Journal of Agricultural and Resource Economics, 20(1):135–145

Obligations and Penalties under Lemon Laws: Automobiles versus Tractors

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Distinctive new provisions of tractor lemon laws which create obligations and provide penalties for defective self-propelled agricultural equipment are contrasted with provisions of automobile lemon laws. Lemon-law obligations involve both producers' guarantees to provide consumers with a serviceable vehicle and producers' promises to remedy defects. Due to fewer manufacturer obligations under the tractor lemon laws as opposed to automobile lemon laws, tractors may be expected to have more defects than automobiles. Yet the tractor lemon laws contain fewer penalties in the form of restitution remedies. The inconsistences of these obligations and penalties suggest tractor laws may be inefficient.

Key words: lemon laws, obligation, penalty, precaution, principal-agent, warranty

Introduction

Consumer dissatisfaction with the consumer remedies provided by state commercial laws and the federal Magnuson-Moss Warranty Act relating to defective products[1] led to the enactment of state lemon laws in the 1980s (Greenberg; LaManna; Samuels, Coffinberger, and McCrohan; Vogel). Many of the earlier consumer remedies for defective products are based on a breach of an express or implied warranty[2] and involve the replacement of defective items, the repair of the product during a specified warranty period, or the refund of the purchase price (Chapman and Meurer). For some defective products, sellers are liable for incidental and consequential damages incurred as a result of the defect (Uniform Commercial Code). Lemon laws were designed to augment these remedies and require producer-manufacturers to repair defective products, fulfill product guarantees, and take back defective vehicles or refund the purchase price. Lemon laws also ease consumers' burden of proof of defects (Norman; Vogel), encourage resolution of disputes without a trial (Adams; Dahringer and Johnson; Kegley and Hiller; Nicks), and simplify refunds for defective products (Adams; LaManna). Although lemon laws are best known for their warranty coverage of new automobiles, new and expanded provisions also cover used

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This research was supported by a Hatch grant from the College of Agriculture and Environmental Sciences, The University of Georgia.

[1] As used in this article, defective products include products with defects as well as products that do not meet the guarantees of applicable warranties.

[2] State warranty provisions generally are analogous because they were adopted from a Uniform Commercial Code. An affirmation of a product's quality constitutes an express warranty (Uniform Commercial Code § 2-313). For merchants, an implied warranty of merchantability accompanies the sale of a product unless excluded or modified and requires goods to pass without objection in the trade; be fit for ordinary purposes; be of even kind and quality; be adequately contained, packaged, and labeled; and conform with promises made on the label or container (Uniform Commercial Code § 2-314). A warranty of fitness for a particular purpose exists if, at the time of contracting, the buyer requested goods for a particular purpose, the seller knew that the buyer needs the goods for a particular purpose, and the seller knew that the buyer was relying on the seller's skill or judgment to furnish suitable goods (Uniform Commercial Code § 2-315).

automobiles, leased automobiles (Adams; Greenberg), and tractors (Centner).[3] The state lemon laws may be grouped in two major categories, one for automobiles and one for tractors.

Probability of product defects creates market imperfections resulting from the uncertainty of defects, limited information by consumers concerning the distribution of product defects, moral hazard, and negative externalities such as medical expenses and property damage accompanying product defects. These market imperfections prevent a Coasian solution (Coase). Thus, lemon laws were established providing warranties to increase product quality, augment remedies for a defect, and diminish the probability that a consumer will receive a defective product (Cooper and Ross; Grossman; Priest). Smithson and Thomas concluded that consumers place a relatively small value on lemon-law protection because consumers do not believe it is likely they will end up with a lemon vehicle.[4] An expected result of this consumer perception is insufficient consumer demand for product reliability. The low consumer demand and market imperfections provide a basis for governmental market intervention in the form of lemon laws with remedies for defective vehicles.

