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## ABSTRACT

In an attempt to protect their intellectual property and compete effectively in an increasingly dynamic marketplace, software producers have employed a number of preventive and deterrent measures to counter software piracy. Conventional wisdom suggests that reducing piracy will force consumers to legitimately acquire software, thus increasing firm profits. In this paper, we develop an analytical model, using Buchanan's economic theory of clubs, to test the implications of anti-piracy measures on producer profits. Our results suggest that deterrent measures can potentially increase profits. Empirical results are also presented which support the assumptions of the analytical model.

## 1. INTRODUCTION

The effect of piracy on firm performance is a central economic question facing the software publishing industry. Estimates on the dollar amount of pirated software reach as high as $4 billion (Zagorsky 1990). Because software has the characteristics of a public good where the consumption utility of unit derived by an individual is not reduced by sharing with others, the typical market dynamics of exclusivity do not come into play. Therefore those who do not pay directly for a public good *can* still consume it and receive the accompanying benefits. Software is very much like art in a museum or a public park, even though it is classified as a private good which is produced for commercial purposes.

Software publishers, in the face of an increasingly competitive marketplace, have employed anti-piracy technologies and legal and educational campaigns as a way to protect their intellectual property. The objective of these strategies is to reduce the size of software *piracy clubs*. The effect of these strategies on reducing the size of the software piracy clubs and the ensuing effect on the economic performance of software publishers is the subject of this paper.

## 2. STRATEGIES TO COUNTER PIRACY

Straub (1990) identified deterrent measures and preventive measures as the primary strategies for combating computer hardware abuse. Similarly, preventive and deterrent strategies have also been employed by software publishers to counter piracy.

*Preventive measures* use technology to increase the costs of engaging in acts of piracy. Such measures, often referred to as front-end strategies, are usually undertaken through hardware-based or software-based copy protection schemes (Valigra 1985). Examples of hardware-based protection methods include nonstandard disks, Coder cards, and hardware locks (Morgon and Ruskell 1987). Software-based protection methods are employed by embedding special codes in the software that make copying more difficult for the users (Morgon and Ruskell 1987). Additional preventive strategies include providing customer support only to registered users and having documentation which is difficult to duplicate. The objective of preventive measures is to increase the costs associated with *using* pirated software.

*Deterrent measures*, in contrast to preventive measures, do not *directly* increase the cost of pirating software. Deterrent measures, often referred to as back-end strategies, attempt to dissuade users from copying software by disseminating litigious information about software piracy. In addition to distributing information concerning the *illegality* of software pirating, software companies also distribute information on the effect of piracy on new software development. These measures are usually employed through educational, investigative and legal campaigns (Fuentebella 1989). Educational campaigns attempt to educate users about copyright laws and inspire attitude changes about appropriate software copying behavior (Paolo 1991).

The Software Publishers Association (SPA), a commercial software watchdog group representing 565 software publishers, has recently taken to using billboard advertising to

get the message across (Anonymous 1991), but it has also taken legal action against individuals and organizations who exhibit flagrant disregard for copyright law. For example, the SPA often conducts unannounced software audits of firms and files lawsuits against overt offenders of the law (Mason 1990). The intent of the informational, investigative and legal campaigns is to draw attention to the fact that everyone has legal, ethical, and social responsibilities related to piracy behavior.

In the following section, an economic model is developed and analyzed to determine the influence of preventive and deterrent strategies for reducing piracy on the profitability of software publishers. Buchanan's (1965) economic theory of clubs, where economic actors engage in consumption ownership arrangements, provides the theoretical foundation for modeling software piracy behavior.

## 3. MODEL DEVELOPMENT

The following discussion describes the mathematical foundations of an economic model for determining the effect of software protection strategies on software piracy and firm performance. Following the lead of Conner and Rumelt (1991) — for reasons of tractability and consistency — we assume that (1) the demand function for software is downward sloping and linear and (2) that marginal production costs are zero. The assumption that the demand curve for a particular software package slopes downward implies that there are no substitute products available in the market. (Relaxing the substitutability restriction is an area for future research.) The marginal production costs for a unit of software are typically a small percentage of the total production costs for software (less than five percent). The cost for producing an additional unit of software is the sum of the costs for duplicating a diskette and the costs for printing the documentation. It follows then that the total cost to the software publisher for a package is simply the fixed cost $F$ for developing and marketing the software.

