# Economists' Topsy-Turvy View of Piracy

**Stan J. Liebowitz**

**School of Management**

**University of Texas at Dallas**

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Abstract

Although it was once considered inevitable that unauthorized copying would harm copyright owners, it is now understood that this is not necessarily the case. The concept of indirect appropriability played an important role in shaping this newer understanding. In recent years, however, many economists seem to have taken the message from this new understanding too far, seeing gains to the copyright owners from unauthorized copying in every nook and cranny of the economy, when in reality the instances of such gains are likely to be rather limited. The current literature on this subject, which consists mainly of theoretical models, seems to be badly out of kilter. In this paper I attempt to explain some of the problems and try to provide the outlines of what I believe to be a more balanced and nuanced view of copying. It emphasizes the importance of examining various institutional and behavioral details of individual markets, which are often overlooked by researchers.

The term 'pirate' has historically been associated with the activities of stealing and plundering on the high seas. Perhaps because the concept of sea pirates has in modern times largely been relegated to children's stories, these characters have been transmuted, in the public's mind, into swashbuckling heroes with far more charm and generosity than actual pirates were likely to have had. This childish view of pirates is not appropriate for real acts of piracy, which should go by the far less romantic term—theft.

It wasn't so long ago that the act of pirating a product—either by theft, the selling of stolen units, or by selling counterfeits—was taken for granted to be harmful to the owner/seller of the stolen good. And in most markets in most circumstances this is still assumed to be true. After all, it is easy to see how having an unauthorized competing copy, or having stolen inventory available on the market, was likely to decrease the profit available to the creator of authorized versions. Why should a consumer buy a thousand dollar Rolex watch if they can just as easily impress their friends with one bought at a much lower price from the trunk of an automobile, albeit with lower quality or at least a non-functional warranty?

The term pirating is largely used, these days, to describe the unauthorized copying of intellectual products such as software, music or movies. It currently appears to be the case that for a majority of economics papers on the subject (though this claim is rather casual since I have not done a count of these papers), pirating is treated as an activity that should be embraced by the party being pirated, if they are farsighted and enlightened enough. Theoretical models now abound in the literature 'demonstrating' all the ways that the producer of a product might benefit from piracy. Economic articles on this subject would seem to imply that it is almost always a terrific strategy to have third parties providing free copies of your product. And these articles generally conclude that society would almost always be better off in such a situation.

I take some of the blame for this state of affairs, since my early work discussed instances when copying (pirating) might make the copyright owner (seller) better off. The Canadian government asked me, in 1979, to investigate the impact of photocopying on copyright owners of printed materials. There had been no prior work by economists on the impact of new copying technologies. In the course of that examination I postulated some possible alternatives to the negative impacts of copying—the exposure effect and, the theme of this set of papers—indirect appropriability. I suggested that these factors improved the financial situation of publishers (Liebowitz, 1981, 1985).

**To be sure, there are possibilities, under certain circumstances, where pirating might have this type of beneficial impact on the producer of the real article.[1] But I never claimed that it would apply to all situations in all times, or most situations in most times, or even a large minority of instances. And for those instances where I claimed pirating might be beneficial, I provided detailed empirical examinations of the conditions in the market to see if they met the theoretical requirements of the model, and then closely examined market outcomes to see if the real world worked the way the theory predicted it would.

The current literature on this subject seems to me to be badly out of kilter, and I try, in the following pages, to explain what some of the problems are and what a more reasonable view of copying would be.

## I. The fundamental impacts of piracy

We can start with the basics. The general expectation is that theft harms the aggrieved party. Because of this harm, potential victims will use resources trying to prevent such theft and at its worst, production might come to a halt because the costs of protecting property become greater than the surplus provided by the property. That is more traditionally known as a breakdown in civilization.

[1] For surveys of the literature on copying See Varian (2005) or Watt (2000).

