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The Economic Effects of Counterfeiting and Piracy

A Review and Implications for Developing Countries

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Abstract

Policy makers around the world recognize the potentially harmful consequences of trademark counterfeiting and copyright piracy. Indeed, many countries have recently initiated policy reforms to strengthen the enforcement of intellectual property rights (IPR). Further, minimum standards of enforcement have been incorporated in many international treaties, especially trade agreements. This emphasis on enforcement raises basic questions about the actual impacts of IP rights infringement, which differ across the types of IPR and economic sectors. The authors review the academic literature and other studies in the public domain to evaluate what has been learned about these socioeconomic effects, with an emphasis on developing countries where possible. They also identify important gaps in our understanding of the consequences of counterfeiting and piracy and develop recommendations on how governments might collect data and conduct studies to better inform IPR enforcement policy.

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The Economic Effects of Counterfeiting and Piracy: A Review and Implications for Developing Countries

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Intellectual property rights (IPR) cover a broad array of legal rules affording individuals and enterprises, or their licensees, exclusive opportunities to make, copy, and sell products and technologies arising from their inventive and creative work. These rules range from patents on new inventions to trademarks and geographical indications certifying the origin of goods. These rules also include copyright on creative and literary works, including software and digital transmissions. Because these rights are national in scope, how they are defined and protected varies considerably across countries for a variety of reasons (Maskus 2012).

Despite their broad similarity as a means of supporting markets for knowledge, various forms of IPR embody different economic and social objectives. It follows that their *infringement*, or actions taken by third parties in violation of exclusive rights, interferes in varying degrees with attaining these objectives. Producing an imitative good that infringes on one's patent rights may diminish dynamic incentives to invest in R&D, for example, though it can also bolster market competition in a static sense. Moreover, there is an important international element: if IPR infringement weakens the profitability of largely foreign enterprises, why would governments choose to invest in costly enforcement activities?

The particular forms of IPR infringement that have attracted the greatest global policy interest are counterfeiting, which is the illegal use of trademarks to sell unauthorized goods, and piracy, which is the duplication and sale of copyrighted goods without the copyright holder's permission. Policy makers around the world recognize the potentially harmful consequences of trademark counterfeiting and copyright piracy. First, infringements of intellectual property (IP) rights undermine trust in rules-based systems that are at the core of modern market-based economies. Second, counterfeit products can confuse consumers and may be ineffective or even dangerous, as with adulterated medicines and foodstuffs or non-certified engine replacement parts. Third, extensive counterfeiting can significantly deter the

emergence of new products and firms, and piracy can block the development of creative industries, especially in poor countries where entry conditions are already weak.

Over the past two decades, many governments—including those of developing countries—have initiated policy reforms to strengthen the enforcement of IPR (Maskus 2012). In addition, minimum standards of enforcement have also been incorporated in many international treaties, especially trade agreements, as IPR owners in wealthier economies push for stronger global protection. For example, the terms of the Trans-Pacific Partnership (TPP), while still under negotiation, embody extensive expectations for stronger border and domestic enforcement.

However, instituting a policy framework for combating counterfeiting and piracy poses substantial challenges. The economic effects of infringements differ across different IPR and economic sectors (Fink 2009), and it is important to understand these differences at the theoretical and empirical levels to set priorities for IPR enforcement policy. Governments are invariably resource-constrained, and completely eradicating violations of IP law—similar to violations of other types of law—is out of reach for even the best-resourced states. This is especially true for developing countries, where many public goods are underprovided and enforcement challenges exist in many areas of law.

Thus, in this article we review the academic literature and other studies in the public domain to evaluate what is known about the socioeconomic effects of counterfeiting and piracy.[1] We also identify important gaps in the understanding of these effects and develop recommendations on how governments might collect data and conduct studies as inputs into the formulation of IPR enforcement policy. For the most part, we ignore differences and limitations in the effectiveness of IPR enforcement measures, which are equally important

[1] The literature on counterfeiting and piracy is large and cannot be fully reviewed here. Instead, we focus on widely-cited studies of counterfeiting and piracy and offer an overview of the various approaches that researchers have adopted.

but warrant a separate discussion. Where relevant, we draw inferences from these studies about important implications for economic development and policy making in developing countries. In particular, we highlight the importance of collecting better and more consistent data, conducting microeconomic studies of the impacts of infringements on local firms, and raising consumer awareness of the potential externalities they impose on domestic producers and the potential risks they face with sub-standard products. Governments may also wish to develop an impact evaluation framework to assess their strategic investments in enforcement activities. This could be particularly important in light of growing external pressures for stronger efforts in the context of regional trade agreements.

