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SOCIAL WELL-BEING AND IP THEFT: A DYNAMIC ECONOMIC ANALYSIS

Abstract: One of the most vexing issues of late is how to develop an effective yet socially–acceptable policy response to stop the rampant and expanding theft of intellectual property ("IP") using the Internet. While much of the debate is of a populist and unsophisticated nature, there are in fact some significant and legitimate philosophical disagreements surrounding IP protection. For example, since IP is typically non-rivalrous in consumption, the theft of IP may be (and has been) construed as merely a transfer—what the copyright owner loses the thief gains. Some argue, consequently, that IP theft is economically of little significance. In this paper, using a very conventional dynamic general equilibrium framework, we show that the theft of IP reduces social well-being, even if we count the benefits to the thief and assume theft requires no resources. In effect, theft acts as a distortionary tax on sellers, and this distortion is not remedied by merely returning the proceeds of the theft as a lump sum transfer to consumers. As such, as the debate moves forward on how to develop effective mechanisms to prevent IP theft, we may set aside the argument that on-line theft of IP causes no real economic harm and therefore no foul.

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I. Introduction

By most accounts, the Internet is revolutionary. And while this revolution appears to provide significant economic and social benefits, it also imposes costs. One such cost is the rampant theft of intellectual property. For the most part, there is not a single musical work, book, film, or software program that cannot be downloaded illegally on the Internet. The theft of intellectual property in goods and services, such as pharmaceuticals, is also facilitated by the widespread use of high-speed Internet services which link infringers and customers. Law enforcement against such acts has proven difficult, in part because the act of theft and distribution over the Internet can occur largely outside the reach of U.S. jurisdiction, since the infringing websites—often referred to as "rogue" websites—can be located outside the country yet their content remains available to U.S. customers. At present, U.S. law permits action against domestic infringers, albeit through imperfect channels,[1] but the rouge website is difficult if not impossible to touch.[2]

Most agree that something needs to be done to improve the enforcement of intellectual property rights, not only in the United States but across the globe.[3] Given the growing culture of the Internet that everything on-line should be "free", however, finding an effective enforcement mechanism that is politically palatable is difficult.[4] Indeed, while many people pay lip-service to the notion that IP protection is a good idea, many people nonetheless simply don't see the harm from IP theft.

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[1] *See, e.g.*, P. Menell, *Jumping the Grooveshark: A Case Study in DMCA Safe Harbor Abuse*, WORKING PAPER (December 2011) (available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1975579).

[2] *See, e.g.*, MPAA Webpage at: http://mpaa.org/contentprotection/roguewebsites; Global Intellectual Property Center webpage at http://www.theglobalipcenter.com.

[3] WIPO INTELLECTUAL PROPERTY HANDBOOK: POLICY, LAW AND USE, WIPO Publication No. 489 (2004) at p. 207 (available at: http://www.wipo.int/about-ip/en/iprm) ("There is no point in establishing a detailed and comprehensive system for protecting intellectual property rights and disseminating information concerning them, if it is not possible for the right-owners to enforce their rights effectively in a world where expanding technologies have facilitated infringement of protected rights to a hitherto unprecedented extent. They must be able to take action against infringers in order to prevent further infringement and recover the losses incurred from any actual infringement. They must also be able to call on the state authorities to deal with counterfeits."); M. Blakeney, GUIDEBOOK ON ENFORCEMENT OF INTELLECTUAL PROPERTY RIGHTS, EUROPEAN COMMISSION, TRADE (2005) (available at: http://trade.ec.europa.eu/doclib/docs/2005/april/tradoc_122641.pdf) ("The prevalence of infringing activities in a country will also discourage investment from those industries in which proprietary rights are important. Thus for example, the pirating of music CDs and computer software will discourage investment in the music and information technology sectors.").

[4] *See, e.g.*, *Pols Fear "SOPA Backlash"*, POLITICO (March 8, 2012) (available at: http://www.politico.com/news/stories/0312/73802.html).