Before economists started to discuss this topic, it was apparent to almost everyone that theft was likely to harm the owner of the material that was stolen. This view of the negative impacts of theft on the victim was generally applied to the 'theft' of intellectual property as well, at least until the last few decades. If a pirate video/music company begins to sell thousands of duplicated CDs and DVDs, it is generally accepted that such activity is likely to harm the legitimate producers. Even most economists are likely to admit that this type of organized pirating is likely to damage the legitimate producers, in spite of models, discussed in more detail below, showing how such activity might benefit the legitimate producer, particularly if the pirated versions are of lower quality.

**The Substitution Effect**

Prior to 1980 it was generally thought that unauthorized copying, by allowing individuals to consume an intellectual product without having to pay for it, would be harmful to the creators of that intellectual product. The unauthorized copy was a substitute for a legitimate purchase and this substitution of an authorized copy for a purchased copy was expected to harm the seller. In my early work on the subject I referred to this as the substitution effect and acknowledged that it was the dominant force both in the market and in the thinking of those contemplating the impact of such copying.

There wasn't much need to explain how the substitution effect worked. Everyone was familiar with the impacts of theft, and the substitution effect worked the same way.

**Benign Theft?**

Theft doesn't need to harm the victim, however. It is possible that if a thief steals a manufacturer's shipment of sneakers, but the thief and his compatriots are icons of coolness in their neighborhoods, that legitimate sales might increase as other individuals try to imitate the look of their

cool brethren's stolen sneakers. In this example, therefore, theft might have a positive impact on the sales of the sneaker vendor.

**It is easy to think of other examples. If youthful individuals shoplift steaks by putting them under their coats, that activity might be beneficial to the butcher in the long run. One might argue, after all, that this behavior might induce in the pilferers a lifelong taste for meat which they otherwise might not have, and thus, assuming that as adults they continue to patronize the same vendor, the butcher might benefit in the long run.

But I have never seen these types of arguments put forward in a serious way to suggest that society might be better off if the prohibition on theft were overturned. For one thing, it is normally assumed that the producer of the product would know about the benefits of giving free samples to influential users and would not require being forced at gunpoint to make decisions which turn out to be in his own best interest. It also must be acknowledged that the examples above would correctly be considered mere exceptions to the more general rule that theft harms the victims. Stealing physical goods, therefore, is not considered an issue of economic, moral, or legal ambiguity even though we can come up with instances where such activity can be beneficial to those being stolen from.

Replace steaks, in the above example, with CDs, and very little would seem to be different. In fact, no one seems to argue that stealing physical CDs benefits the producer of CDs. This may be partly due to the fact that the retail seller of the CD might suffer the harm from the theft. But if the CDs were still under the ownership of the producer it seems unlikely that the theft of the CDs would be viewed any more favorably.

In the case of digital theft, however, many economic theorists writing on the subject seem to think it is eminently likely that the legitimate producers will benefit from such activity—in other words, benign piracy. Included in this category of potentially beneficial theft is the case of file-sharing,

with its millions of users exchanging files with strangers. The models that have been used to suggest the beneficial impacts of copying could apply almost as well to the theft of CDs containing software or music or, for that matter, any product of any kind, a point that has been overlooked in the literature. All that would differ in models of physical goods would be the cost of the physical good, such as the CD, which within the model would be just a particular cost of unauthorized copying that would need to be counted against the gains.[2] Just as these theoretical models can merely show the *possibility* of the gains from unauthorized copying, so too can they be used to show a possible gain from the theft of CDs or any other physical good. Although it is often difficult to not be swayed by results from economic models, it is important to remember that models are not random draws, that they are created based on factors such as the tastes of the authors and the fads in the profession, and that the proportion of models that suggest gains from piracy as opposed to models that focus on the harms to piracy need bear no relationship to the frequency with which piracy might actually benefit copyright owners.

