

Pricing strategy and practice

Pricing and pirate product market formation

Theo Papadopoulos

The author

Theo Papadopoulos is Senior Lecturer in the School of Applied Economics, Faculty of Business and Law, Victoria University, Melbourne, Australia.

Keywords

Pricing, Marketing environment, Copyright law, Music industry

Abstract

Explores the relationship between legitimate product pricing, copyright law enforcement and the formation of black markets for pirate products. The analytical framework is illustrated using the market for sound recordings as a case study. Investigates copyright owner strategies to combat piracy, including price discounting to establish a legitimate market and lobbying for increased enforcement and infringement penalties. An elementary regression model is employed to examine the empirical relationship between legitimate sound recording price, black market distribution channels and piracy. The empirical model supports the hypotheses that piracy is directly related to legitimate price and the size of black markets.

Electronic access

The Emerald Research Register for this journal is available at
www.emeraldinsight.com/researchregister

The current issue and full text archive of this journal is available at
www.emeraldinsight.com/1061-0421.htm

Introduction

The phenomenon of piracy and counterfeit, products distributed via informal or black markets, poses a significant threat to the profitability of copyright dependent industries such as music recording, software, video games, motion pictures and books. Estimates of trade losses in the USA alone total some \$9.4 billion (IIPA, 2002).

Numerous studies have looked at the formation of black markets as a function of tax evasion, prohibition, price controls and other forms of government regulation (Bhagwati and Hansen, 1973; Pitt, 1981; Norton, 1987; Fausti, 1992). With the growing importance of international trade in copyright-related products, we have observed a parallel growth in piracy and counterfeiting. International piracy and counterfeiting typically involves the act of smuggling infringing products across national borders. The contribution of this paper is the empirical exploration of the relationship between price setting in the legitimate market for copyright product and pirate product demand formation in black markets. Utilising the market for sound recordings as a case study, this paper presents an analytical framework that explores the interrelationship between the legitimate and black market for sound recordings, and the impact of varying levels of copyright law enforcement and financial penalties on the supply of pirate products.

The nature and scope of sound recording piracy

Products that infringe intellectual property (IP) rights may be classified into two broad groups: counterfeit and pirate products. The term counterfeit is often used to describe a product designed to imitate a genuine product, typically those associated with a particular trademark or brand name. A counterfeit product is made to resemble, as closely as possible, the authentic product, with the objective of deceiving the consumer and defrauding the producer. In the case of a copyright product, such as computer software, video games and sound recordings, duplication technology is so advanced that it is often impossible to distinguish between legitimate and counterfeit products, which in many cases are clones of the original. In the case of high quality counterfeits, neither the packaging nor the product quality provide any clues as to the products authenticity.

Because counterfeits are being passed off as legitimate products, they are often sold at the full price. Given the relatively small reproduction cost,

large economic rents accrue to the manufacturer, distributor and/or retailer of these copyright-infringing products. The point at which these rents are captured depends on the stage along the distribution channel at which the deception is carried out. For example, when retailers unknowingly purchase counterfeit product at the regular wholesale price, the economic rents accrue to the distributor. If, however, all parties at each stage of the distribution channel knowingly trade in counterfeit products, the economic rents will be distributed accordingly. The ultimate deception in this case is committed against the consumer, who unknowingly purchases a counterfeit product.

If the counterfeit is a perfect reproduction of the legitimate product, are there any real consequences for the consumer? Regardless of the quality of the reproduction, consumers would, having paid the full price, undoubtedly feel cheated. A consumer's marginal valuation of a counterfeit product would be lower than that for a legitimate product. Consumer deception is just one of the two economic consequences of counterfeiting. The second is to defraud the IP holder(s) of their economic rights. In the case of a sound recording, for example, a number of copyrights coexist in a single copy. The result is that an infringing product defrauds a number of rights holders. First, the record company, having made an investment in the production of the master recording, is deprived of a return on this investment. Second, the featured artist has copyright in the performance and is defrauded of the artist royalty. Lastly, the songwriter has copyright in the musical work itself, for which he/she receives a publishing royalty. Both artist and publishing royalties can be shared among two or more members of a band or writing team. Licensing (contractual) agreements normally require the payment of a royalty for each and every copy of the sound recording to each of the rights holders. Moreover, affiliated businesses such as artist managers and music publishers earn their living from commissions on artist and songwriting royalties. Counterfeit and piracy also defrauds these businesses of income.