As noted in the previous section, software publishers employ a variety of preventive measures ($A$) and deterrent measures ($B$) to reduce software piracy. It is assumed that the degree to which preventive measures and deterrent measures are applied increases the fixed product costs, and thus

$$\frac{\partial F}{\partial A} \geq 0 \quad and \quad \frac{\partial F}{\partial B} \geq 0 \qquad (1)$$

It should be noted that software is not strictly a *private* economic good. That is, the utility derived from consuming or using software is not affected if someone else makes a copy of the software. It is further assumed that the utility derived when someone copies the software is not affected by the fact that it is a *copy* of the original. Thus, the utility a consumer receives from *using* the software does not depend on whether the software is an original or a pirated copy.

If we further assume that consumers are strict value maximizers, then it follows that search behavior should take place to locate individuals to "share" in the cost of the software. The resulting economic group has the characteristics of what has been described as a *private goods club* by Buchanan and elaborated on by Sorenson, Tschirhart and Whinston (1978).

The incentive for club formation lies in the decreasing cost function affiliated with acquiring the software. One can visualize a club consisting of a group of individuals who purchase a software package and make copies of the software and relevant documentation for the club members. Alternatively, a club need not be so formal. An individual may give a copy of the software to a friend or a business associate with the implicit agreement that the friend or business associate reciprocate the transaction in the future with some other software.

There are, of course, additional costs associated with belonging to a club. These include the cost of defeating copy protection schemes, the opportunity costs of foregone performance guarantees and access to customer support, and the costs associated with duplicating documentation. We assume that the average cost ($AC$) to an individual in a club of size $n$ is

$$AC = \frac{P}{n} + cn \qquad (2)$$

In the above expression, $P$ is the market price of the original software package and $cn$ represents the costs to defeat the preventive measures employed by the software producer, where $c$ is the additional cost to each member when an individual joins the club. Note that the average cost to a club member to defeat the preventive measures is $cn$, which is an increasing function of the club size. Typically, software publishers provide customer support only to the individual who actually purchased the software. Other members of the club have to direct their queries through the *legitimate* member of the club. *Congestion* costs are the result of the increased traffic and ensuing inconvenience associated with larger club sizes.

We assume that the software publisher can increase congestion costs by adopting stricter preventive measures in the form of protection technologies. Thus we have

$$\frac{\partial c}{\partial A} \geq 0 \qquad (3)$$

For any given price of the software, the optimal club size is reached when the average cost to a club member is at a minimum. Minimizing equation 2 results in an optimal club size $n^*$ of

$$n^* = (P/c)^{1/2} \quad for \ P \geq c \qquad (4)$$

Accordingly, the software producer can reduce the club size by adopting stricter preventive measures. Note that the

software club will cease to exist if the average cost to a club member exceeds the market price of the software. Substituting equation 4 into equation 2 and equating the average cost to the price of the software leads to the first observation.

*Observation 1:* **The software producer can effectively eliminate piracy through preventive measures by ensuring that**

$$c \geq \frac{P}{4} \ .$$

Up to this point in the analysis, we modeled the club formation as a "legal and socially acceptable" activity. But of course the unauthorized duplication of most computer software is illegal. In the presence of copyright laws, individuals may still participate in clubs because (a) they are unaware of the legal aspects of pirating software, and/or (b) they believe the chances of getting caught are minimal, and/or (c) they perceive the consequences of getting caught as minor.

From this discussion, an important question surfaces concerning the effects of deterrent measures on club formation. We assume that for given values of $P$ and $c$, the optimal size of the software club is inversely related to the deterrent measures undertaken by the software publisher. Thus, we reformulate equation 4 as follows

$$n^* = (\frac{P}{c})^{1/2} \cdot \frac{1}{f(B)} \tag{5}$$

Where $f(B)$ is the effectiveness of the deterrent measures and it satisfies the following properties.

$$\frac{\partial f(B)}{\partial B} \geq 0 \quad and \quad f(0) = 1 \tag{6}$$

Where $B = 0$ implies that the producer does not copyright the software and thus does not undertake any deterrent measures.

Typically larger clubs are more easily detected than smaller clubs (Benham and Wagner 1987) and thus the software producer may be able to actually cause smaller club sizes to form through deterrent measures. The assumption that club sizes can be controlled through deterrent measures is an important empirical question that will be tested in a later section in this paper.