**Indirect appropriability, the exposure effect, and network effects**

There are three possible positive impacts of copying that have been identified in the literature.

The exposure effect is basically a free-sample type story. Individuals who use unauthorized copies of works might discover that they enjoy those works and this might lead them to become customers. In my early writings on the subject I pointed out that such activity, which now goes by the term 'sampling', might have a positive or negative impact on overall sales. It is easy to see how providing consumers with superior information about their available music choices might lead to increases in sales. Less obvious is the possibility that making fewer mistakes when purchasing items can lead to quicker satiation and thus fewer purchases. Thus the impact of the exposure effect is ambiguous, which I have restated in more recent writings (2002).

[2] Usually ignored in these models is the possible cost involved when the owners take steps to reduce the 'theft'.

There are two other possible factors that might ameliorate the otherwise negative impacts of unauthorized copying. The first is indirect appropriability, the topic of interest in this symposium. I discuss this at length in the next section of the paper.

The other factor is network effects. The sneaker example above is an example of network effects. In previous writings on network effects (with Stephen Margolis, 2002a) we argued that network effects were often being claimed where none existed, and that the theory was often taking inappropriate shortcuts with reality, reducing the applicability and usefulness of these models. The focus of our analysis then was not, however, the impact of network effects on copying. In my opinion, that mindset—to overuse network effects—appears again in some models of copying based upon network effects, which I will explore in section III.

## II. The use and misuse of indirect appropriability

**The basic idea behind indirect appropriability is that the seller of authorized copies might benefit from an increased demand for authorized copies due to the value generated by the unauthorized copies. If, for example, everyone who purchased a CD later made one cassette copy to play in their automobile, then the demand for the original CD would increase by the value those individuals placed on being able to make the cassette. The seller of CDs could capture some or all of this higher value by increasing the price of CDs to match the increase in value due to the unauthorized copying.

[the old second paragraph is now part of the previous paragraph]

Alternatively, if the typical purchaser of a CD made one copy of each CD they purchased and gave that copy to a friend, and the friend reciprocates by providing a copy of some other CD, each of the friends would value their purchase of the original CDs by an amount that included the presumably positive value that the exchange of copies provided. Their higher demand, again, might be captured by the producer through the use of a higher price for CDs.

Finally, if individual subscribers to journals made few if any photocopies of journal articles, but the patrons of libraries routinely made many photocopies of articles, the publishers of journals could charge a higher price to libraries if the library was capable of capturing some of the additional value placed on the journals by the library patrons making those copies.

**The value from the copies, in all these cases, is captured indirectly since there is no direct payment made to the original creator (producer) by the recipient of the unauthorized copy. Note that in these examples, although some additional value is generated, the net effect on the seller of originals might still be negative. Some of the lost revenue might be recaptured, but it is not clear that all of the lost revenue would be captured.

In order for indirect appropriability to work at all, however, several conditions must hold.

**First and foremost, the value received by the individual using the unauthorized copy must be registered, at least to some extent, with the individual providing the authorized copy from which the unauthorized copy is made. This is an absolutely necessary precondition for indirect appropriability. Obviously, it is met when the user of the unauthorized copy is also the purchaser of the authorized copy, as in the first example above. This precondition would be met to some degree in the second example if the copied CDs that were the quid pro quo in the trade were of value to those receiving the copies. The precondition could be met in the library example if the additional value received by patrons is transmitted to the library operators in some tangible form. Libraries do not charge admission fees, and thus there is likely to be an imperfect linkage between the value of patrons and the budget of the library. Nevertheless, it seems a reasonable assumption that libraries adjust their budgets in a manner that reflects the desires of its patrons, even if inexactly. That was the assumption that I made when I examined the case of photocopying.