The paper is structured as follows. In the next section, we approach the topic from a theoretical perspective, first reviewing the different market failures underlying trademark and copyright protection, and then exploring what happens when these rights are violated. The discussion concludes with brief suggestions for future theoretical research. In the next section we review existing empirical evidence, including aggregate estimates of levels of counterfeiting and piracy, studies of the effects of IPR infringements in particular industries, and anecdotal evidence from selected case studies. In the final section we explore what the findings of the literature imply for policymaking in developing countries, and develop recommendations for data collection and the conduct of future studies on counterfeiting and piracy.

Theoretical Considerations

In general, intellectual property rights aim to remedy the failure of markets to provide an efficient allocation of resources. The relevant market failures that give rise to copyright and trademark protection vary. Accordingly, the effects of trademark counterfeiting and

copyright piracy vary and warrant separate treatments.

Economics of Trademark Counterfeiting

The primary welfare effects of counterfeiting depend crucially on whether consumers are deceived into believing that a fake good is produced by the owner of the trademark. The likelihood of this deception depends on product characteristics and the nature of distribution channels. For example, consumers are usually unable to ascertain whether a pharmaceutical product contains the desired chemical ingredient, whereas most fashion shoppers can distinguish an original handbag from its fake clone. We discuss the implications of deceptive and non-deceptive counterfeiting in turn.

Deceptive Counterfeiting

The most relevant market failure giving rise to trademark protection arises from asymmetric information. For many goods, consumers do not have enough information to ascertain the quality of a potential purchase. A trademark guarantees that a product or a service originated with a particular producer. This is valuable information to consumers because it reduces both uncertainty and the costs of searching for particular quality levels. Indeed, producers compete by establishing a reputation for different levels of quality. In turn, trademarks serve as an indication of product quality, a crucial support for functioning markets. Thus, trademarks, geographical indications, and similar rights enable high-quality producers to distinguish themselves in the market, supporting investments in improved product or service quality.

Deceptive counterfeiters copy trademarks, logos, and designs to confuse consumers into believing they are buying the legitimate product. In the presence of information asymmetries, deceptive counterfeiting is virtually certain to reduce economic welfare (Grossman and Shapiro 1988a). Those who discover they bought a fake good realize less consumption value than the price they paid for it (Liu et al 2005). Rational consumers, aware

that fake goods are on the market but are indistinguishable from originals, are unwilling to pay the full price of a high-quality good. This problem undermines the incentive for producers to invest in higher quality and may destroy markets for high-quality goods (Akerlof 1970; Qian et al 2013).

For developing countries, where deceptive counterfeiting sometimes reaches high levels, at least two significant costs arise (Maskus 2012). First, extensive anecdotal evidence suggests that the likelihood of infringement deters market entry by local enterprises, thus limiting the growth of small and medium-sized enterprises. In this context, counterfeiting can be anti-competitive in a dynamic sense, even in poor countries.

Second, for certain products, the consumption of deceptive fakes can generate negative externalities. Examples would be an increased risk of disease transmission in the case of pharmaceuticals, or environmental degradation in the case of industrial chemicals. Indeed, the distribution of counterfeit drugs poses a significant public health challenge in many developing countries, especially in Africa.[2] The presence of negative externalities calls for public action against counterfeit products, independent of any private incentive for enforcing trademark rights.

Non-deceptive Counterfeiting

A more complex situation arises where consumers are perfectly able to ascertain the quality attributes of goods at the moment of purchase and therefore know whether they are buying a counterfeit. Because no information asymmetry prevails, trademarks, at first sight, seem irrelevant. However, for so-called status goods the display of the producer's name confers prestige on the purchaser, yielding utility beyond that from the goods' functional characteristics. Counterfeiting of status goods can reduce the prestige value of genuine

[2] See, for example, Newton et al (2010). Counterfeit drugs are part of the broader challenge of substandard pharmaceuticals, which also extends to generic medicines.

versions. Such value is real, as is manifested by the substantial marketing outlays of producers of luxury goods and the prevalence of counterfeits.

Grossman and Shapiro (1988b) analyze the effects of non-deceptive product counterfeiting. In their simplified model, status value depends negatively on the number of consumers who purchase a product bearing the same brand name, whether genuine or fake. In this setting, the social welfare consequences of product counterfeiting become theoretically ambiguous. Producers and consumers of the genuine product are made worse off by counterfeits because their presence reduces the status value, and therefore the price, of the genuine product. However, producers and consumers of the counterfeit product are better off. In particular, consumers of fake products gain status value without paying the full price of the genuine product. The overall effect on social welfare is an empirical question.