By way of example, take an argument found in a recent GAO report entitled *Intellectual Property: Observations on Efforts to Quantify the Economic Effects of Counterfeit and Pirated Goods*, where one unidentified interviewed expert claims, as summarized by the GAO, that the "effects of piracy within the United States are mainly redistributions within the economy for other purposes and that they should not be considered as a loss to the overall economy."[5] In other words, the argument is made that theft of IP is costless since it is merely a transfer—what the copyright owner loses the thief gains and spends the savings elsewhere. The same or similar argument has been repeated in other places. Julian Sanchez of CATO, for example, observes that while IP theft "is a loss to the content industry, [it is] not a net loss to the economy, since the money just ends up being spent elsewhere."[6]

This redistribution idea points to an interesting feature of intellectual property. Unlike the theft of ordinary "physical" property, the theft of intellectual property does not preclude its enjoyment by other consumers. In economic jargon, we say that IP is "non-rivalrous" in consumption, meaning, for example, that the consumption of a musical work by one person does not imply someone else cannot listen to it.[7] Contrast this circumstance with the familiar case of a cheese sandwich: if Tom eats it for lunch, then Jimmy is precluded from doing so. This implies, *inter alia,* that the opportunity cost of someone "stealing" a bit of intellectual property is zero. To put this idea in simpler terms, one might say that, when a song is illegally downloaded, the person stealing the song gains a benefit, while no one is deprived of listening to the song, and the owner of the song, while cheated of a payment of $1, say, would otherwise have obtained this $1 from the person who downloaded it (i.e., the $1 is simply a transfer). Thus, the gain to the copyright holder would be offset by the cost to the user, so society benefits from unlimited distribution of things with zero marginal costs.

If the redistribution argument outlined above seems "fishy," that is because it is fishy. Ignored in this simple calculus is the incentive—or lack thereof—of those persons who create, produce, and distribute the intellectual property being stolen. With widespread theft of intellectual property, one would expect less intellectual property to be produced, with a consequent potential reduction in social welfare. Indeed, this idea lies at the foundation of copyright law. Yet, it is undeniable that those who obtain "free" downloads of popular films or musical works do benefit directly from this activity: they are not compelled to pay for

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[5] GOVERNMENT ACCOUNTABILITY OFFICE, *Intellectual Property: Observations on Efforts to Quantify the Economic Effects of Counterfeit and Pirated Goods* (2011) at p. 28 (available at: http://www.gao.gov/new.items/d10423.pdf).

[6] *See, e.g.,* J. Sanchez, *How Copyright Industries Con Congress*, CATO@LIBERTY (January 3, 2012) (available at: http://www.cato-at-liberty.org/how-copyright-industries-con-congress).

[7] *See, e.g.*, F. Lévêque and Y. Ménière, THE ECONOMICS OF PATENTS AND COPYRIGHT (2004) (available at: www.bepress.com/leveque).

something that, strictly speaking, has zero marginal cost (in the short run). Thus, for the economist, the problem of the theft of intellectual property, in the overall social sense (i.e. "general equilibrium"), is evidently not trivial. What is stolen is consumed by users who value it. While the producer is thereby cheated, the nefarious downloader will benefit.[8] Can one say, in any precise way, that *society is worse off* in this case? The answer, as we will show below, is "yes". In particular, we will establish, using a dynamic general equilibrium model of a very standard sort, that the extent of theft will in effect act as a sort of tax on the production of the good being stolen, and this tax, in turn, will lead to distortions in resource allocation that reduce the welfare of society. This result applies even though the stolen goods are seen to benefit the thief directly. The society in question will suffer, producing less output in the long run due to the disincentives created. Additionally, reductions in the level of theft will increase welfare, and such reductions are desirable in an economic sense. As such, theft of intellectual property by rogue websites is not just a question of redistribution.

II. Economic Model of IP Theft

In order to analyze the consequences of theft, it is necessary at a minimum to recognize that, in the inclusive, general equilibrium sense, theft does not represent goods that just "disappear" from the economy: rather, the stolen goods are indeed consumed, producing benefits for those who take them. Obviously, if the theft activity is costly, then theft merely becomes another way of obtaining goods, and consumers would balance the two avenues to consumption—theft and purchase—in their consumption plan. To strengthen our findings and highlight, in our view, the fundamental problem, we will assume in what follows that theft is costless. In fact, a certain amount of theft will occur, and the stolen goods will produce benefits for consumers in exactly the same way as goods obtained legitimately.[9]

We utilize a very conventional dynamic general equilibrium framework in which a representative consumer (or, equivalently, a continuum of consumers) optimizes their consumption and investment plan over time. In models of this sort,[10] it is the case that an

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[8] *But c.f.,* C. Young, *Copyright Enforcement Debate Misses Big Picture*, REAL CLEAR POLITICS (January 25, 2012) ("… media corporations and other owners would be far better helped by being savvy about consumers' wants and needs than by draconian and ultimately futile attempts to police the Web.") (available at: http://www.realclearpolitics.com/articles/2012/01/24/copyright_debate_misses_big_picture_112884.html#.Tx6so_8RX-k.facebook).

