer cannot service the piano, we give the consumer the names of several members of the Piano Technicians' Guild in the area. The Guild is an association of independent tuners all of whose members are required to take a technical examination before being admitted to membership. We feel sure, with our present set-up, that our customers' interests, as well as our own, are being well-served.[26]

This is virtually the entire text of Sohmer's request for a waiver. In support of the request, the company submitted five documents: (1) a copy of its warranty containing the tying restriction; (2) its catalog, consisting of pictures and descriptions of its pianos; (3) its price list; (4) a diagram showing the action of its grand piano; and (5) a diagram showing the action of its upright piano.

As required by § 102(c), the Commission asked for public comment on the proposal in October 1975.[27] No comments were received.

In April 1976, the Commission issued its decision, denying the Sohmer request. The decision sets a precedent followed in the remaining waiver applications, namely a very restrictive reading of the "function properly" standard.

While the Commission correctly argued that the Sohmer application failed to prove that the product would operate properly only if Sohmer-accredited representatives were used for servicing, its decision stated that even if Sohmer's assertion

that unqualified tuners could damage the piano were true, this would not justify a waiver:

> Even assuming, arguendo, the assertion . . . that piano servicers not authorized by Sohmer may cause damage to the pianos while performing tuning and other service not covered by the warranty, this alone does not demonstrate that tuning and service by Sohmer is "necessary for the proper operation of" Sohmer pianos.[28]

Thus, the FTC in its first application of § 102(c) showed its unwillingness to heed arguments based on moral hazard. Indeed, the Commission refused to entertain any efficiency explanations for the tie-in. Instead, reduction in the buyers' options in the tied good was paramount; even the competitiveness of the market in the tying good was ignored.

B. Harmsco, Inc.

In December 1975, Harmsco, Inc., applied for a waiver of § 102(c) on the grounds that its swimming-pool filter machines could only operate properly when used in conjunction with Harmsco, Inc., replacement filter cartridges.[29] Unlike Sohmer, Harmsco made its application through a law firm, and it provided consultant studies showing that Harmsco cartridges were indeed superior in performance to competitors' cartridges.

In its August decision denying the application, the Commission noted that it was unconvinced of the Harmsco cartridge's superiority. But, it said, even a showing of more efficient performance by the Harmsco filter would not be adequate to meet the "function properly" standard. After quoting from the

Northern-Pacific decision and noting that § 102(c) indicates Congress' "intention to prohibit those tying arrangements imposed upon consumers by means of a penalty of loss of warranty coverage," the Commission's decision stated:

> With this background in mind, the Commission believes that a mere demonstration of the superior performance characteristics does not satisfy the "function properly" standard. The proper functioning of the warranted product is not necessarily the best functioning of that product.[30]

The Commission also noted that Harmsco would be free to specify performance characteristics of filters to be used in its machines. "In contrast to brand name identification," the Commission argued,

> such a requirement does not reduce competition because consumers may choose among those brands meeting the specifications, allowing any manufacturer to compete for the consumer's business.[31]

Concern that tie-in restrictions could foreclose markets and limit competition was thus the Commission's primary motivation.

C. Coleman Company, Inc.

The third and last application made for a waiver was submitted by Coleman Company, Inc., in July 1976. Among other products, Coleman manufactures a mobile-home furnace/air-conditioning unit. The company's general counsel asserted in the July 15 letter requesting the exemption that Coleman furnaces would operate properly only if used in conjunction with replacement parts certified by a nationally recognized testing laboratory. In addition,

the letter noted, testing by a nationally recognized laboratory is required under standards for mobile-home furnaces promulgated by the Department of Housing and Urban Development (HUD). Failure to use certified parts, Coleman suggested, could actually result in a violation of Federal regulations.[32] With this in mind, Coleman requested that it be permitted to add the following clause to its warranty:

> This warranty is expressly conditioned upon the use of air conditioning conversion blowers, gas valves, limit switches, and air conditioning coils that have been certified or approved for use in this furnace by nationally recognized testing laboratories such as Underwriter's Laboratories, Inc., or the American Gas Association, Inc. and use of noncertified or unapproved components will void the warranty.[33]