**After this precondition is met, one of two other additional conditions must hold. One condition is that the variability in the number of copies made from each original must be small, as in the first two examples above.[3] If this variability is low, then the increase in demand for originals is fairly uniform, allowing the producer of originals to increase the price by a similar amount to all consumers while still retaining most sales. If the variability in copies made per authorized original were high, the seller of authorized copies would be in the unfortunate position of needing to make a pricing decision which is going to lose a good portion of the value being generated by the authorized copies. The seller might raise the price of authorized copies by an amount based on the value generated by users making a very large number of unauthorized copies. This would be a large price increase and the seller would lose the sales from those individuals who do not make many unauthorized copies, of whom there may be very many. Alternatively, the seller could raise his price based on the value of unauthorized copies made by consumers who make few if any unauthorized copies. This would lead to a very small, perhaps zero, price increase for authorized copies. The seller, in this case, would lose the additional value generated by individuals making many unauthorized copies.

If the variability of copies made per authorized original is high, a second condition is required for the seller to be able to appropriate much indirect revenue. The condition is that the seller needs to be able to charge differential pricing—higher prices for those originals from which the most copies are made, as in the library example above, and lower prices for other originals.

This price discrimination condition applied to the real world example of photocopying as discussed in Liebowitz (1985). Surveys of photocopying activity in the 1970s demonstrated that the most heavily photocopied copyright materials were journals, and most photocopying of journals took place in libraries. Publishers of journals charged higher prices to libraries than they charged to

[3] Or perhaps more precisely, the additional value placed on an original due to the making of copies should not vary too greatly.

individual subscribers, and this behavior began shortly after photocopiers became popular in libraries. The most heavily copied journals were also those with the greatest price differentials between individuals and libraries. Libraries also dramatically increased their expenditures on journals relative to books. The large number of new journals, which far exceeded any increase in the population of potential users, was an additional piece of evidence to support a conclusion that photocopying was not harming publishers of journals.

The concept of indirect appropriability has recently been used by Boldrin and Levine (BL) in several papers (2002, 2004) attempting to demonstrate that producers of intellectual products did not need protection from rampant copying. Their paper in this volume presents similar claims???? Their model assumes that there are a fixed number of unauthorized copies made each period from each copy that existed in the beginning of the period. A single competitive price of copies is determined for each period and revenues are generated based on that price. Under these circumstances, the seller of the first copy can receive the present value of these streams of revenues. They also assume that the elasticity of demand is always greater than one. Even though the price drops every period, the quantity sold increases by a larger percentage and revenues continue to increase each period.

BL's model was critiqued by Klein, Lerner, and Murphy (KLM) (2002) on several grounds. KLM's main criticisms were that that BL ignore the variability in copies made from each original, that BL's assumption of an always elastic demand was unreasonable, and that the dramatic decline in prices that occur combined with more realistic elasticities would make it impossible for the copyright owner to appropriate much in the way of revenues.

The BL model is an intriguing exposition of how indirect appropriability can work, and that is what I see as its virtue. The KLM critique of this model for the case of file-sharing, however, is quite convincing. Nevertheless, I think the problems with the BL model, as applied to a more general world

without intellectual property, which is how Boldrin and Levine wish to use it, are greater and at a deeper level than indicated in the KLM critique.

The fundamental difficulty, in my opinion, is that BL fall into the trap of ignoring the first precondition mentioned above. Their model assumes that the copies made in each period are sold and that the seller of what passes for an original at the beginning of a period can capture those revenues. With this formulation, a seller in any period is able to capture the present value of the future stream of revenue from all future generations of copies that descend from that original. Under these circumstances all revenues then return to the very first original that is made. By structuring the model the way they do, they implicitly assume that the precondition above is met. This might be a reasonable assumption if all copies that were made in each period were, say, sold in one giant auction on Ebay. Such an auction would assure a revenue stream to those who made the copies (you would need to have a single auction to keep BL's assumption of a single price each period). Further, by assuming that a fixed number of copies are made from each original BL eliminate the problem of variability.