The software producer can reduce the club size and in some cases preclude their formation by adopting stricter deterrent measures. Substituting equation 5 into equation 2 and equating the average cost to price of the software leads to the following observation:

*Observation 2:* **The producer can effectively eliminate piracy through deterrent measures by ensuring that**

$$f(B) \geq \frac{1}{2} \cdot ( \ (\frac{P}{c})^{1/2} - (\frac{P}{c}-4)^{1/2} \ )$$

Using equations 2 and 5, the average cost of belonging to an optimal size club is

$$AC = \frac{2(Pc)^{1/2}}{f(B)} \cdot (1 + f^2(B)) \tag{7}$$

Assuming a linear demand function, the total number of individuals who would obtain a copy, $Q$ is given by

$$Q = z - \alpha \ \frac{2(Pc)^{1/2}(1 + f^2(B))}{f(B)} \tag{8}$$

Where $\alpha$ is the reduction in the demand per unit increase in price and z is the zero-price demand. The total number of originals sold by the software publisher, $Q_s$, is

$$Q_s = \frac{Q}{n} \tag{9}$$

The publisher's problem then is to choose the price which maximizes profits ($\pi$) as given by

$$\pi = P \cdot Q_s - F \tag{10}$$

Maximizing $\pi$, using equations 8, 9 and 10 we have

$$P^* = \frac{z^2}{4\alpha^2 c} \cdot \frac{f^2(B)}{(1 + f^2(B))^2} \tag{11}$$

$$n^* = \frac{z}{2\alpha c(1 + f^2(B))} \tag{12}$$

$$\pi^* = \frac{z^2}{4\alpha} \cdot \frac{f^2(B)}{(1 + f^2(B))} - F \tag{13}$$

where $P^*$ is the profit maximizing price, and $n^*$ and $\pi^*$ are the corresponding club size and profit. To study the effects of preventive and deterrent measures, we perform the comparative static analysis and derive the following propositions.

*Proposition 1:* **Increases in preventive and deterrent measures reduce the market price P.**

*Proof:* From equation 11, it is obvious that $\dfrac{\partial P^*}{\partial c} \leq 0.$

Using equation 3 we have $\dfrac{\partial P^*}{\partial A} = \dfrac{\partial P^*}{\partial c} \cdot \dfrac{\partial c}{\partial A} \leq 0.$

Similarly from equation 11 we have,

$$\frac{\partial P^*}{\partial B} = \frac{z^2}{2\alpha^2 c} \cdot \frac{f(B) \ (1 - f^2(B))}{(1 + f^2(B))^2} \cdot \frac{\partial f(B)}{\partial B}$$

Since $f(B) \geq 1$ and $\dfrac{\partial f(B)}{\partial B} \geq 0$ *(equation* 6) , we have

$$\frac{\partial P^*}{\partial B} \leq 0 \; .$$

The results suggest that market price of the software and preventive/deterrent measures are substitute strategies. This is consistent with the current strategies of the software publishing industry where publishers charge higher prices to compensate for revenues lost to pirates or they lower prices and more stringently enforce anti-piracy programs (Carrol 1986).

> *Proposition 2:* **Increases in preventive measures reduce profits and increases in deterrent measures may increase or decrease profits.**

*Proof:* From equations 1 and 13 we have

$$\frac{\partial \pi^*}{\partial A} = -\frac{\partial F}{\partial A} \leq 0 \tag{14}$$

From equation 13 we have

$$\frac{\partial \pi^*}{\partial B} = \frac{z^2 f(B)}{2\alpha(f^2(B) + 1)} \cdot \frac{\partial f(B)}{\partial B} - \frac{\partial F}{\partial B} \tag{15}$$

Equation 14 shows that increasing preventive measures reduces profits. In equation 15, the first and the second terms on the right hand side are positive (equations 1 and 6) and thus the profit may rise or fall depending on the magnitude of these two terms. The above results can be explained as follows. The objective of undertaking preventive and deterrent measures is not solely to reduce piracy but to *appropriate* a higher price from each member of the software club. The price paid by each individual *to* the software producer is $P^*/n^*$. From equations 11 and 12, we have

$$\frac{P^*}{n^*} = \frac{z(f^2(B))}{2\alpha(1 + f^2(B))} \tag{16}$$

From the above expression we have,

$$\frac{\partial(\frac{P^*}{n^*})}{\partial A} = 0 \tag{17}$$

$$\frac{\partial(\frac{P^*}{n^*})}{\partial B} = \frac{zf(B)}{2\alpha(1 + f^2(B))^2} \geq 0 \tag{18}$$