As before, the Commission published a summary of Coleman's request and asked for comments.[34] Unlike the previous cases, however, the Coleman application elicited considerable attention from competitors and others. A total of 12 comments were submitted, of which 5 flatly argued against the waiver on the grounds that it would in effect grant Coleman a monopoly in the market for replacement parts. Of the remainder, two supported the waiver as necessary to insure proper functioning of the furnace and five expressed opinions only as to details of the application. (Two testing laboratories commented that Underwriters Laboratories and the American Gas Association should not be the only testing labs named.)[35]

In its December 22, 1977, decision denying the Coleman application, the Commission continued to show extreme reluctance to grant any exceptions to the § 102 prohibition. First, it argued that use of certification was simply an indirect means of identifying brand names:

> For purposes of determining whether a waiver must be sought, the Commission sees little basis for distinguishing between direct and indirect (e.g., certification) references to brand, trade or corporate names.[36]

Regarding Coleman's evidence and arguments, the FTC noted that evidence provided by Coleman that noncertified parts could be damaging was unconvincing. Furthermore, the HUD standards requiring use of certified parts applied only to assembly and manufacture, not to repairs and alterations by consumers. On the whole the Commission found that Coleman had failed to show that certified parts were necessary for the proper functioning of its mobile-home furnaces.

D. Efficiency of the Proposed Ties

As the above summary shows, the Commission has concentrated almost entirely on market-foreclosure considerations in its deliberations on waiver applications. It should be obvious, however, that both the Sohmer and Harmsco ties may have had positive efficiency implications, in accordance with the theory in Section II.

Sohmer's application came close to asserting that the tie was intended to alleviate moral hazard. It indicated the company's fear that low-quality repair services could result in increased

warranty claims, and implied that it would be difficult or impossible to avoid such claims without a brand-name specification. (It is difficult to imagine how Sohmer could specify the qualitative aspects of various repair services.) While the application did not address adverse selection, the conditions necessary for the metering scheme to apply are present: Warranty repairs will be correlated with intensity of use, and intensity of use will in turn determine the need for tuning and other adjustment/repair services. Enforcement of the tie would not be costless, but Sohmer could simply ask customers to identify who did the questionable repair work and verify the answer with its representatives.

All of the above applies equally well to the Harmsco application. Harmsco filters do have unique characteristics (most notably, Harmsco filters have 6 square feet of filter material; in contrast, some externally similar filters contain only 3 to 4 square feet.) While this characteristic could (theoretically) be specified without mentioning brand names, the cost to consumers of becoming familiar with the intricacies of pool-filter-cartridge design is probably large in relation to the benefits. And again, the metering scheme would appear to apply. Pool-filter usage will be correlated both with demand for replacement cartridges and with warranty claims. Enforcement might pose a problem with dishonest consumers (who might purchase low-priced cartridges until a defect arose and then buy a single Harmsco cartridge before making the warranty claim, claiming to have used Harmsco cartridges all

along), but it is not obvious that many consumers would go to the trouble of cheating.

The Coleman application is somewhat more ambiguous. On the one hand, comments received by the Commission suggested that Coleman was simply trying to limit entry to the market for Coleman air-conditioning coils. (Its furnaces are constructed with a cavity, to allow for later installation of an air conditioner.) A consumer who failed to read and understand the tying clause in the warranty and later decided to install an air conditioner could be faced with the unexpected choice between giving up the warranty and purchasing a (possibly more expensive) Coleman air conditioner. Moreover, it seems unlikely that the replacement parts named by Coleman would be an accurate metering device to avoid adverse selection.

On the other hand, Coleman submitted evidence to show that other manufacturers' parts were certified for use in its furnaces. It is at least arguable that use of the "nationally recognized lab" requirement may have lowered search costs for consumers or enforcement costs for Coleman without restricting any manufacturer's access to the market for replacement parts.

E. Evidence on the Adverse Effects of FTC Policy

Evidence that efficiency considerations motivate warranty tie-ins would be indicated by a reduction in warranty coverage or an increase in warranty costs, either for all warranties that had tie-ins before passage of the Act or for the three instances in which waivers were requested. There have been two empirical

studies of warranty content before and after the Magnuson-Moss Act, both of which concluded that there was no appreciable change in warranty coverage.[37] However, neither study covered products for which there are important complementary inputs, so that tie-in restrictions would not have been frequent even before the Act.[38] Indeed, we were able to examine the work-sheets for the FTC's study of the effects of the Act and found that only 1 of the 40 pre-Act warranties examined had a tie-in restriction. (Three tie-ins were present among the 1978 warranties, raising questions about the FTC's enforcement efforts that we will not address here.)