**But copying technologies, in general, and file-sharing systems, in particular, do not operate as does Ebay. Explicit revenues are not generated in a copy market by the owners of originals. Photocopies were not sold at market prices by libraries (the public photocopy machines were usually run by third parties the way vending machines selling candy tend to be operated). Copies of records that were made into audio cassettes and given to friends or relatives were not sold in markets, and any reciprocating gratitude would differ among those friends. In these cases, the actual revenue linkage was much weaker than that proposed by BL. And these are cases that conform to the BL model better than many others.

Most importantly for modern digital copying technologies, it is certainly not the case that those using file-sharing services pay anything to the individual who owns the hard drive from which they are

taking the copy, nor is there even any gratitude that could be converted to value, since the donor of the file is anonymous. This completely breaks the linkage between the value of copies and the revenues generated from originals and violates this precondition for indirect appropriability to operate. The instances of copying that are in the news and that have attracted so much attention, therefore, do not conform to this implicit pre-condition that is required for the BL model to have any validity.

In the more general circumstance of no copyright in a world with fast and easy digital copying, it is difficult to imagine any revenue generation at all, contrary to the claims of the BL model, which merely assumes all the real world difficulties away.

The only case I know of where unauthorized copies are sold in markets and generate revenues to their sellers, in accordance with the BL model, are the organized forms of pirating that virtually everyone decries—the types of organizations that make millions of copies of pirated (counterfeit) materials to sell. There is a large international market in such illicit software and DVDs. Since these markets meet one aspect of the models assumptions, they can help to determine the empirical relevance of BL's model.

How much revenue do the firms creating the legitimate software or movies receive from these illicit markets?

The answer, quite clearly, is zero—there are no dollars, direct or indirect, being paid by pirates to Microsoft for illicit copies of Word, or Pixar for illicit copies of The Incredibles.[4] There are several reasons for this, with the primary reason being the inability of the seller to charge a higher price for the copy that was used by the pirate to make the thousands of duplicates.

There are some other, less major, problems with BL's model. BL make the assumption that consumers have a disutility for postponing consumption. But copying that allow extremely rapid

[4] Zero is not exactly correct since one legitimate version was presumably purchased, or one theater admission paid in the case of the unauthorized DVDs which often appear while a movie is still in theatrical release.

dissemination of the product, as occurs with file-sharing, would lower the price extremely rapidly. This rapid decline in prices should be easily predictable by consumers. If prices were dropping 50% per day, which seems a conservative figure for file-sharing systems (see KLM who note that if 10,000 copies were made from each original per period, price would fall 99.99% per period) it is hard to imagine many individuals who would not be willing to wait 24 hours for such a large decline in price as long as prices were far from zero. Once prices became very low, the absolute fall represented by a 50% decline would no longer be greater than the benefit of earlier consumption. For the sake of internal consistency, BL should have built into their model some form of requirement that the price decline of copies needed to be less than the depreciation in consumption value in order for any trade to occur at a positive price. Otherwise the price drops to zero immediately. Of course, this requirement would seem to be violated by viral forms of copying, such as Napster and its brethren.

Indirect appropriability has its uses. I would actually like there to be more applications of the concept since I like to see other economists using my work. I am sure there are other instances where it could explain the functioning of markets besides the case of photocopying, but only careful empirical examinations can provide sufficient detail to know. Nevertheless, indirect appropriability is not going to be a factor in the case of file-sharing. Nor can the BL model be used as a demonstration that indirect appropriability is capable of replacing the entire copyright mechanism. By leaving out important preconditions and conditions for indirect appropriability to work, BL draw a conclusion that is overly general when in fact their results are limited to a set of circumstances that is in fact quite narrow.

## III. The limits of network effects

**Some products have network effects. These occur when consumers' values of the product change depending on the number of other users there are of the product. Telephones and fax machine are two examples of products where the value of those products depends on the number of individuals

using those products. The sneaker example at the beginning of the article was a hypothetical example of network effects where the value that the overall population had for a brand of sneakers depended on the number of cool individuals wearing those sneakers.