The issue addressed in this article concerns an optimal level of obligations and penalties regarding defective vehicles as a policy instrument for improving market performance. An economic efficiency model of warranties based on a principal-agent model is developed with the state as the principal and the producer-manufacturer as the agent. Distinctions among obligations and penalties of the automobile and tractor lemon laws are investigated to show the effects of warranty laws on producers' incentives for providing conforming products. Conforming products mean products with defects as well as products that do not meet the guarantees of applicable warranties. The analysis demonstrates that as the obligations of producers are weakened through more rigorous qualifications for a defect, penalties in the form of consumer remedies associated with a defect should increase. However, the provisions of the automobile and tractor lemon laws do not agree with this model. The tractor lemon laws contain fewer obligations due to more rigorous qualifications for a defect, yet also specify fewer penalties than the automobile lemon laws. This inconsistency suggests that the tractor lemon laws may be inefficient.

General Distinctions between Lemon Laws

The laws of the four states (Georgia, Illinois, Minnesota, and Virginia) that have both automobile and tractor lemon laws reveal two distinctive categories concerning consumer rights and defective vehicles (*Georgia Code Annotated*; *Illinois Compiled Statutes Annotated*; *Minnesota Statutes Annotated*; *Virginia Code Annotated*). The first distinction is that the laws contain dissimilar prerequisites that curtail lemon-law obligations. The second distinction is that the laws contain dissimilar penalties regarding restitution remedies.

Prerequisites Curtailing Obligations

Lemon-law obligations involve both producers' guarantees to provide consumers with a serviceable vehicle and producers' promises to remedy defects. Tractor lemon laws incorporate four prerequisites that are not present in the automobile laws to curtail obligations.

[3]Tractors include other self-propelled agricultural equipment such as combines.

[4]Legislative passage of lemon laws may be part of an effort for legislators to look good in the eyes of their constituents. Such posturing may be unrelated to the value of the benefits bestowed by the lemon laws (Smithson and Thomas).

Fewer obligations signify less producer precaution and more defective vehicles in the marketplace.

An initial prerequisite curtailing obligations is the definition of vehicles. The tractor laws only cover new vehicles whereas many of the automobile laws also cover leased, demonstrator, and reconveyed vehicles. For example, under the tractor lemon laws a manufacturer could resell a returned lemon tractor without full disclosure of its previous problems. In contrast, full disclosure is required to subsequent purchasers under many automobile lemon laws.

A second prerequisite curtails obligations by limiting penalties to a narrow class of warranties. Tractor laws cover defects of items guaranteed by the producer in writing, whereas consumers' recovery under the automobile lemon laws generally may be based on an oral warranty, and in some cases, on an implied warranty. This prerequisite reduces the guarantees made by tractor producers with a concomitant reduction of situations whereby consumers of tractors may qualify for restitution.

The lemon-law definition of a defect also curtails obligations. Three tests may be used to classify an automobile as defective: the vehicle is unreliable, the vehicle is unsafe, or the vehicle has a diminished resale value. In contrast, tractor lemon laws in Georgia, Minnesota, and Virginia require the replacement of a lemon vehicle or refund of the purchase price only if the defect substantially impairs both use and market value.[5] Thus, if a consumer bought a tractor and an automobile, each with a safety problem that did not substantially impair the vehicle's use or market value, the consumer would qualify for a refund for the defective automobile but not for the defective tractor. Similarly, the purchaser of a tractor with a defect other than a safety problem that substantially impairs only its use or market value, but not both, may not qualify for lemon-law relief.

A fourth prerequisite involves aggregations of different defects to calculate an out-of-service period. All automobile and tractor lemon laws stipulate that if the vehicle is out of service due to repairs for more than a specific number of days, the consumer is entitled to a replacement vehicle or a refund. Automobile lemon laws allow adding out-of-service times from different defects. The tractor lemon laws require the same defect to preclude usage of the vehicle for more than the prescribed period before a consumer may qualify for a refund or replacement.

Remedies That Serve As Penalties

Restitution remedies suggest that the automobile lemon laws provide consumers greater relief than the tractor laws. Under the automobile lemon laws, a consumer who is entitled to a replacement or refund is entitled to be reimbursed for collateral and incidental costs. These costs include sales taxes, financing charges, towing charges, and costs of obtaining alternative transportation, but a reasonable allowance for consumer use of the lemon vehicle is subtracted. The tractor lemon laws do not provide that farmers be compensated for towing charges or the rental of other equipment while their new tractors are under repair.