The evidence regarding the three warranties for which there were waiver applications is supportive of our hypothesis. Sohmer did indeed reduce its warranty coverage by excluding consequential damages, and Harmsco eliminated its cartridge warranty to avoid spurious claims. Coleman's actions were rather more striking. As of November 1973, Coleman conditioned its mobile-home furnace warranty on the use of Coleman air-conditioning components. The warranty provided for exchange of any defective parts during the first year and replacement of the heat exchanger on a pro rata basis in years two through ten. Following denial of the waiver application, Coleman limited its warranty to 1 year, excluding (as it had not previously done) "damages caused by failure to perform normal and routine maintenance . . . ." However, while conversations with representatives of all three companies produced

claims of increased warranty costs, no reliable statistical evidence could be produced to support these claims.[39]

V. CONCLUSIONS

We argue in this paper that tying restrictions in warranties may be an efficient response to the problems of adverse selection and moral hazard that are common in insurance markets. Tying warranty performance to the purchase of some complementary inputs may allow sellers to meter customers' riskiness and hence avoid adverse selection. Tying restrictions may also be justified if information and enforcement costs prohibit complete specification of buyer duties under the warranty--especially where specification of replacement-part characteristics would be costly or impossible.

Our review of the FTC's policy towards tying restrictions indicates that it has taken a very narrow stance. Ignoring the fact that tie-ins can only have adverse efficiency consequences where market power exists, the Commission has expressed a concern about foreclosure of markets that appears unjustified by the evidence. In at least two of the three waiver applications we review, there is reason to believe that the tie may have had positive efficiency implications. The failure of the Commission to recognize any benefits from warranty tie-ins except in the instances where the tying product literally will not function without use of the tied product has probably discouraged other warrantors from seeking waivers.

We have not provided conclusive evidence that the FTC's policy toward warranty tie-ins has reduced consumer welfare, but the theoretical justification for warranty tie-ins we cite together with the reduction in warranty coverage offered by all three warrantors who were denied waivers creates a case for reexamination by the FTC of its policies towards § 102(c) waiver applications. Its denial of the three applications received to date was couched in unforgiving terms that may have deterred other potential applicants. While efficient tie-ins may not be universal, the potential for welfare gains in some cases should not be ignored; sellers who believe their warranties could benefit from tie-ins should be encouraged to submit their claims.

FOOTNOTES

*The opinions expressed in this paper are those of the authors and do not necessarily represent the views of the Federal Trade Commission or its staff. We are grateful to James C. Miller III and Robert Tollison for comments on an earlier draft.

1 See Benjamin Klein, "Transaction Cost Determinants of 'Unfair' Contractual Arrangements," American Economic Review: Papers and Proceedings 70 (May 1980), p. 362.

2 See Federal Trade Commission, "Sohmer & Company, Inc.: Denial of Application for a Waiver of Section 102(c) of the Magnuson-Moss Warranty Act," 41 Federal Register 17821 (1976), in which a piano manufacturer that required buyers to employ only its accredited agents for tuning and other services was denied a waiver. (Hereafter cited as "Sohmer decision.")

3 See idem, "Harmsco, Inc.: Denial of Application for a Waiver of Section 102(c) of the Magnuson-Moss Warranty Act," 41 Federal Register 34368 (1976), in which a swimming-pool-filter manufacturer that required buyers to use only its own replacement filters in its filter machines was denied a waiver. (Hereafter cited as "Harmsco decision.")

[4] See idem, "Coleman and Company, Inc.: Denial of Application for a Waiver of Section of Section 102(c) of the Magnuson-Moss Warranty Act," 43 Federal Register 1991 (1978), in which a manufacturer of mobile-home furnaces was denied permission to require that replacement parts be certified by a nationally recognized testing laboratory. (Hereafter cited as "Coleman decision.")

[5] The originator of this idea seems to be Akerlof: see George A. Ackerlof, "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism," Quarterly Journal of Economics 84 (August 1970), p. 499. Akerlof's suggestion has been expanded upon by several authors. See, for instance, Michael Spence, "Consumer Misperceptions, Product Failure and Producer Liability," Review of Economic Studies 44 (October 1977), pp. 561-72. A theory of quality signaling without third-party enforcement is found in Benjamin Klein and Keith B. Leffler, "The Role of Market Forces in Assuring Contractual Performance," Journal of Political Economy 89 (August 1981), pp. 615-41.