It has sometimes been claimed that network effects might be important to understand the impact of copying. Conner and Rumelt (1991), Takeyama (1994) and Shy and Thisse (1999) are a small sample of the much larger number of papers creating models where network effects lead to the conclusion that unauthorized copying might benefit the seller of authorized copies. These models are usually put forward in the context of software, although recent papers by Gayer and Shy (2005), among others, apply such models to file-sharing and music.[5]

**The network effects story in the case of copying is relatively straightforward. Because the pirated version is less expensive than the market price of authorized versions, piracy would be expected to increase the number of individuals who use the product. If users of pirated versions are new users of the product, and if their use increases the value of the product to the purchasers of non-pirated versions, the piracy should increase total revenue.[6]

**Just because it is possible to construct conditions when network effects might cause unauthorized copying to have a positive impact doesn't mean it is likely. The sneaker theft example mentioned above, for example, is very unlikely to have much real world traction. The gain in sales from the network effects (ignoring how farfetched these gains are in the first place) would be very unlikely to overcome the very clear substitution effect caused by the theft. It is obvious that network

[5] It is unclear how strong network effects are for different categories of software. For some categories, such as personal finance software, network effects might be expected to be weak or nonexistent. In other cases, such as spreadsheets network effects are thought likely to be large. Although there have been attempts to measure the strength of network effects for spreadsheets, these attempts were marred by using Lotus 1-2-3 file compatibility as measure of network effects when such compatibility was also important for upgrading spreadsheet users wanting to remain compatible with their old work independent of any network effects.

[6] A variant of this story would be employees who would not pay the full price for a spreadsheet at home, but who are happy to install a pirated version. This then allows them to bring some work home and become more adept at using the package. This increases the value of the product to their employer who purchases authorized versions of the product.

effects are more likely to overcome substitution effects when the substitution effect is small and the network effects are large. Such circumstances may exist in a real market but, to my knowledge, they have yet to be documented in even a single instance.

There are several other issues to be addressed in the context of the impact of network effects on the effects of unauthorized copying. The first is whether there are network effects at work in the market of interest. The second is whether illicit copying increases network effects. Since file-sharing is the topic of the day, and the reason for the renewed burst of activity on the economics of copying, I will focus on that particular market in the following discussions.

i. Are there Network Effects? If so, what kind?

**As normally modeled, network effects depend on the number of other users of the product.[7] The more telephones, the more valuable it is to have a telephone. The brand of phone doesn't matter as long as the phones are compatible with each other. In these models the utility of a user is a function of the number of other users.

**Network effects for telephones are obvious. Network effects for software are likely to arise when users exchange files with each other, or when they ask one another for help when a problem arises with the software. Like phones, computers have network effects as long as there is some level of compatibility between computers. It is useful to be able to share files and family pictures.

**Unlike those cases, however, the linkage of values between different music listeners is far less clear. What might be the nature of network effects in music? Although it will happen sometimes that one person hears music at a friend's house and then decides to purchase it for himself, that is not a

[7]Models based on the number of individuals listening to music are not likely to have any real world viability since just about everyone listens to music, meaning that there would be no variation in the measured network effect over time or as new copying technologies arose. If network effects do not change, they cannot explain any changes in the market. If the measure of network effects is to be impacted by new technologies, it would need to be based on something like the total number of man-hours of music listening.

network effect. Encountering new music and then purchasing it is merely a variant of the exposure effect (sampling). For there to be a network effect, the value of the music must be higher because others also listen to this music. That means that you enjoy the music more because you know that others also consume the music. This certainly seems possible. But we actually need more detail than this to understand how these network effects might impact music markets.