The automobile lemon laws provide consumers more rights than are provided by the tractor laws under the dispute settlement provisions set forth by the laws. First, the dispute resolution procedure established by the Georgia and Minnesota tractor lemon laws encourages informal settlement of disputes through industry-sponsored programs, whereas a state

[5]The Georgia and Minnesota laws require the defect to substantially impair use or market value, but an affirmative defense would require both to be impaired before a consumer meets the statutory requirements for a refund or replacement.

program under the automobile lemon laws potentially offers greater consumer relief. As related by *Consumer Reports*, state-run arbitration programs have reported consumer success rates of 48–77%, whereas only 10–30% of consumer actions have been resolved agreeably under industry-sponsored programs.[6] Second, dispute settlement programs under tractor lemon laws adopting the federal procedure enable a manufacturer to prevent a consumer from making an oral presentation (*Code of Federal Regulations*). Third, automobile consumers may have more rights in appealing unfavorable results. The dispute procedures of the Georgia and Minnesota tractor lemon laws require settlements to be binding, whereas the automobile laws of these states allow consumer appeals.

A loaned-tractor exception of the tractor lemon laws may negate replacements or refunds for a defect. The exception declares that if a consumer is provided the use of another farm tractor which is capable of performing the same functions, the prescribed out-of-service period is tolled. This allows producers to provide a substitute tractor so that the consumer would never qualify for a replacement or refund (Centner). For example, if qualification for relief was to be based on the vehicle being out of service due to repairs for too many days, the consumer could be loaned another tractor until the statutory term had expired. Thereafter, any days the tractor was out of service after the statutory term had run would not count for meeting the out-of-service period. Moreover, a consumer might be loaned a tractor for the remainder of the statutory term so that the vehicle would not break down enough times for the consumer to qualify for relief.

Principal-Agent Lemon-Law Model

The economic efficiency of lemon laws may be investigated with a principal-agent model. To eliminate certain preventable accidents and preclude negative externalities from accruing, the state acts as an agent for consumers inducing producers of vehicles to reduce the level of defects. Reducing defects is costly, and in the long-run, the costs are passed on to consumers. Therefore, the state's objective is to design a warranty law that induces the producer to take socially efficient action (precaution). In the literature, this is defined as a principal-agent problem where the state is the principal and the producer is the agent (Varian). For modeling the lemon-law warranty provisions, the principal-agent problem is modified so that the principal employs a penalty based on warranty law as opposed to a payment. Furthermore, the objective of the state is solely to induce a certain action, which does not include maximizing the extraction of economic surplus from the producer.

Since lemon laws define conformity and specify what is guaranteed, a conforming vehicle may have a defect. Let x_c be the monetary value for a set of defects associated with a conforming vehicle and x_n be the monetary value for a set of vehicle defects where neither set is observable at time of sale. The four lemon-law prerequisites imply $x_c|_{tractors} > x_c|_{autos}$, with the symbols $|_{tractor}$ and $|_{autos}$ referring to tractor and autos, respectively. Following Varian, let a and b be possible levels of precaution that can be chosen by a producer out of some set of feasible actions, A, which influence the probability of occurrence of x_c and x_n. Let v_a and v_b be the costs of precautions a and b, respectively, π_{cb} denote the probability that x_c is observed if the producer chooses precaution b, and let $\pi_{nb} = 1 - \pi_{cb}$. To provide incentives

[6]In Georgia, an Office of Consumer Affairs offers automobile consumers assistance and a reasonably simple procedure to assert rights against manufacturers of lemon automobiles, whereas no corresponding assistance is available for tractor consumers. Within the first 29 months of adoption of the Georgia automobile lemon law, over three thousand consumers contacted this office (Georgia Office of Consumer Affairs).