Through preventive measures the software producer cannot *appropriate* a higher price from a user, and thus the negative effect on the profit. However, through deterrent measures the software producer can *appropriate* a higher price from each *user*, and the net effect of these measures is positive *if* the following conditions are in place (equation 15):

- deterrent measures effectively reduce club size and

- the fixed costs of implementing the deterrent measures are not prohibitively high.

## 4. DISCUSSION

The model presents two interesting results. The first is that the price and the preventive/deterrent measures are substitute strategies. The second result is that while preventive and deterrent measures can both effectively eliminate piracy, preventive measures have a negative effect on profits while deterrent measures can potentially increase profits if they are effective in curtailing club formation and the associated fixed costs are low.

There is some anecdotal evidence supporting these results. Around 1985, a number of software companies started removing copy-protection devices on their software (Antonoff 1987). Coinciding with the removal of copy-protection technologies, the software publishers began active educational and legislative campaigns (Mason 1990). Further anecdotal evidence for the model is the recent phenomenon where software companies sell both a copy-protected and an unprotected version of the same software (Carrol 1986). The unprotected version sells at a higher price than the protected version.

As noted earlier, a critical assumption of the analytic model presented is that deterrent measures decrease club size. In the next section, we report the results of a study conducted to determine if the deterrence assumption holds up to empirical analysis.

## 5. EMPIRICAL RESEARCH ON SOFTWARE PIRACY

As yet, the number of empirical studies related to software piracy is limited. Further, many of the studies on software piracy have been primarily descriptive, reflecting the relative newness of the topic. For example, Soloman and O'Brien (1991) report that software piracy is widespread among business students and that they view piracy as socially and ethically acceptable. Shim and Taylor (1991) found that copying software is perceived by IS faculty members as being more prevalent among IS faculty than similar perceptions among business managers regarding their employees. In another study Swinyard et al. (1990) found that Asians have a more casual attitude toward piracy than Americans, and that Asian attitudes are rooted in cultural mores which emphasize sharing creative work.

Particularly interesting at this stage of inquiry are studies that focus on the demographics and personality characteristics of software pirates and the social and organizational context of software piracy. Eining and Christensen (1991) found that negative attitudes toward computers, individual perceptions concerning the net benefits of piracy, and personal norms were related to the amount of pirated

software possessed by business students. Solomon and O'Brien found that females engage in less piracy and younger students pirate more software.

We also included an ethics construct in the main research study because several of the subjects in the pilot study commented on the obvious link between software piracy and ethics. In reviewing the literature, we could find no studies that included a general measure of ethics in the research model. This is indeed perplexing, because copying software is illegal and studies on software piracy can be found in recent books on the ethical issues in information systems (Dejoie, Fowler, and Paradice 1991). In addition, several studies refer to the ethical overtones of software piracy (Swinyard et al. 1990; Carrol 1986; Antonoff 1987). As such, a general measure of ethical attitudes was included as a control variable in the empirical analysis in order to better assess the effect of the deterrent measures on the propensity of individuals to participate in software piracy clubs.

## 6. THE DETERRENCE ASSUMPTION

This study examines the effects of deterrent measures on an individual's propensity to pirate software by participating in the formation of a software piracy club. The primary objective of the research is to establish the theoretical underpinnings for the economic model outlined earlier. In most studies, software piracy is measured as a single item score, usually by asking the respondents whether they copy software and how much they copy. We contend that another important aspect of software piracy is the number of people willing to participate in a piracy transaction. It was noted earlier that a *club* is formed when (1) a group of individuals purchase a software package and make copies of the software and relevant documentation and (2) when there is an implicit agreement among individuals to engage in reciprocal pirating transactions. The number of individuals participating in the club is defined as the *club size* and, as demonstrated earlier, larger club sizes reduce the profitability of software publishers. A typical deterrence approach employed by software publishers is the unfolding of educational campaigns to provide users with information regarding copyright laws and the consequences of breaking the law. Deterrent measures attempt to dissuade users from copying software by informing them about the *illegality* of software pirating. The purpose of educational campaigns is to inform users about copyright laws and inspire attitude changes about appropriate software copying behavior.