**What is it in the psychology of man that would lead to network effects in music consumption? If it is related to a desire to be trendy, than the absolute number of users of a musical work may be less important than the relative shares of competing works. Network effects in trendy nightspots, for example, tend to lead to rapid changes in fortunes, including declines and bankruptcies for the no longer trendy clubs. We do not know whether the net impact of these network effects increases or decreases the overall number of people who patronize such nightspots, however. If there were no desire to be chic there might be a more evenly distributed number of patrons across clubs, but it unclear whether the total population of club goers would be greater or smaller.

** I have not seen any discussion of these points in the models of network effects. Instead, the network effect models merely assume that an individual's value of music increases when others increase their consumption of music. Music is just some amorphous product, like telephones or computers. Therefore, if those who did not purchase music before the advent of copying were the only ones who increased their consumption of music due to pirating, the network effects they created would have a positive impact on the demand for music by the actual consumers and the music producers would face a higher demand for legitimate copies. However, if the network effects were based on relative shares, then the new music listeners would tend to tilt the market toward the products they listen to, but overall consumption would remain unaffected.

**The existence of network effects based on relative shares could lead to important fallacy of composition issues ready to trap the unwary analyst. In other words, measuring the impact of network effects on individual songs could give very misleading results if generalized to the impact on the entire industry. After all, it is quite possible that network effects would increase the sales of songs made more popular by copying and at the same time decrease the sales of the songs made relatively less popular, compared to their pre-copying sales.

**Those economists creating models of network effects might just respond "we have assumed that network effects are based on absolute usage, not relative usage." This of course, would lend credence to the joke about the economist on the desert island who finds a can of food and then solves the problem of how to open it by assuming he has a can opener. The problem, of course, is that this assumption may not be true. I am not aware of any direct evidence about the nature of network effects for music. Do music listeners care very much about how much music everyone else listens to? Perhaps. But it is not even clear how they would even know how much music others listen to. Most music publications and radio stations place great emphasis on relative sales, but very little emphasis on absolute sales. Nor do individuals know how much time their friends spend listening to music, unless they live and work together. Instead, they tend to know which songs their friends currently enjoy the most.

**Nonetheless, it is conceivable that upon investigation, that we would discover that there were network effects in music consumption, and these were based on absolute magnitudes. In the next section I explain how it is that that file-sharing might have no impact on these network effects.

ii. Does unauthorized copying increase network effects?

Let us assume that the utility of purchasing any CD increases as other individuals listen to more music. This network effect is most consistent with the theoretical models of network effects and file-

sharing, such as that of Gayer and Shy.[8] Nevertheless, those models demonstrate, at most, that there are certain theoretical conditions under which an increase in general network effects brought about by copying might benefit the sellers of music.

A requirement for this result is that file-sharing actually increases network effects. Such network effects are presumably related to man-hours spent listening to music, as discussed above. It is unclear that file-sharing will increase the time spent listening to music, however, as explained below.

**It is usually assumed that file-sharing must increase music listening since consumption is expected to increase as price decreases, and the price of music is lower on file-sharing networks than with the purchase of CDs. Although this is true, it doesn't make the case that file-sharing increases music listening. What is left out of these analyses (in addition to the other left out considerations) is the fact that the alternative to file-sharing might not be the purchase of CDs, but instead might be the activity of listening to radio. Radio is another free substitute for the purchase of CDs. File-sharing, because of it higher quality and ability to match the tastes of the listener better than can a disc jockey, is likely to cause individual downloaders to substitute time spent listening to downloaded recorded music (from file-sharing networks) for time spent listening to radio. There is no reason to expect file-sharing to increase the overall time spent listening to music.[9]

**The claim that file-sharing might benefit legitimate record producers due to network effects is thus fraught with difficulties. Although it is conceivable that it might happen, several possibilities all need to go the right way at the same time. Network effects, if there are any, need to be based on

[8] It is the case that these models do not make a distinction between specific and general network effects. Instead the models treat music as a single commodity. Thus they could represent a single song, or all music. Since the results are then generalized to the entire industry, it would make little sense to view the model as representing only a single song.