[9] This approach does not "stack the deck" against any finding that theft is not harmful.

[10] *See, e.g.,* R. Becker, *Capital Income Taxation and Perfect Foresight*, 26 JOURNAL OF PUBLIC ECONOMICS 147-167 (1985); S. Paltsev, *Moving from Static to Dynamic General Equilibrium Economic Models*, MIT Joint Program on the Science and Policy of Global Change, Technical Note. No. 4 (June 2004) (available at: http://web.mit.edu/globalchange/www/MITJPSPGC_TechNote4.pdf).

optimal plan for the consumer corresponds to an optimal growth path with a reduced discount factor, this alteration in the implied rate of discount being the consequence here of the extent of theft. The important point for the reader to note is that this approach will allow us to incorporate the consumption benefits of stolen goods directly. Thus, in what will strike some readers as rather too charitable, we will in effect consider the welfare of those stealing goods as having importance equal to that of honest consumers.[11]

On the other hand, when some of what is produced is stolen, it seems reasonable to assume that this stolen output displaces output that would otherwise be purchased legitimately. The evidence points in that direction.[12] Moreover, if this were not so, then the owners of the content in question would not care about its theft, whereas they clearly do care. The effect of this, in the general sense, is that some part of what is produced is *not* paid for. The producers, whom we will assume behave in a competitive manner, make their production decisions based on what they get compensated for. Thus, from their point of view, the theft activity acts like a sort of tax on production. As intuition and experience suggest, this tax suppresses output.

Thus, the basic outline of the analysis is as follows. A representative household makes consumption and labor supply decisions to maximize its welfare over time, subject to a budget constraint which must be met during each period.[13] Further, the household faces a labor supply constraint (they can only work so much), and discounts the future (they are impatient). Firms behave competitively, and produce "output" using capital and labor. To simplify the model,

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[11] Our model leans in favor of theft in that we have assumed that theft is costless and by assigning equal to weight to the consumer benefit received from consuming stolen goods and purchased goods.

[12] Econometrically quantifying the substitution effect between music theft and record sales has proven difficult, in part due to the fact that the quantity of theft is difficult to measure and in part due to identification problems. For attempts to resolve the problems, *see* B. Danaher, M. Smith, R. Telang and S. Chen, *The Effect of Graduated Response Anti-Piracy Laws on Music Sales: Evidence from an Event Study in France*, Unpublished Working Paper (2012) (available at: http://ssrn.com/abstract=1989240); S. J. Liebowitz, *Testing File Sharing's Impact on Music Album Sales in Cities*, 54 MANAGEMENT SCIENCE 852-9 (2008); R. Rob and J. Waldfogel, *Piracy on the High C's: Music Downloading, Sales Displacement, and Social Welfare in a Sample of College Students*, 49 JOURNAL OF LAW AND ECONOMICS 29-90 (2006); F. Oberholzer-Gee and K. Strumpf, *The Effect of File Sharing on Record Sales: An Empirical Analysis*, 115 JOURNAL OF POLITICAL ECONOMY 1-42 (2007); S. J. Liebowitz, *How Reliable is the Oberholzer-Gee and Strumpf Paper on File-Sharing?*, Working Paper (2007) (available at: http://ssrn.com/abstract=1014399); S. J. Liebowitz, *The Metric is the Message: How Much of the Decline in Sound Recording Sales is Due to File-Sharing?*, Unpublished Working Paper (2011) (available at: http://ssrn.com/abstract=1932518).

[13] It is not sensible to consider net lending or borrowing in such a model since there is no one "outside" the model to whom one could lend, or from whom one could borrow.

we will make the conventional assumption that constant returns to scale imply zero economic profits for the firm in any equilibrium.[14]

Let s_t denote the household's receipt of stolen output (content). The household takes as given $\{k_0, (r_t, w_t, s_t)_{t=0}^{\infty}\}$ and chooses $(c_t, l_t)_{t=0}^{\infty}\}$ to maximize:

$$\sum_{t=0}^{\infty} \beta^t u(c_t) \quad \text{subject to} \tag{1}$$

$$c_t + k_{t+1} = r_t k_t + w_t l_t + s_t \ , \ \ 0 \le l_t \le 1 \text{, and } c_t \ge 0 \, . \tag{1'}$$