Piracy, like counterfeiting, involves the unauthorised duplication or reproduction of a copyright or patented product. Piracy, while defrauding rights holders in the same way as counterfeit product, does not include the act of deception. That is, a pirate product is typically marketed as an unauthorised reproduction of a copyright or patented product. In this case, price sensitive consumers choose to purchase the pirate product in preference to the relatively higher-priced legitimate product. In many cases, manufacturers of pirate products make only

piecemeal attempts at imitating the packaging of legitimate products. For example, pirate video games and sound recordings often have relatively poor colour reproduction on packaging. However, the product itself is often a close or perfect duplicate (clone).

In the case of video games, sound recordings, computer software and movies, pirate and counterfeit products are often mass-produced at optical disc manufacturing plants located in specific countries and exported around the world. Table I presents estimated pressing capacity for optical disc manufacturing in selected countries and compares this to legitimate demand in those countries. While excess capacity is a common feature of most manufacturing sectors, the table highlights the gross over-investment in optical disc manufacturing capacity relative to domestic demand. According to the IFPI (2000), the countries identified in Table I are those that are responsible for a high proportion of pirate and counterfeit music production. Excess capacity is by itself not a determinant of piracy, but simply a measure of the potential size of the illegitimate market for optical disc-based products. Moreover, the existence of excess capacity does not help to explain the varying levels of piracy observed in specific countries. Instead, it simply helps to identify the possible origin of infringing products.

The international distribution of pirate and counterfeit goods entails the act of smuggling. Smuggling refers to clandestine exports and imports, principally to avoid various forms of government regulation such as quantitative restrictions (requiring licences or permits), taxes (tariffs) and outright prohibition (for example, narcotic drugs). It is important to draw a distinction between smuggled goods that are authentic or legitimate products and those that, in addition to violating certain border controls, also infringe IP rights, namely pirate and counterfeit products. In contrast, smuggled legitimate products, imported by traders who attempt to circumvent quantitative restrictions or taxes, are

Table I Estimated optical disc manufacturing capacity

Country	Estimated capacity – all formats (millions)	Total legitimate demand (millions)
Taiwan	8,000	200
Hong Kong	3,000	140
China	1,200	700
Singapore	700	50
Malaysia	500	60
Indonesia	200	15
Russia	185	60
Poland	180	100
Macau	150	1

Source: IFPI (2002)

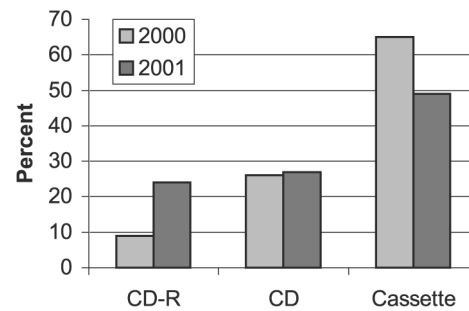
“illegal” in that they enter a country in some clandestine fashion. These products are not “infringing” in the context of IP. The cloaking techniques employed by smugglers vary from the simple to the sophisticated and depend, in part, on the level of IP enforcement encountered at the border in specific countries.

The threat of international piracy has galvanised support for a coordinated international initiative to combat its growth. The International Intellectual Property Alliance (IIPA) is a coalition of trade associations each representing a significant component of the US copyright industry[1]. Estimates of trade losses, totaling US\$9.4 billion in 2001, are presented in Table II. According to the IIPA, the reported trade losses actually underestimate losses due to piracy, valuing black market transactions at pirate rather than legitimate prices.