for a producer to take precaution b, the state may levy certain penalties $s_c(x_c)$ and $s_n(x_n)$ associated with x_c and x_n, respectively. These penalties may consist of restitution remedies in lemon laws that outline a producer's duty to establish arbitration mechanisms, repair vehicles, or take back and replace a vehicle. As addressed above, the different restitution remedies for automobiles and tractors result in $s_n|_{tractors} < s_n|_{autos}$. Assuming the state is risk neutral, the state's expected returns if a producer chooses precaution b is

$$(1) \qquad (s_c - x_c)\pi_{cb} + (s_n - x_n)\pi_{nb}.$$

Assume a producer is risk averse and has the objective of maximizing a von Neumann-Morgenstern utility function with precaution costs entering linearly into utility, u. The producer will choose precaution level b if the following incentive compatibility constraint is satisfied:

$$(2) \qquad u(s_c)\pi_{cb} + u(s_n)\pi_{nb} + v_b \le u(s_c)\pi_{ca} + u(s_n)\pi_{na} + v_a,$$

and will choose precaution a otherwise (Kreps; Varian). The producer's optimal precaution level will be determined given the warranty law that the state picks. Although the state is not able to choose the producer's level of precaution directly, it can influence the producer's level through warranty law.

The producer's costs, s_c, s_n, *and* v_b, are negatively related to utility. A warranty law with high penalties for producing a defective vehicle can cause the producer to exit the market. Assume the level of disutility where the producer will not participate is $\bar{u}$. The expected utility from participation must then be

$$(3) \qquad u(s_c)\pi_{cb} + u(s_n)\pi_{nb} + v_b \le \bar{u}.$$

Constraint (3) is called the participation-individual rationality or reservation level of utility constraint. The producer may have other opportunities available that result in some reservation level of utility. The state may want to ensure the producer receives at least this reservation level. As discussed in Kreps, this formulation is far from general. A very special form of a utility function is assumed for the producer and the state is assumed to be risk neutral. However, the analysis can be extended to encompass more general formulations (Grossman and Hart).

The state's objective is to maximize (1) subject to constraints (2) and (3). Assume that precaution level b results from the optimal incentive scheme, s_c and s_n, determined from maximum of (1). Kuhn-Tucker first-order conditions for this maximum can be derived by differentiating the Lagrangian, resulting in

$$(4) \qquad \pi_{ib} - \lambda u'(s_i)\pi_{ib} - \mu u'(s_i)(\pi_{ib} - \pi_{ia}) = 0, \quad i = c \text{ and } n,$$

where λ and μ are the Lagrange multipliers associated with (3) and (2), respectively. Equation (4) may be interpreted by dividing by $u'(s_i)\pi_{ib}$ and rearranging terms

$$(5) \qquad \frac{1}{u'(s_i)} = \lambda + \mu\left[1 - \pi_{ia}/\pi_{ib}\right], \quad i = c \text{ and } n.$$

Suppose $\mu = 0$, the incentive compatibility constraint is nonbinding, then (5) implies that $u'(s_i) = 1/\lambda$, some constant. Penalty to the producer is independent of the outcome, x_i, so s_i is equal to some constant $\bar{s}$. Substituting $\bar{s}$ into (2) and noting that probability distributions sum to one, yields

$$v_a \geq v_b. \tag{6}$$

This case where $\mu = 0$ can only arise when the precaution level that is preferred by the state is also the low-cost action for the producer. When the incentive compatibility constraint is binding, $\mu \neq 0$, the costs to the producer will vary with the outcome. The state desires a precaution level that imposes high costs on the producer, so the cost to the producer will depend on the behavior of the likelihood ratio π_{ca}/π_{cb}. This likelihood ratio measures the likelihood of observing x_c given that the producer chooses a to the likelihood of observing x_c given that the producer chooses b. A high value of the likelihood ratio is evidence that the producer chooses a, while a low value indicates the producer chooses b.

Graphical Treatment

Following Varian, it is convenient for graphical treatment to reformulate the problem as one with linear constraints and a nonlinear objective function. Let u_i be the penalty associated with precaution level x_i, $u(s_i) = u_i$, and f be the inverse of the utility function, $s_i = f(u_i)$, $i = c$ and n. The largest possible utility that the state receives if it designs a scheme that induces the producer to choose precaution level b is

$$v(b) = \max_{u_c, u_n} \left[f(u_c) - x_c\right]\pi_{cb} + \left[f(u_n) - x_n\right]\pi_{nb}, \tag{7}$$

subject to

$$u_c\pi_{cb} + u_n\pi_{nb} + v_b \leq u_c\pi_{ca} + u_n\pi_{na} + v_a, \text{ and} \tag{8}$$

$$u_c\pi_{cb} + u_n\pi_{nb} + v_b \leq \bar{u}. \tag{9}$$

The constraint set determined by (8) and (9) is illustrated in figure 1. A producer choosing precaution a or b has linear indifference curves:

$$u_c\pi_{cb} + u_n\pi_{nb} + v_b = \text{constant, and}$$
$$u_c\pi_{ca} + u_n\pi_{na} + v_a = \text{constant.}$$