The subscript t is used here to denote the time period for each variable, r is the return to capital, w is the wage paid to labor, β is the discount factor (so $0 < \beta < 1$), l is the labor supply of the consumer(s), and u is the representative agent's utility function for consumption c. Labor cannot be supplied past its endowment value, taken here to be arbitrarily equal to 1. The agent selects her sequence of consumption and labor supply choices over an infinite planning horizon in order to maximize the discounted value of her consumption plan. The constraint on this choice reflects the necessity of society living within its means: in each and every period, what is consumed is just equal to what is produced. This dynamic optimization problem yields the following Euler necessary condition:

$$u'(c_t) = \beta r_{t+1} u'(c_{t+1}) \, . \tag{2}$$

This condition must hold for any optimal (i.e., welfare maximizing) consumption plan. In particular, we can give this requirement a simple economic interpretation. Since society can either consume or invest a unit of output in any period, and the investment choice will raise consumption opportunities in the future, efficient planning requires that the consumer (society) be indifferent between consuming the unit "now" or investing it and gaining the benefit "later." This finding is the standard one in models of this type.

We consider next the effect of theft of output on the behavior of the producers in society. As mentioned in the section above, we will just take theft of output to be an exogenously determined activity that is completely costless to execute, and which perfectly "recycles" the

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[14] Alternately, if the firms make profits or losses, then those would enter the consumers' budget constraint, as they own the firms. This complication sheds no light on the issue of the effect of theft so we decline to introduce it.

stolen output to consumers. Let θ denote the fraction of stolen output (content).[15] The representative firm maximizes profit given the market prices for labor and capital:

$$(1-\theta)f(k_t, l_t) - r_t k_t - w_t l_t \tag{3}$$

Here, f represents the production function of the representative firm, and it determines the level of output produced in any period as a consequence of the amount of labor and capital employed. Of course, labor and capital are both costly, having prices w and r respectively. Thus, the expression above represents the profit of the firm, with the price of output normalized to 1. Market clearing requires that the firm be able to implement its plans: the markets for labor and capital must clear each period.

For simplicity, we make the common assumption of constant returns to scale in production for zero profits in equilibrium. Additionally, we do not introduce technical change (changes in f) because such changes are extraneous to our purpose and results. The first order conditions from the firm's optimization yields the input price equations:

$$(1-\theta)f_k = r_t \tag{4}$$

$$(1-\theta)f_l = w_t \tag{5}$$

These conditions describe optimal (profit-maximizing) input use and production for the representative producers. Notice that theft reduces the rate of return to capital investment, and the wage rate. Because the structure of the model implies that labor is inelastically supplied, this wage-depressing effect has no consequence on labor supply, an assumption that again minimizes the consequences of theft. Combining the interest rate equation with the household Euler equation yields:

$$u'(c_t) = \beta(1-\theta)f_k u'(c_{t+1}) \tag{6}$$

The above equation shows the dynamic distortion created by the theft. Essentially it reduces the discount factor (beta) leading to greater household impatience and less capital accumulation. In other words, the existence of theft, even when it is costless and perfectly

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[15] θ need not imply a 1:1 to relationship between a stolen items and the loss of a sale. If there is no displacement of purchased goods, then the consequences of theft (under our assumptions of costless theft) are zero. In such a case, the copyright owners would be unconcerned with theft. Since the owners are so concerned, it is reasonable to conclude displacement is a serious problem. For some empirical evidence on the issue, *see* S. Liebowitz, *Testing File Sharing's Impact on Music Album Sales in Cities*, 54 MANAGEMENT SCIENCE 852-859 (2008); A. Zentner, *Measuring the Effect of File Sharing on Music Purchases*, 49 JOURNAL OF LAW AND ECONOMICS 63-90 (2006).

"efficient," has much the same effect as causing consumers to behave as if the future were of less importance. When the future is seen as less important, less is invested since investment, by definition, is costly now but provides its benefits only in the future.

A. *Effects of Theft on Capital and Wages*

In the long-run steady state of the economy ($c_t = c_{t+1}$), we have:

$$\frac{1}{\beta(1-\theta)} = f_k \tag{7}$$

This condition states that the marginal product of capital, f_K, will be made equal to a factor which becomes larger as the level of stealing rises. This immediately implies the greater the rate of theft, the higher the steady-state marginal product of capital. Since the marginal product is a decreasing function, the greater the rate of theft, the lower the steady-state level of capital. Lower capital also implies lower wages. Thus, we have rigorously established the relatively intuitive proposition that, when some output is stolen (i.e., sellers do not get revenue for it), they invest less in production, lower output is obtained, and wages are suppressed.