Music piracy involves the unauthorised reproduction and fixation of a sound recording to a sound carrier. These sound carriers come in a variety of formats and change as rapidly as advances in technology facilitate. Recent technological advances have increased the range of formats including, audiocassette, compact disc, CD-Writer (CD-R) and digital distribution over the Internet. Digital audio files are distributed using peer-to-peer software at close to zero marginal cost. Advances in the home computer and the introduction of the CD-R enable one-at-a-time digital reproduction of sound recordings. The diversification of music piracy formats has not only increased the level of piracy, but it has also made it more difficult to monitor and deter. Internet piracy is a major and growing concern for record companies and there has been some modest progress in this arena, as evidenced by the much publicised litigation initiated by RIAA against Napster, a peer-to-peer file swapping software (see for example, Ku, 2002).

Notwithstanding the growing threat of Internet piracy, a major concern for copyright industries is the continued mass production and distribution of physical copies of pirate products. As Figure 1 shows, audiocassettes remain the dominant format for pirated sound recordings, reflecting the fact

Figure 1 Change in sound recording piracy format



Source: IFPI Music Piracy Report (2002)

that in many developing countries CD players have not yet been widely adopted. The CD format accounts for around 25 percent of pirated sound recordings. Perhaps of greater concern is the significant rise in the CD-R piracy share, spurred by a growth in organised CD-R piracy fueled by technological advances in high-speed low-cost CD-R replication equipment. Combined with Internet piracy, this paints a rather stark picture for the future of the music recording industry.

The development of effective strategies in the fight against international piracy necessitates a clear identification of the causes of the phenomenon. In 1999 the EU Commission on Intellectual and Industrial Property produced a Green Paper on combating counterfeiting and piracy. In this paper the commission sought responses to a series of questions relating to the economic, legal and administrative issues surrounding international trade in IPR infringing products. In its response, the International Chamber of Commerce (ICC) cites the following as the main causes of counterfeiting and piracy (ICC, 1999, p. 1):

- huge profits;
- low risk of detection;
- weak deterrent (fines and prison sentences are minimal);
- advances in technology (tools for reproduction of copyright product);
- public perception that piracy is socially acceptable; and
- courts view of IPR infringement as a “low grade” or soft crime.

Expected profit from commercial piracy can be gauged by the divergence between the legitimate and pirate price in various national markets. The risk of detection will reflect national government commitment to IP law enforcement. To deter entry effectively, IP laws should be backed by penalties commensurate with expected profit. The following section presents an analytical framework within

Table II Estimated trade losses due to piracy (US\$ million)

Industry	2000	2001
Motion pictures	6,246.5	6,323
Records and music	2,066.4	2,339.1
Business software	2,926	3,207.4
Entertainment software	1,582.6	1,888.7
Books	671.8	650.8
Total	8511	9,409

Source: IIPA (2002)

which legitimate pricing and enforcement efficacy can be evaluated.

Legitimate sound recording pricing and pirate demand formation

The international market is oligopolistic, in which the largest five multinational (MNE) record companies (the majors) enjoy around 85 per cent of global sales. Artists are signed to exclusive recording contracts providing record companies with exclusive commercial rights over an artist specific sound recording. Given the nature of demand for popular music, where demand for hit records is highly inelastic, this provides a record company with a temporary monopoly over an artist specific title (Federal Court of Australia, 2001). An international network of subsidiary and joint venture networks provides the majors with exclusive distribution rights to its music catalogue (a bundle of titles). In the presence of demand dispersion (between national markets) international price discrimination maximises industry profit, while national markets are themselves characterised by price uniformity (Papadopoulos, 2000). The analysis of monopoly supplier of an artist specific sound recording and the development of a black market for pirate product is facilitated by the following assumptions:

- Copyright owners are nationals of Country A, the home country of the MNE record company that exclusively produces and distributes an artist specific international hit record.
- An exclusive distribution agreement with a wholly-owned subsidiary ensures monopoly supply of the record company's music catalogue in country B.
- Country B is a developing country in which the principal source of pirate sound recordings is either audiocassettes or CD formats, mass-produced in country C.
- Computer and Internet penetration rates in country B are low, such that CD-R and Internet piracy are relatively insignificant and ignored.
- Legitimate production costs are a linear function of output so that cost per unit, inclusive of royalties and license fees, is constant.
- Consumer marginal valuation of pirate sound recordings is lower than for legitimate sound recordings. However, the level and distribution of income in Country B is such that, for some proportion of consumers, pirate

sound recordings are a normal rather than inferior good.

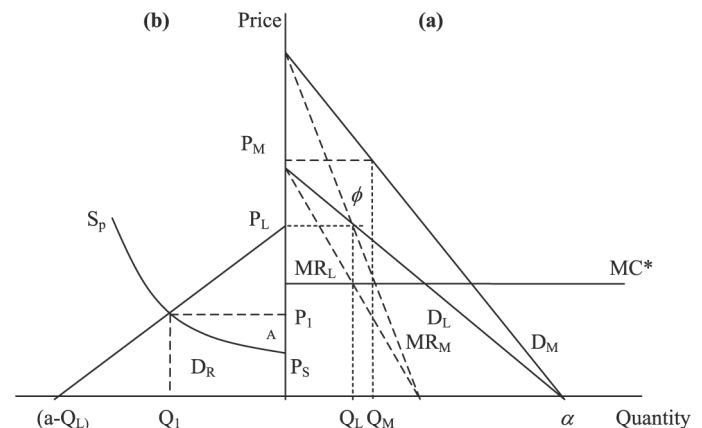
- Pirate sound recordings are smuggled and distributed in Country B by a monopoly importer; a member of an organised crime syndicate.
- The risk of detection and size of penalties is rising in the volume of pirate trade.

The profit maximising monopoly record company distributing an artist specific hit record is illustrated in panel (a) of Figure 2. With prohibitive enforcement the record company sets a price of P_M , at which consumers are willing to purchase a quantity of Q_M . The market demand curve (D_M) represents the aggregate demand curve for an artist specific sound recording title and consumer's marginal valuation of that product[2].

In the absence of prohibitive enforcement, legitimate products will be displaced by low-price pirate sound recordings sold in the black market. The extent of this crowding-out or displacement effect will depend on, among other things, consumer preferences and incomes, as well as the quality of pirate products. Despite the existence of high-quality low-priced duplicates, some consumers will choose to purchase the relatively more expensive legitimate product. This may be partly explained by the "snob effect", where conspicuous consumption of luxury brand products is a symbol of social status and financial success. For others, the criminal risk element may be a deterring factor, while for others it may simply reflect ethical behaviour.

To examine these dynamics we need an analytical framework that will capture the relationship between the legitimate and black market sector in which legitimate and pirate products co-exist. We need a title specific demand function that will capture the movement of consumers between the formal and informal

Figure 2 Title specific sound recording market



sectors. Accordingly, the demand function for a sound recording is depicted as:

$$Q_i = \alpha - \beta P_i - \delta P_i \quad (1)$$

where β measures the response of quantity demanded (Q_i) to a change in legitimate product price (P_i) and δ measures the displacement effect resulting from the diversion of demand to the black market, *ceteris paribus*. The magnitude of the displacement effect will be directly related to the quality of infringing pirate products and the size and efficiency of black market distribution channels. In the presence of non-prohibitive enforcement the displacement effect will cause the demand for legitimate product D_M to pivot leftward.

On the other hand, the higher and more effective the level of enforcement, the lower is supply and consumer access to pirate product. This will frustrate consumer willingness to buy pirate sound recordings by discouraging smuggling and causing black market supply bottlenecks. The ultimate location and shape (elasticity) of the demand curve for legitimate product will therefore be a function of the countervailing strength of these two effects. As illustrated in Figure 2, non-prohibitive enforcement results in a change in demand for legitimate products from D_M to D_L , with a corresponding reduction in the profit maximising price and quantity traded to P_L and Q_L respectively. In a global context, the strength of the δ coefficient will vary significantly between countries, resulting in a range of profit maximising prices.