The equality of (8) corresponds to the point where the producer's two indifference curves intersect. Solving for u_c at this equality yields

$$u_c = u_n + \frac{v_a - v_b}{\pi_{cb} - \pi_{ca}}, \tag{10}$$

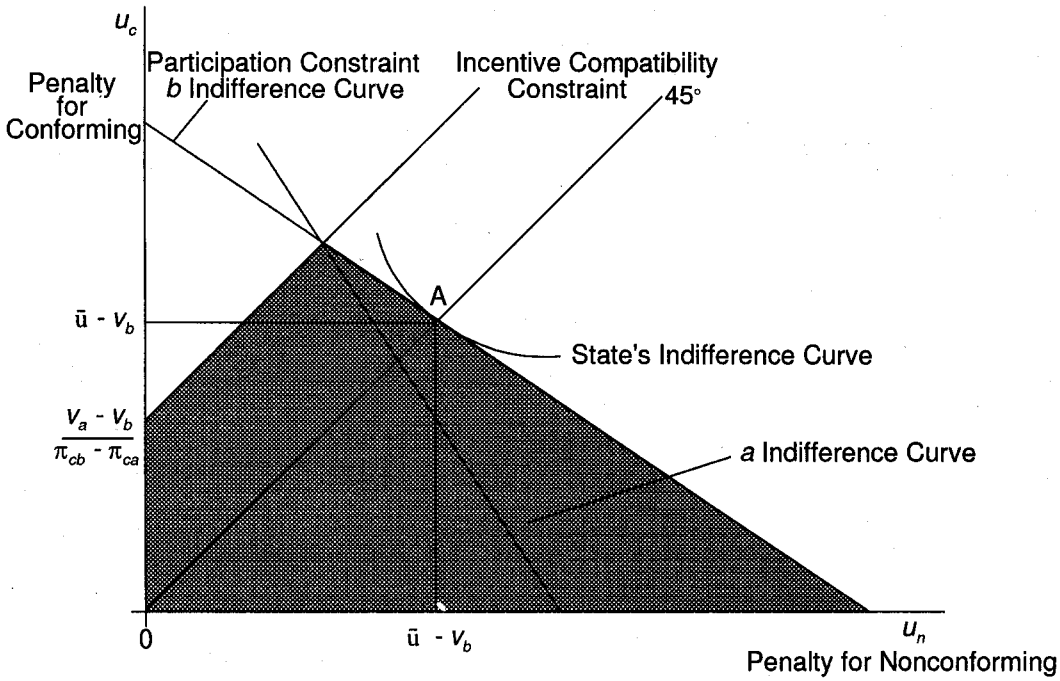

Figure 1. Efficient penalties with a nonbinding incentive compatibility constraint

represented as the incentive compatibility constraint in figure 1. At every point on this incentive compatibility constraint the producer is indifferent between the two precaution levels *a* and *b*. The region where precaution *b* is preferred by the producer is the region below the line formed by (10). Below (10) the strict inequality in (8) holds, so the producer will choose level *b*. The shaded area represents the area satisfying the two constraints (8) and (9).

The state's marginal rate of substitution, MRS_s, is

$$MRS_s = \frac{f'(u_n)\pi_{nb}}{f'(u_c)\pi_{cb}}.$$

The producer's MRS_a is

$$MRS_a = \frac{\pi_{nb}}{\pi_{cb}}.$$

When the penalties u_c and u_n are equal, $u_c = u_n$, as illustrated by the 45-degree line in figure 1, the state's and producer's indifference curves are tangent. If the incentive compatibility constraint is nonbinding, the producer's penalty associated with conformity and nonconformity is constant. It does not vary if the producer conforms or produces a product with a defect.