The thrust of this empirical research is to investigate the validity of the deterrence assumption; however, we believe that an individual's propensity to form a club is also affected by the individual's ethical index. (The ethical index is the ethical profile of an individual as represented by a single summative score obtained from a general ethics questionnaire.) We hypothesize the following relationships:

*H1: An individual with a lower ethical index will participate in larger club sizes.[1]*

*H2: Given an individual's ethical index, providing deterrence information will reduce the club size.*

The expected behavior for the two hypotheses is illustrated in Figure 1. A formal representation of the hypotheses follows.

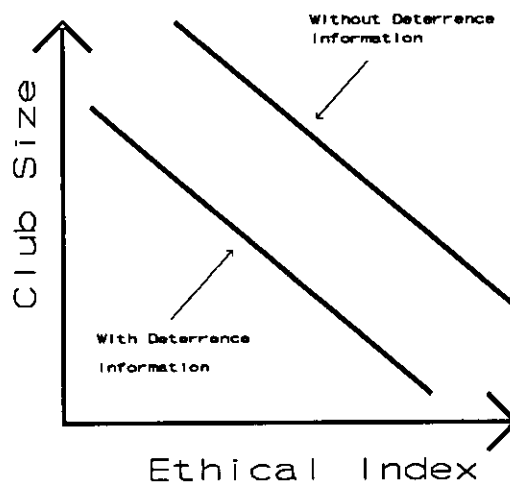*Club Size* = *f(Deterrence Information, Ethical Index)*



**Figure 1. Expected Relationship among Research Variables**

## 7. METHODOLOGY

*Club Size:* Four items were used to operationalize the club size and they are shown in Table 1. The items describe hypothetical scenarios describing an individual making illegal copies for himself or herself at home, for a family member, for a friend, and for other colleagues. The sum of the responses for the four items results in a measure of the club size that the individual is willing to participate in. The scale was constructed so that higher values for the *club size measure* are associated with smaller club sizes.

The *club size measure* is also reasonably reliable. Table 2 shows the correlations between the four items used to measure the club size. All of the four items are significantly correlated, indicating the existence of a single construct. We also performed an exploratory factor analysis, the results of which also indicate the existence of a single factor. Finally, Cronbach's coefficient Alpha for the four club items is .80, indicating that the scale is fairly stable and consistent.

*Deterrence Information:* This is a one page information sheet on software piracy (see Table 3). Deterrence information provided on the sheet included current copyright laws, the consequences of being caught for violating copyright laws, actions taken by the SPA to curtail piracy, and the negative effects of software piracy on software firms and users.

**Table 1. The Club Size Items***

1. Doug Watson is an architect at Architects Unlimited. He is working on a major consulting project for Architects Unlimited. The timing and the completion of the project is critical, and he is committed to the project. He recently purchased an expensive copyrighted software which is essential to finish the project correctly and on time. He anticipates working overtime, including weekends, to successfully complete the project. In order to provide easy access to the software he makes a copy of the software, and installs the software at home and at work (mean = 2.16, standard deviation = 0.982).

2. A close family member of Doug Watson is also an architect. During a holiday family get-together, the family member comes to know about the software and asks to make a copy of the software. Doug Watson lets him make a copy of the software (mean = 3.27, standard deviation = 1.17).

3. While Doug Watson is using the software at work at Architects Unlimited, one of his colleagues happens to pass by and notices the new software. This person shows strong interest in making a copy of the software. Doug Watson lets him make a copy of the software (mean = 3.16, standard deviation = 1.14).

4. The computer consultant at Architects Unlimited comes to know about the software. The consultant wants to keep a copy of the software at the lab so that any employee at the company can copy and use the software. Doug Watson lets the consultant make a copy of the software (mean = 3.63, standard deviation = 1.11).

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+ Ratings for the items consisted of a five-point scale with steps varying from "Always Acceptable" to "Never Acceptable.

**Table 2. Correlations Between Club Size Items**

|   | 2 | 3 | 4 |
|---|---|---|---|
| 1 | 0.422* | 0.433* | 0.309* |
| 2 |  | 0.689* | 0.448* |
| 3 |  |  | 0.685* |

* p < 0.0005

*Ethical Index:* These items were obtained from a scale developed by Wood et al. (1988) to determine the ethical profile of business students. The ethical index is computed by summing the responses to sixteen hypothetical situations listed in Table 4. A higher scale value indicates higher ethical values. The Cronbach coefficient Alpha value for the sixteen scale items is .77, indicating that this scale is reasonably stable and reliable.