At a price of P_L , those consumers depicted by the segment of the demand curve θ to α , will be excluded from the legitimate market because their individual marginal valuations (based on preferences and income levels) are lower than the legitimate price. This unsatisfied demand is depicted in segment (b) as the residual demand curve D_R , derived by taking the horizontal difference between the market demand curve D_L and the vertical axis at each price below P_L . For the smuggler of pirate sound recordings, D_R represents a market opportunity presently unserved by the territorial copyright owner or licensee. The record company, unable to segment the domestic market, cannot exploit this market opportunity. The smuggler seizes this opportunity by setting up a black market distribution channel for the supply of pirate sound recordings. We assume a small country model so that the level of domestic demand does not influence the foreign pirate sound recording price (P_S). By assumption (8) the risk of detection and penalties (fines and/or imprisonment) is captured by a pirate supply curve (S_p) that is increasing in the volume of black

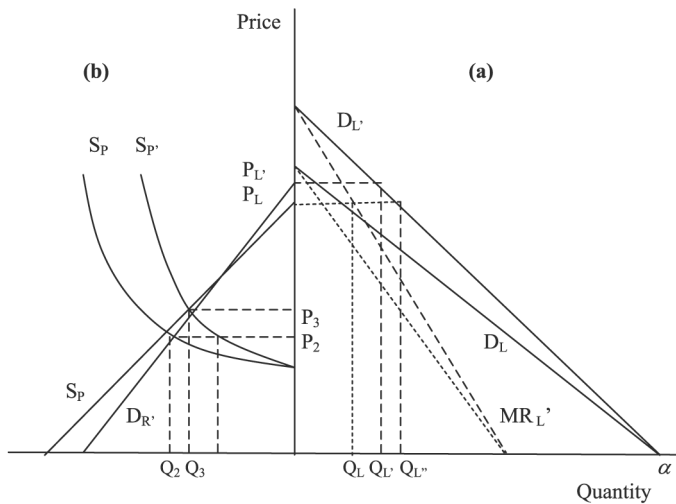
market trade. The gradient of S_p reflects the risk of detection and the size of the ensuing penalties. Alternatively, the price of corruption services (purchased to avoid detection and penalties) may increase with the volume of smuggling and pirate product distribution, producing an upward sloping smuggling supply curve. As illustrated, the profit maximising price and quantity in the black market is P_I and Q_I .

The displacement effect of piracy can be measured by subtracting legitimate sales in the presence of piracy (Q_L) from legitimate sales in the absence of piracy (Q_M); that is, $Q_M - Q_L$. It is noteworthy that the quantity of pirate sound recordings sold in the informal sector exceeds the volume of displaced legitimate product; that is, $Q_I > (Q_M - Q_L)$. This means that pirate sound recordings do not displace legitimate product on a pro rata basis. That low-price duplicates induce sales beyond the volume of displaced product is not surprising given the relatively low price of pirate products. Accordingly, estimates of piracy market shares and the ensuing trade losses (based on the volume of infringing product sales) as presented in Table I will likely over-estimate actual losses to copyright owners. Trade losses are measured in Figure 2 by $(P_M \cdot Q_M) - (P_L \cdot Q_L)$, while black market profit is depicted by area A in panel (b).