[6] Michael Rothschild and Joseph Stiglitz, "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information," Quarterly Journal of Economics 90 (November 1976), pp. 629-49.

[7] Hoy, however, has recently argued that grouping of risks based on imperfect information has uncertain welfare implications. Those placed in the high-risk category will be made worse off under grouping than under a pooling equilibrium, so that the move is not Pareto optimal. See Michael Hoy, "Categorizing Risks in the Insurance Industry," Quarterly Journal of Economics 96 (May 1982), pp. 321-36.

[8] See George L. Priest, "A Theory of the Consumer Product Warranty," Yale Law Journal 90 (May 1981), pp. 1299-1302. See also Richard Craswell, "Tying Requirements as Consumer Protection Remedies," manuscript, Federal Trade Commission, February 1982.

[9] This is an oversimplification. Other producers would of course offer warranties and would tailor those warranties to consumer demands. Rothschild and Stiglitz, supra, pp. 634-38 especially, have explored this situation more fully and shown that no equilibrium exists. For our purposes it is sufficient to note that Pareto optimality will not obtain and that low-risk customers are unable to purchase full insurance at fair-odds prices. (Like Rothschild and Stiglitz, we assume that consumers are risk averse while firms are not, so that Pareto optimality requires full insurance for all consumers.)

[10] See William F. Shughart, "A Survey of Earlier Work on Tie-In Sales and Product Durability," manuscript, Federal Trade Commission, October 1981, p. 2.

[11] See Mark V. Pauly, "The Economics of Moral Hazard: Comment," American Economic Review 58 (1968), pp. 531-37; and idem, "Over-insurance and Public Provision of Insurance: The Roles of Moral Hazard and Adverse Selection," Quarterly Journal of Economics 88 (1974), pp. 44-62.

[12] Michael Spence and Richard Zeckhauser, "Insurance, Information, and Individual Action," American Economic Review, Papers and Proceedings 61 (May 1971), pp. 380-87.

[13] Isaac Ehrlich and Gary S. Becker, "Market Insurance, Self-Insurance, and Self-Protection," Journal of Political Economy 80 (1972), pp. 623-48.

[14] John M. Marshall, "Moral Hazard," American Economic Review 66 (December 1976), pp. 880-90.

[15] The buyers' duties may not be expressed but may be implied in the contract. Higgins has shown that the judicial rule of contributory negligence provides a means for implying efficient

contracts when explicit contracts are too costly to write. See Richard Higgins, "Products Liability Insurance, Moral Hazard, and Contributory Negligence," Journal of Legal Studies (January 1981), pp. 111-28.

16 Benjamin Klein, Robert G. Crawford, and Armen A. Alchian, "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process," Journal of Law and Economics 21 (October 1978), pp. 297-326.

17 Klein, supra.

18 Priest, supra, p. 1330.

19 Harmsco, Inc., alleges that FTC staff would not sanction the presence in its warranty of a specification that swimming-pool filter cartridges used in its machines have at least 6 square feet of filtration material. Apparently the specification was viewed by the staff as a means of avoiding the brand-name tie while accomplishing the same end, since Harmsco may have been the only manufacturer of cartridges meeting the specification. This information was discovered in a telephone conversation with Mr. John Harm Sr., President of Harmsco, Inc. (July 23, 1982).

[20] In International Business Machines v. U.S., 298 U.S. 131 (1936), the court found IBM's quality-control justification inadequate. However, quality-control arguments did prevail in U.S. v. Jerrold Electronics Corp., 187 F. Supp. 545 (1960) and in Dehydrating Process Co. v. A. O. Smith Corp., 292 F.2d 653 (1961).

[21] See W. S. Bowman, "Tying Arrangements and the Leverage Problem," Yale Law Journal 67 (November 1957), pp. 19-36.

[22] Craswell, supra, p. 31.