B. *Effects of Theft on Consumers*

How, though, does this finding impact the lifetime welfare of the households in the economy? In order to examine the lifetime utility of the household, we need to convert the general equilibrium problem outlined above into an equivalent optimal growth model. Becker (1985) shows that this type of dynamic equilibrium is equivalent to the optimal growth model with a reduced discount factor $(\hat{\beta} = \beta(1-\theta))$:

$$\sum_{t=0}^{\infty} \hat{\beta}^t u(c_t) \tag{8}$$

subject to

$$c_t + k_{t+1} = f(k_t, l_t),\ 0 \le l_t \le 1, \text{ and } c_t \ge 0. \tag{8'}$$

Notice that there is no distortion to the feasible set in this planning problem. Hence, if $(\hat{c}_t^*)_{t=0}^{\infty}$ is optimal for the distorted discount factor, $\hat{\beta}$, then it is still feasible for the true discount factor β Since $(\hat{c}_t^*)_{t=0}^{\infty}$ is clearly distinct from $(c_t^*)_{t=0}^{\infty}$, it is a sub-optimal path for the true household discount factor. Thus, the theft distortion reduces household lifetime utility.

Another way to characterize the reduction in the utility is to look at the long-run steady-state. Let $V(k, \beta)$ denote the value function to the optimal growth model (initial capital and the discount factor being parameters), the recursive nature of utility implies:

$$V(k,\beta) = \max_{c,x}\{u(c) + \beta V(x,\beta)\} \quad \text{s.t.} \quad c + x = f(k,1) \tag{9}$$

Differentiating the value function with respect to beta, using the envelope theorem, and evaluating at the steady-state $(x^* = k = \bar{k})$:

$$\frac{\partial \overline{V}}{\partial \beta} = \overline{V} + \beta \frac{\partial \overline{V}}{\partial \beta} \tag{10}$$

This implies:

$$\frac{\partial \overline{V}}{\partial \beta} = \frac{\overline{V}}{1-\beta} > 0 \tag{11}$$

Hence, a reduction in the discount factor (an increase in the rate of theft), reduces long-run household utility.

C. *Summary*

This model shows that the existence of theft of some output introduces a distortion, similar to that created by a distortionary tax, into the optimal growth path/competitive equilibrium of the economy. This distortion is not eliminated by the fact that the consumers enjoy the full benefits of the stolen output. Because the set of all feasible (i.e., technically possible) consumption paths for the economy is the same regardless of whether stealing occurs or not, one immediately obtains the conclusion that *theft of output unambiguously reduces social welfare, resulting in reduced levels of social well-being and output.* We note that the model does not imply simply that the copyright owners are harmed by IP theft. Indeed, it is consumers that are hurt by theft in the long run, as the incentive to invest in IP is diminished. The desire to curtail IP theft should not be viewed as a war between consumers and producers, but as a policy that reduces the general well-being of society. IP theft reduces investment, wages, and household utility.

III. Conclusion

The existence of IP theft—even when assuming theft is costless to affect, produces consumption goods of quality fully equal to those consumers pay for, and does not suppress labor supplied—results in a reduction in social welfare. We observe lower equilibrium levels of capital investment and output. Wages are reduced. These harms occur because theft deprives

producers of sales, reducing the apparent returns to capital investments. In effect, theft of output acts as a sort of distortionary tax on sellers, and this distortion is not remedied by merely returning the proceeds of the theft as a lump sum transfer to consumers. The claim that piracy involves mainly redistributions within the economy and thus is not a loss to the overall economy is demonstrably false. Theft is not merely a transfer, even when the stolen goods are non-rivalrous in consumption.

From the producers' points of view, the difficulty arises from the displacement of sales that theft represents. Returning to our earlier point that, strictly speaking, theft of intellectual property differs from theft of a cheese sandwich due to non-rivalrous consumption, we see here that it is the loss of sales that drives the wedge between the private and social returns to capital investment. Thus, the fact that people steal copyrighted material, for example, is socially significant because *some* (though not necessarily all) of them do not buy it as a result. It is by this means that their activities can produce social losses.

We can conclude, then, that policies that reduce IP theft are socially desirable from the economic perspective. The reduction in the rates of theft of intellectual property would benefit society (producers and consumers), and the harm society suffers is made larger by higher levels of theft. As such, as the debate moves forward on how to develop an effective mechanism to prevent IP theft, we should at least immediately discount the argument that on-line theft of IP causes no harm and therefore no foul.