Copyright owner strategies

This analytical framework proves useful in examining the dynamic relationship between the legitimate and black market sectors and copyright owner strategies for minimising the displacement effect. First, record companies can respond to significant pirate activity by lobbying national governments to improve enforcement and thereby raise the risk of detection and/or to raise penalties and increase the cost of detection. Second, faced with ineffectual copyright law, they may choose to employ a strategy of price discounting, which is necessary in some countries, simply to establish a market for legitimate products. We now consider these strategies sequentially. An increase in enforcement and the probability detection will cause black market supply bottlenecks and frustrate consumer attempts to buy pirate sound recordings. This is illustrated in Figure 3 where a lower δ coefficient, is reflected in the rightward shift in the demand curve from D_L to $D_{L'}$. The corresponding curve D_R in the black market shifts to $D_{R'}$. The pirate price and quantity traded falls to P_2 and Q_2 , with a consequential fall in black market profit. By comparison, the legitimate

Figure 3 Formal and informal markets



market price and quantity traded increases to $P_{L'}$ and $Q_{L'}$.

Where lobbying simultaneously raises IP infringement penalties, this raises the risk-return ratio to pirate traders. This is illustrated by a steeper pirate supply curve $S_{P'}$, reflecting the higher expected penalties imposed upon detection. The result is an increase in the price of pirate sound recordings to P_3 and a reduction in quantity traded to Q_3 . This will further reduce the displacement effect in the legitimate market and increase price and profits in that sector. The analysis suggests that improved enforcement measures backed by severe penalties can successfully reduce the volume of pirate trade and raise prices.

Consider now a strategy of price discounting. Lowering price of legitimate sound recordings from $P_{L'}$ to P_L will cause a movement along the demand curve D_L and raise quantity traded to $Q_{L''}$. While price discounting will lower record company profit, it will cause a shift in the residual demand curve (not shown) toward the origin and further lower the quantity of pirate sound recordings traded [3].

The preceding analysis suggest monopoly pricing that leaves a significant portion of the market unserved, provides an opportunity to establish a black market for pirate sound recordings. The higher the price of legitimate sound recordings relative to consumer marginal valuation, the larger the proportion of consumers excluded from the legitimate market, and thereby, the larger the potential strength of demand for pirate product. Moreover, non-prohibitive enforcement will result in the establishment of a black market for pirate sound recordings. The empirical relationship between legitimate price,

the size and efficiency of black market distribution channels and the volume of pirate sales is explored in the next section.

Empirical analysis

The analytical framework is examined utilising an elementary empirical model as follows:

$$PIR_i = a + \beta PE_i + \delta BM_i + \varepsilon_i$$

where PIR_i is sound recording piracy market share in the i th country, PE_i is the ratio of legitimate sound recording price to average hourly earnings, and BM_i is an index of black market activity. The dependent variable for the empirical model is the absolute value of the percentage of the domestic market for sound recordings (excluding CD-Rs) accounted for by pirate products. That is, sales of pirate audio CDs and audiocassettes divided by total (legitimate plus pirate) sales. This amounts to an estimate of smuggled piracy market share in each country. Piracy, by its very nature, leaves no paper trail and is therefore impossible to measure precisely. The IIPA publishes estimates of international copyright piracy for the motion picture, sound recording, business software and book industries. These estimates are obtained from IIPA member associations, such as RIAA, which are derived from local surveys conducted in various countries.

Given significant cross-country variations in absolute incomes, the price-earnings ratio provides a more accurate measure of relative affordability. It is well known that traders in pirate products focus on the most successful (Top 40) sound recording titles (hit records), as these are the highest selling recordings by volume and command the highest price. Prices for Top 40 sound recordings in the numerous countries included in the study are unavailable. The proxy used is the average sound recording price in each country. Data on sales volumes (units) and retail sales revenue are obtained from "The record industry in numbers" (IFPI, 1999). Average price is obtained by dividing total sales revenue by total sales volume for each country. The second component of the price-earnings ratio is hourly earnings for which we use average hourly wage rates in manufacturing as our proxy variable for hourly earnings. Average hourly manufacturing wage rates are obtained from the International Labour Office (ILO), *Bulletin of Labour Statistics* (ILO, 2000). Our proxy variable for affordability is the PE index:

$$PE = \frac{\text{Average sound recording price}}{\text{Average hourly manufacturing wage}} (100). \quad (2)$$

The empirical model proposes that there is a direct relationship between the PE ratio and sound recording piracy market share[4].