[9] **As mentioned earlier, if each hour of music listening provides greater value, there are two contrasting effects that determine whether consumption increases or decreases, as I have discussed in several other papers. The demand for hours of music consumption will tend to rotate clockwise. The first hours are more highly valued, but satiation is likely to occur with a smaller number of hours of music. The net effect is ambiguous. Further complicating this issue is the possibility that the constraint on consumption of music is more one of time than one of money. If this is the case, then there is little reason to expect time spent listening to music will change due to file-sharing.

absolute and not relative amounts. File-sharing then needs to increase the consumption of music, which is not readily apparent. And finally, the network effects need to exert a more powerful increase in demand than the decline in demand from individuals who used to purchase CDs but now prefer a free substitute (the substitution effect). These are not a set of conditions that seem terribly likely to occur. More importantly, these are not conditions that have been documented to exist in any market.

**The analogous story for software makes somewhat more sense because the possibility of an absolute network effect seems greater. Unlike music, using software often requires the help of others who are more skilled. Network effects in software are not thought to be based on trendiness (consumers do not pay great attention to those items which are climbing the charts). Further, there are no zero cost versions of programs available other than those coming from unauthorized copying (i.e., no equivalent to radio) so the users of unauthorized copies might actually increase consumption. It is still something of a leap to say that the existence of general network effects would then overwhelm the substitution effect, but it is more plausible than it is in the case of file-sharing.

## IV. Too much theory and too little empirics

Theory has its place as a useful tool. Nevertheless, when conclusions from theory are applied to particular real-world events, as has been the case for all the models discussed, we should insist on careful empirical work before we grant much credence to the application of the theory. This is true both for models of network effects and indirect appropriability.

There is some empirical work on these topics. Yet if one looks, it is clear that pure theory articles are far more numerous than articles that contain some, or mostly, empirical work. This was a criticism that Margolis and I had of much of the enormous literature surrounding network effects. But in most cases, those models often had no particular relevance to ongoing debates about public policy, except in a most tangential manner.

Articles on the economics of copying, on the other hand, almost always make some claim for relevance to ongoing political and policy battles. For example, the Boldrin and Levine articles are motivated by an interest in changing the laws regarding intellectual property. I commend the authors in this literature for their interest in theory for more than just the sake of theory. But I suspect that bad habits learned from work in areas where theory is largely done for the sake of showing what is conceptually possible has created a form of myopia. This would be a disease that prevents the researcher from seeing that theories need to be verified by data before we can take these theories as having any particular relevance to the issues at hand. This verification, in my opinion, requires an examination of the realism of the assumptions as well as the implications.

Of course, this is just my view of what I believe to be a malady in the economics profession.

## V. Conclusion

Economists have come to understand that unauthorized copying of originals need not have negative impacts on copyright owners. That is a useful insight. In their enthusiasm for this insight, however, economists seem to have gone too far in the other direction, seeing gains from copying in every nook and cranny of the economy, when in reality the instances of such gains are likely to be rather limited.

The real insight of these models is an understanding that there are potential competing forces. The negative substitution effect is only one factor. But as a general statement, the substitution effect needs to be given a wide berth since it is likely to be the most powerful factor at work. For those instances where the substitution effect might be overwhelmed, or at least severely limited by these alternative factors, a very careful theoretic and empirical examination is required before we can judge the outcome.

These evaluations need to be performed on a case by case basis, with a careful examination of the institutional and behavioral details of these markets and an empirical examination of the assumptions required for indirect appropriability or network effects to operate. In the case of file-sharing it appears that the net impact of these competing forces is far more likely to have a negative than a positive impact on sellers, although in particular cases, such as photocopying, this has not been the case. The more extravagant claim, that these factors might be considered a replacement for copyright, seems entirely unwarranted.

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