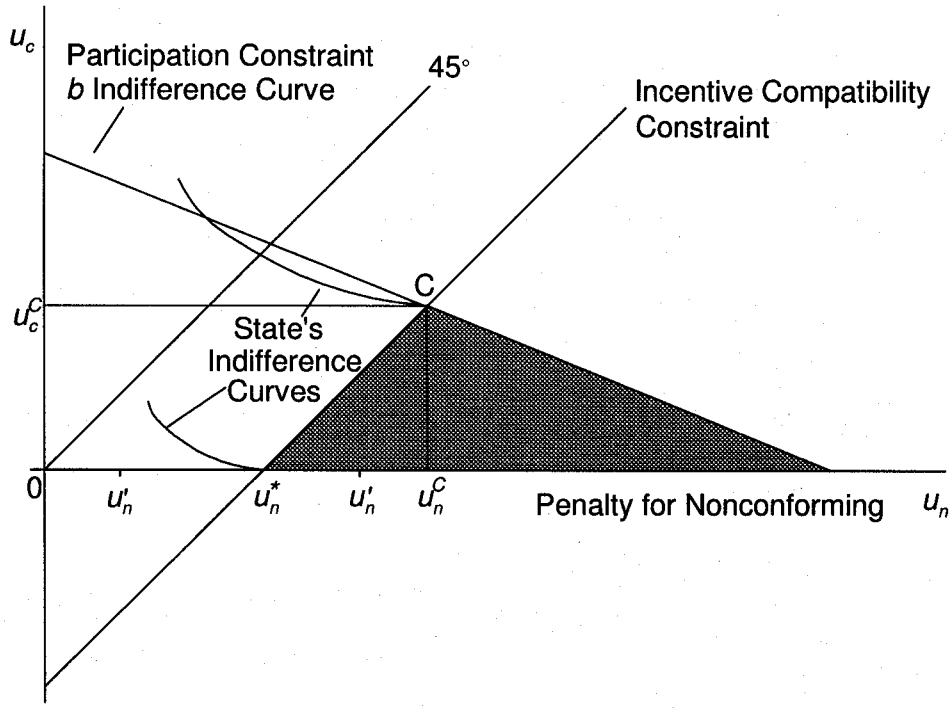

Figure 2. Binding incentive compatibility constraint warranty legislation

If the state exercised its full monopoly power, the state would extract the reservation value of utility. This represents a lump-sum tax on the producer independent of whether the producer conforms. For a level of taxation at or below this reservation value, the producer will always choose the desired precaution level *b*, because of (6). The producer will maximize utility where $u_c = u_n = 0$. At all points on this Pareto efficient cord the level of nonconformity is the same. Only a shifting of economic surplus between the producer and the state occurs depending on the magnitude of this tax. Warranty legislation is generally not used as a lump-sum taxation method. Thus, no warranty legislation would be enacted and the equilibrium is $u_c = u_n = 0$.

If the incentive compatibility constraint is binding, as illustrated in figure 2, the penalty to the producer will vary with the outcomes x_c and x_n. The producer has the option of either adopting the lower cost precaution level *a*, $v_a < v_b$, and incurring penalty u_n when a defect occurs with probability π_{na}, or choosing precaution level *b* and incurring cost v_b and penalty u_n with a lower probability π_{nb}. If the state exercises its full monopoly power, point *C*, u_c^C and u_n^C are the threshold levels of penalties where the producer is indifferent between precautions *a* and *b*. In contrast, the minimum level of penalties at a threshold level of disutility is u_n^* associated with $u_c = 0$ in figure 2.

Inducing Precaution

Assuming the state is solely interested in warranty laws to induce producers to employ precaution *b* and not as a taxation method, then the equilibrium threshold level is u_n^* and

$u_c = 0$. If a producer produces a vehicle which conforms to the terms of the warranty law, no costs for repair or replacement of the vehicle are incurred as a result of the warranty. Alternatively, if the vehicle does not conform with the warranty law, the producer will incur an additional cost u_n^*. This provides an incentive for decreasing the probability of producing a defect by employing precaution b. If the state sets u_n below this threshold value u_n^*, say u_n', the disincentive will not be sufficient to induce producer's adoption of desired precaution b. Alternatively, a level above the threshold value u_n^* and still satisfying the participation constraint, say u_n'', will induce producer's adoption of precaution b. If the disincentive becomes so large that the participation constraint is violated, the producer exits the market.