*The Sample:* Two sets of questionnaires were developed. One questionnaire contained the one page sheet with *deterrence information*, the items for measuring *club size*, and the items for determining the *ethical index*. The other set of questionnaires contained the same variables, with the exception of the *deterrence information*. *Deterrence information* is in effect a treatment. The questionnaires were randomly distributed to 130 MBA students. Because

of the sensitive nature of the topic, subjects were assured of complete anonymity of their responses. There were 123 usable responses in the sample with 60 of the questionnaires containing the *deterrence information* (see Table 3).

## 8. RESULTS

The inter-item correlations for all of the research variables are found in Table 5. Regression analysis was performed with the *club size* as the dependent variable and *ethical index* and *deterrence information* as the independent variables. *Deterrence information* was coded as a dummy variable, with 0 indicating that the respondents were not provided *deterrence information*. The results of the regression analysis are as follows (t-values for the coefficients are in parentheses):[2]

**Table 3. Deterrence Information**

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**Copyright Law and Computer Software**

Computer software is copyprotected under US Code Section 17. The software producer has the exclusive right to make and distribute copies of the software. When the user purchases the software, he or she is only buying the right to *use* the software. The program itself remains the property of the software publisher. Most software packages come with a license agreement that restricts users from making copies for purposes other than backups. Usually the license agreement prohibits the use of the software package on more than one hardware device.

**Penalties**

Under federal law, unauthorized duplication of computer software carries both civil and criminal penalties. Any person infringing a copyright may be fined up to $ 10,000 and/or imprisoned for up to one year.

Software publishers have taken a number of steps to deter piracy. The recently formed Software Publishers Association (SPA) performs corporate audits. Specialized software is available to detect pirated copies of software in computer hard disks. While the audits are voluntary, if a company refuses, the SPA will take it to court. The number of court cases has increased dramatically in the past few years. SPA has stepped up its educational campaign to inform users about the copyright laws.

**Impacts of Piracy**

Software industry analysts argue that piracy is a huge drain on the software publishers' profits. They estimate that $ 170 million to $ 4 billion worth of software is pirated and it directly affects over 11,000 companies engaged in software development. Industry analysts predict that continued piracy will inhibit the development of new software as companies will not be able to recoup their software development costs. Thus, piracy will not only affect the software companies but it will also affect users as new software will not be developed.

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$Club\ size = -1.67 + 0.235\ Ethical\ Index + 1.31\ Deterrence\ Information$
$measure\quad (-0.832)\qquad (6.714^*)\qquad\qquad (2.474^*)$

$R^2$ (adjusted) = 0.28  $R^2$ = 0.29

The $R^2$ value for the model and the F-value of 24.71 (significance value < .00005) indicate a good fit for the research variables. The t-values for the independent variables are significant at the .05 level, thus providing strong evidence for accepting the two research hypotheses. Multicollinearity did not present a problem in fitting the model because the correlation between the two independent variables was not significant (r =-0.059) as illustrated by Table 5. These results also provide some evidence of the discriminant validity of the club size construct. In effect, providing subjects with deterrence information does not affect their ethical index. In contrast, providing deterrence information does influence the subjects' propensity to form software piracy clubs (r = 0.156*). In other words, club size responds to manipulation while the ethical index does not respond.

The results provide strong support for the critical economic assumption that deterrence information has a significant effect on the club size.

**9. CONCLUSIONS**

This paper has investigated the effects of preventive and deterrent measures on software producers' profits. The results suggest that preventive measures do not increase producer profits while deterrent measures can have a positive effect on profitability. Future areas for research could involve:

- Empirically validating the two propositions derived in this paper.

- Further validation and refinement of the research variables. For example, examining the relationship between the club size construct and actual club formation behavior.

- Determining the durability of the deterrence treatment. This should provide insight into the timing and intensity required to wage effective educational campaigns.

- Investigating the case where there are substitute products available. Consider the case of two firms producing near substitutes. There may be incentives for one producer to allow formation of larger software clubs to attract consumers away from the other firm's product.

- Investigate the role of piracy as an advertizing mechanism.