The analytical framework suggests that the higher the legitimate sound recording price, the larger the displacement effect. However, the extent to which this residual demand is met depends on the size and efficiency of black market distribution channels. Estimates of black market activity are obtained from the Heritage Foundation (1998) "Index of economic freedom". The higher the level of black market activity, the higher the index score and the lower the level of economic freedom. The methodology for compiling the black market index is the compilation of information on the extent of agricultural goods, manufactured products, services, transportation and labour services supplied on the black market. Our empirical model proposes that the higher the black market index (BM), the higher the piracy market share.

Without a clear justification to the contrary, linear models should be preferred to other functional forms. Preliminary estimations reveal that both linear and log versions of the model behave satisfactorily with respect to a range of diagnostic tests. The model is estimated using the ordinary least squares (OLS) procedure and results are reported in Table III. The model (adjusted) R^2 is 0.483, which suggests that around 50 per cent of the variation in estimated sound recording piracy market shares is explained by the model. The independent variables PE and BM have the expected signs and are significant at the 5 per cent and 1 per cent level respectively.

The model suggests that a one unit decrease in the PE ratio results in a 4.3 per cent reduction in sound recording piracy market share. This provides support for the hypothesis that the higher the price of legitimate sound recordings relative to income, the higher is piracy market share. However, the magnitude of the PE coefficient suggests that copyright owner pricing strategies have a relatively minor impact on the absolute level

of piracy. For example, a reduction in the ratio of legitimate price to hourly earnings from say 3 to 2 is required to induce a reduction in piracy market share by 4.3 per cent. The model suggests an increase in the black market index (representing a reduction in the size of black market activity) of one unit results in an 11.34 per cent reduction in sound recording piracy market share. This is consistent with the analytical framework, which proposes that larger and more efficient black market channels are associated with higher levels of piracy. By comparison to the PE ratio, the size and efficiency of black market distribution channels would seem to play a more significant role in determining a country's piracy market share. This suggests that lobbying for improved copyright law enforcement promises the greatest returns to copyright owner effort to counteract piracy and counterfeit.

Diagnostic tests for normality and multicollinearity are satisfactory, where rule of thumb cut-offs suggest the model is not compromised by multicollinearity[5]. The regression standardised residuals behave normally with a standard deviation of 0.99 and a mean of 0.0. Predicted values lie within the range 9.48 and 94.88 suggesting that the estimation procedure is satisfactory[6].

Conclusion

Traditional forms of piracy, involving smuggling and black market distribution, impose significant costs on copyright owners across a broad range of industries. The analytical framework proposes that increased enforcement and copyright infringement penalties can cause black market bottlenecks and reduce the displacement of legitimate sales. Price discounting, while lowering profits, can facilitate the establishment of a legitimate market. The empirical analysis supports the hypothesis that sound recording piracy is directly related to the PE

Table III Regression results – dependent variable: sound recording piracy market share

Regressor	Coefficient	SE	T-ratio	(Prob.)	Eigenvalue	Conditional Index	VIF
Intercept	52.798	10.790	4.893	(0.000)	2.465	1	1.919
PE	4.336	1.741	2.490	(0.015)	0.495	2.234	1.919
BM	-11.399	2.603	-4.379	(0.000)	3.365E-02	0.242	
R^2	0.496						
Adj. R^2	0.483						
F-stat	38.829	(0.000)					
SE	23.86						
DW	2.159						
Predicted values	Min 9.48	Max 94.88					

Notes: Data relate to 1998; $n = 82$

ratio. We also find support for the hypothesis that sound recording piracy is directly related to the size and efficiency of black market distribution channels. This suggests that copyright owners have much to gain from lobbying government to more rigorously enforce copyright law. Given the international dimensions of piracy, the most effective way of achieving this outcome is via international bodies such as the World Intellectual Property Organisation (WIPO) and the World Trade Organisation (WTO), responsible for implementation of the TRIPS agreement. The relatively slow pace of reform, particularly in developing countries, can frustrate copyright owner attempts to establish markets in new territories. Notwithstanding, it is clear that pricing strategies need be mindful of the size and efficiency of black market distribution channels. Price discounting by monopoly distributors of copyright product may be necessary to reduce the price differential between legitimate and pirate product, particularly in developing countries where piracy penetration rates are elevated. Coupled with lobbying for improved enforcement, this may facilitate the establishment of an infant market for legitimate product and provide the opportunity for future growth and profit.