[23] In antitrust law, tie-in sales have been considered per se illegal whenever four conditions are met: (1) the tie involves two distinct products; (2) the sale of one good is effectively conditioned on the purchase of the other; (3) the seller has sufficient market power in the tying product; and (4) the practice forecloses a substantial volume of commerce in the market for the tied good. See Northern Pacific Railway v. U.S., 356 U.S. 1, 6 (1958) (tie-ins held per se illegal); and Fortner Enterprises v. U.S. Steel Corp., 394 U.S. 495, 497-8 (four conditions for a tie to be found).

[24] In addition to the three waiver cases discussed below, the FTC has made two general statements that are of interest here. On

June 18, 1975, it published a general statement of implementation policy. (40 Federal Register 25721.) While the thrust of the statement was procedural, it is of interest because it contains the first mention of the "function properly" standard that the Commission has since applied: "To grant a waiver," it stated, "the Commission must determine that the warranted product will function properly only if the identified article or service is used in connection therewith . . ." The Commission's second general statement, which appeared after its decisions in two of the three waiver cases, is also of interest. The formal interpretation of the Act's provisions read, in part:

> No warrantor may condition the continued validity of a warranty on the use of only authorized repair service and/or authorized replacement parts for nonwarranty service and maintenance. For example, provisions such as, "This warranty is void if service is performed by anyone other than an authorized 'ABC' dealer and all replacement parts must be genuine 'ABC' parts" and the like, are prohibited . . . . This does not preclude a warrantor from expressly excluding liability for defects or damage caused by such "unauthorized" articles or service; nor does it preclude the warrantor from denying liability where the warrantor can show that the defect or damage was so caused. (42 Federal Register 36121, July 13, 1977.)

Outright ties are thus forbidden under the Act unless the tying product will "function properly only if" used in conjunction with the tied product. However, warrantors may disclaim liability for defects caused by unauthorized parts. The latter interpretation

allows sellers to communicate brand-name information to buyers by specifically excluding liability for damages caused by other-brand parts. However, this device is less desirable as a means of discouraging opportunistic behavior than an outright tie, since sellers are forced to demonstrate that damage was caused by the offending part, rather than simply showing that the unauthorized part or service was used.

25 Application of Sohmer & Co., in FTC File 209-10-1.

26 Ibid.

27 Federal Trade Commission, "Sohmer & Company, Inc.: Invitation to Comment on Application," 40 F.R. 49409 (1975).

28 See Sohmer decision, supra.

29 Application of Harmsco, Inc., in FTC File 209-7-1.

30 See Harmsco decision, supra.

31 Ibid. Also see note 19 above for evidence that the Commission's willingness to accept specification of replacement characteristics is not as strong as suggested in this statement.

[32] Application of Coleman Company, Inc., in FTC File 209-19-1.

[33] Ibid.

[34] Federal Trade Commission, "Invitation to Comment on Application, and Coleman Company, Inc.," 41 F.R. 53708 (1976).

[35] Comments on Coleman waiver application, FTC File 209-19-1.

[36] Coleman decision, supra.

[37] See Jacqueline Schmitt, Lawrence Kanter, and Rachel Miller, Impact Report on the Magnuson-Moss Warranty Act, Federal Trade Commission Bureau of Consumer Protection, 1980, and Michael J. Wisdom, "An Empirical Study of the Magnuson-Moss Warranty Act," Stanford Law Review 31 (July 1979), pp. 1117-46.

[38] The single exception is automobiles, for which complements such as oil filters are purchased fairly frequently and are manufactured by the automakers, so that efficient ties would be a possibility. An earlier FTC study of warranties in the automobile industry found that auto warranties typically required periodic maintenance and frequent (every 6 months or every year) certification of same by an authorized dealer as a condition for warranty

performance. Many consumers would clearly opt to economize on time by having required service performed by a dealer, thus eliminating the extra stop that would be required to have non-dealer servicing certified. Thus, auto warranties came very close to having outright tie-ins. See Federal Trade Commission, Staff Report on Automobile Warranties, 1968.

39 We would like to express appreciation to all three companies for their cooperation in providing us with copies of their warranties and for discussing their experiences with us. In particular, telephone conversations were conducted with Mr. Harold J. Sohmer Jr., president, Sohmer & Co., Inc.; Mr. John Harm Sr., president, and Mr. Henry Harm, Harmsco, Inc.; and Mr. Harold J. Pfountz, corporate attorney, Coleman Company, Inc., during July and August 1982.