The threshold penalty u_n^* is influenced by the probability of vehicle conformity given precautions a and b. The ratio π_{ca} / π_{cb} is $0 \leq \pi_{ca} / \pi_{cb} \leq 1$ and as this ratio approaches one, the threshold u_n^* increases. As the probabilities of producing a conforming vehicle under the alternative precautions converge, the penalty associated with the producer selecting precaution a must increase in order for the producer to be willing to adopt precaution b. Assuming the monotone likelihood ratio property from the regularity conditions in the statistics literature, a relation between π_{ca} / π_{cb} and x_c can be established (Kreps; Varian). The monotone likelihood ratio property requires that π_{ca} / π_{cb} be monotone increasing in x_c, which also results in u_n^* monotone increasing in x_c. Considering the levels of conformity for automobile and tractor lemon laws, as delineated by warranty legislation, automobile lemon laws generally would induce fewer defects compared with tractor lemon laws. This implies

$$x_c|_{autos} < x_c|_{tractors} . \tag{11}$$

Relatively more tractors conform under the tractor lemon laws, but the level of defects is higher compared to the automobile lemon laws. Equation (11), given the monotone likelihood ratio property, results in

$$\frac{\pi_{ca}}{\pi_{cb}}|_{autos} < \frac{\pi_{ca}}{\pi_{cb}}|_{tractors} ,$$

which implies $u_n^*|_{autos} < u_n^*|_{tractors}$. The current lemon laws for automobiles and tractors are not consistent with this result. Under current laws, the level of penalty u_n is reversed; the tractor lemon laws require fewer remedies than automobile laws. As conformity standards weaken, a shift from automobile to tractor lemon laws, the threshold level of penalties for not taking the state's preferred level of precaution should increase. Instead the penalties decrease, penalties under tractor lemon laws are less severe compared with automobile lemon laws.

This inconsistency of the laws with economic efficiency suggests two possible scenarios. First, the definition of a defect under automobile laws may be too strong in terms of increasing the probability of a defect, compared with the level of penalties for defects. In the alternative, the definition of a defect in tractor laws may be too weak relative to its associated penalties. Smithson and Thomas provide evidence as an aid in determining the likelihood of one scenario over the other. As an explanation for why consumers place a low value on lemon laws, Smithson and Thomas note that the new arbitration mechanisms used

by automobile producers reduce the probability of consumers taking actions under lemon laws. This implies that the penalty u_n associated with the automobile lemon laws is equal to or greater than the threshold $u_n^*|_{autos}$. Assuming automobile lemon laws played a role in this upgrading, the laws had the desired effect of inducing producers to adopt precaution levels that significantly decreased the probability of a defect, precaution b.

Tractor lemon laws are relatively new, so no corresponding evidence as associated with automobile laws is available. However, given relative higher likelihood ratios and lower u_n associated with tractors, tractor producers do not have as strong an incentive to adopt the preferred precaution b. Thus, the probability of being below the threshold $u_n^*|_{tractors}$ is significantly enhanced. If state legislators desire tractor producers to adopt similar precautions as automobile producers, consideration of changing the definition of defects and increasing the penalties associated with defects at or near levels associated with automobile lemon laws may be required.

Conclusion

In a broad context of overall resource allocation, when a Coasian solution is not practical due to market imperfections, some form of governmental intervention may improve social welfare. Assuming governmental intervention in the form of lemon laws may improve social welfare, the level of nonconformity and associated penalties should be considered. For economic efficiency, a strong conformity law embracing specific obligations can be coupled with relatively few penalties in the form of remedies. As the definition of conformity is weakened and obligations decrease, remedies associated with defects should increase. As evidenced by the current lemon laws for automobiles and tractors, this economically efficient relation between obligations and remedies does not always exist. In particular, given the inconsistent weak conformity definition for tractors associated with relatively few remedies for defects, the probability of current tractor lemon laws providing sufficient inducement for efficient producer precaution is questionable.

[*Received September 1994; final version received March 1995.*]

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