Notes

- 1 Members include the American Film Marketing Association (AFMA), The Record Industry Association of America (RIAA), the Association of American Publishers (AAP), The Business Software Alliance (BSA), the Interactive Digital Software Alliance (IDSA), the Motion Picture Association of America (MPAA) and the National Music Publishers Association (NMPA). Together these associations represent almost 1,500 companies.
- 2 Alternatively, we can conceptualise the demand curve as represented all Top 40 chart titles, where uniform pricing maximises industry profit and the relative success of a firm's music catalogue (list of exclusive titles) determines market share.
- 3 The residual demand curve described will have the same vertical intercept as D_S at a legitimate price of P_L and a horizontal intercept to the right of D_S equal to $\alpha - Q_L$.
- 4 A number of missing values for the PE variable were estimated by using a regional average PE ratio. For example, the missing value for Costa Rica was obtained by taking the Central American regional average PE ratio. The

rationale for this procedure is that the use of regional averages (rather than the sample mean) provides a more accurate measure of affordability. This procedure increased the sample size to 82 countries.

- 5 VIF is 1.919 and eigenvalue conditional indices are 2.234 and 8.242 respectively.
- 6 The application of OLS using a bounded dependent variable (zero to 100) is satisfactory where an insignificant proportion of the estimated values lie outside the boundaries. In this case minimum and maximum values lie within this range.

References

- Bhagwati, J.N. and Hansen, B. (1973), "A theoretical analysis of smuggling", *Quarterly Journal of Economics*, Vol. 87 No. 2, pp. 172-87.
- Fausti, S. (1992), "Smuggling and parallel markets for exports", *International Trade Journal*, Vol. 6 No. 4, pp. 443-70.
- Federal Court of Australia (2001), *ACCC v. Universal Music Australia Pty Ltd and Warner Music Australia Pty Ltd*, Canberra, FCA 1800, available at: www.austlii.edu.au
- Heritage Foundation (1998), "Index of economic freedom", available at: www.heritage.org/index
- IIPA (2002), "USTR special 301 decision and IIPA estimated US trade losses due to copyright piracy", July, available at: www.iipa.com/pdf/2002_jul11_USTRLOSSES.pdf
- International Chamber of Commerce (1999), "ICC comments on EC Green Paper on combating counterfeiting and piracy in the single market", policy statement, ICC, available at: www.iccwbo.org/home/statements_rul..9?combating_counterfeiting_and_piracy.asp
- International Federation of the Phonographic Industry (IFPI) (1999), "The record industry in numbers", available at: www.ifpi.org
- International Federation of the Phonographic Industry (IFPI) (2002), "Music piracy report 2002", available at: www.ifpi.org/site-content/antipiracy/piracy2002.html
- International Labour Office (ILO) (2000), *Bulletin of Labour Statistics*, ILO, Geneva.
- Ku, R.S.R. (2002), "The creative destruction of copyright: Napster and the new economics of digital technology", *University of Chicago Law Review*, Vol. 69 No. 1, pp. 263-324.
- Norton, D.A.G. (1987), "On the economic theory of smuggling", *Economica*, Vol. 55 No. 217, pp. 107-18.
- Papadopoulos, T. (2000), "Copyright, parallel imports and national welfare: the Australian market for sound recordings", *The Australian Economic Review*, Vol. 33 No. 4, pp. 337-48.
- Pitt, M. (1981), "Smuggling and price disparity", *Journal of International Economics*, Vol. 11 No. 4, pp. 447-58.