- Additional investigation into the role of ethics in economic models.

Table 4. Ethical Index Items<sup></sup>

Table 4. Ethical Index Items*

1.  An executive earning $50,000 a year padded his expense account by about $1,500 a year (mean = 3.87, standard deviation = 0.87).

2.  In order to increase profits, a general manager used a production process which exceeded legal limits for environmental pollution (mean = 4.59, standard deviation = 0.57).

3.  Because of pressure from his brokerage firm, a stockbroker recommended a type of bond that he did not consider a good investment (mean = 4.13, standard deviation = 0.69).

4.  A small business received one-fourth of its gross revenue in the form of cash. The owner reported only one-half of the cash receipts for income tax purposes (mean = 4.00, standard deviation = 0.94).

5.  A company paid a $350,000 "consulting" fee to an official of a foreign country. In return, the official promised assistance in obtaining a contract which should produce a $10 million profit for the contracting company (mean = 3.24, standard deviation = 1.10).

6.  A company president found that a competitor had made an important scientific discovery that would sharply reduce the profits of his own company. He then hired a key employee of the competitor in an attempt to learn the details of the discovery (mean = 2.66, standard deviation = 1.02).

7.  A highway building contractor deplored the chaotic bidding situation and cutthroat competition. He, therefore, reached an understanding with other major contractors to permit bidding that would provide a reasonable profit (mean = 3.39, standard deviation = 1.08).

8.  A company president recognized that sending expensive Christmas gifts to purchasing agents might compromise their positions. However, he continued the policy since it was common practice and changing it might result in loss of business (mean = 2.67, standard deviation = 0.91).

9.  A corporate director learned that his company intended to announce a stock split and increase its dividend. On the basis of this information, he bought additional shares and sold them at a gain following the announcement (mean = 4.00, standard deviation = 1.07).

10. A corporate executive promoted a loyal friend and competent manager to the position of divisional vice president in preference to a better qualified manager with whom he had no close ties (mean = 3.36, standard deviation = 1.07).

11. An engineer discovered what he perceived to be a product design flaw that constituted a safety hazard. His company declined to correct the flaw. The engineer decided to keep quiet, rather than taking his complaint outside the company (mean = 4.07, standard deviation = 0.78).

12. A controller selected a legal method of financial reporting that concealed some embarrassing financial facts that would otherwise have become public knowledge (mean = 2.65, standard deviation = 1.13).

13. An employer received applications for a supervisor's position from two equally qualified applicants but hired the male applicant because he thought that some employees might resent being supervised by a female (mean = 3.77, standard deviation = 1.12).

14. As part of the marketing strategy for a product, the producer changed its color and marketed it as "new and improved," even though its other characteristics were unchanged (mean = 3.30, standard deviation = 1.15).

15. A cigarette manufacturer launched a publicity campaign challenging new evidence from the Surgeon General's office that cigarette smoking is harmful to the smoker's health (mean = 3.08, standard deviation = 1.14).

16. An owner of a small firm obtained a free copy of a copyrighted computer software program from a business friend rather than spending $500 to obtain his own program from the software dealer (mean = 3.30, standard deviation = 1.14).

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*   Ratings for the items consisted of a five-point scale with steps varying from "Always Acceptable" to "Never Acceptable."

**Table 5. Mean, Standard Deviation, and Correlations
Between the Research Variables**

|  | Mean | Std. dev. | Information | Club size |
|---|---|---|---|---|
| Ethical Index | 56.09 | 7.57 | -0.059 | 0.5055* |
| Information | 0.488 | 0.50 |  | 0.156* |
| Club size | 12.16 | 3.45 |  |  |

\* p < 0.0001
\*\* p < 0.1

In response to the final observation, traditional economists assume that ethics has no role in economic behavior. That is, ethics should have no effect on the formation of software clubs. However, our findings suggest that ethical levels have a significant effect on club size. As noted by Reilly and Kyj, "classical economic thought advocates a non-ethical decision-making context and is not functional for a modern complex, interdependent environment" (1990, p. 691).

We agree and suggest that further integration of diverse fields will result in more realistic research models.

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## 12. ENDNOTES

1.  A natural extension of this hypothesis would consider whether individuals with lower ethical values would participate in a greater number of software piracy clubs.

2.  Recall that larger values for the *club size measure* are related to smaller club sizes.