Strategic Responses to Counterfeiting

More recent analysis has identified further interesting features of markets with fake goods. For example, Qian (2013) models the impacts of entry by counterfeiters on the subsequent responses of genuine producers. Because counterfeits are usually an inferior imitation of the authentic product, the theory adopts a vertical differentiation setup. In particular, the theory incorporates two layers of asymmetric information potentially generated by counterfeits: (1) counterfeiters fool buyers, and (2) buyers of counterfeits fool their peer consumers by pretending to have high-status goods. One key prediction is that entry by counterfeiters would induce a genuine producer to upgrade product quality and raise the product's price if and only if the entrant's quality is lower than a threshold level. In essence, genuine trademark owners must raise quality and price (and reduce sales) to attract demand in the market, which is consistent with evidence from China discussed in the next section. Note, however, that the possibility that original producers may invest in higher quality versions to compete with counterfeiters does not imply higher economic welfare, or that the

induced innovation is efficient. Qian et al. (2013) further show that competition from counterfeiting induces branded firms to invest more in improving searchable quality attributes such as appearance, and less in enhancing experiential attributes, such as functionality.

Competition from counterfeit products can either lower the prices of genuine goods due to substitution in demand or raise their prices and production costs in order to move up-market. In addition, Qian (2013) demonstrates how authentic producers could invest in "self-enforcement" strategies to limit the competition from counterfeit goods. Such strategies include conspicuous packaging of products and specially licensed company stores.[3]

Longer-term Welfare Considerations

Counterfeiting can encourage certain forms of innovation among genuine producers in an attempt to differentiate their products from imitations. This process is costly, however, perhaps especially in poor countries where the margin of high-income consumers seeking high-quality genuine goods is relatively small. More fundamentally, under both deceptive and non-deceptive counterfeiting, producers of genuine products realize lower profits. Facing this problem, original trademark owners become less willing to invest in developing new goods, ultimately reducing the rate of new product development and lowering both entry of new firms and consumer welfare (Aghion et al. 2005; Scherer 1967). We conclude that on balance, extensive counterfeiting is likely to harm consumers and impede growth in poor and emerging economies.

Economics of Copyright Piracy

[3] Taylor (1993) analyzed such "masking" strategies, which are costly in welfare terms. Again, Maskus (2000; 2012) offers anecdotal evidence of such responses in developing countries.

The need for copyright protection comes from three characteristics associated with creative works such as books, music, films, and software. First, these products can be reproduced at low marginal cost; in the case of the Internet, such products can be procured and reproduced at virtually zero marginal cost. The second characteristic is that their consumption is non-rival; many people can enjoy them without diminishing availability for others. The third characteristic of such works is that the creative process may require costly sunk investments. If competitive market forces were to provide creative works at marginal cost, actors, artists, authors, producers, and publishers would have little financial incentive to undertake those investments. The copyright offers a solution to this problem by affording producers of creative works the exclusive rights to authorize and control their reproduction. In turn, genuine copies may be sold at a profit, allowing for the financing of creative investments.[4]

In light of this essential economic rationale for protection, what are the implications of copyright piracy? The basic answer is that high levels of copyright infringements undermine the incentives for creating and licensing new works, ultimately lowering social welfare. Unauthorized copying tends to flourish where originals command a high price, copying is cheap (as with digital goods and internet transmissions), and the likelihood of detection or meaningful punishment is low. In such circumstances, widespread copying can significantly diminish the incentives to develop and produce new creative and literary works. This barrier seems particularly relevant for indigenous music and software industries in developing countries with high rates of piracy, where copiers pervasively target local performers and emerging enterprises (Maskus 2000; Penna et al. 2004).

[4] Copyright protection is limited to strike a balance between incentives for creating new works and the desirability of making them widely available. Thus, copyright has a limited term and certain exceptions and limitations to exclusive rights exist in areas in which society reaps special benefits from the rapid dissemination of creative works.

Beyond this basic framework a number of theoretical nuances should be mentioned. For example, theory suggests that piracy can raise or lower the price of original works (Besen and Kirby 1989; Takeyama 1997). If consumers who prefer to buy originals have sufficiently inelastic demand, it is possible for the prices they pay to be higher in the presence of pirated copies. The reason is that copying would induce original producers to concentrate their sales on this group, which pushes up price. Overall sales of legitimate copies are likely to be lower, however, because copyright owners would choose not to sell to the remaining market segment.

An example is the model by Harbaugh and Khemka (2010), who point out that if copyright enforcement efforts are focused on larger users with higher valuations for software, such as public enterprises, universities, and government agencies, the original IP owners can charge higher-than-monopoly prices to those users. The remaining users in the market then purchase pirated copies. When enforcement is spread more broadly throughout the market, however, original producers will sell more legitimate copies and prices will fall, even as the volume of pirated goods diminishes. In this situation, it is possible to observe more genuine goods on the market and an increase in overall consumer benefits.[5]

Another reason prices may rise in the face of piracy is that unauthorized copying may induce copyright holders to add features and functionality to genuine copies to distinguish them in the marketplace. In turn, these features support higher prices, which consumers of originals are willing to pay, whereas pirated copies command lower prices (Varian 2000). An early variant of this concept is detailed by Liebowitz (1985), who presents empirical evidence that academic journals raised their prices after the introduction of photocopying because they had become more valuable to consumers. A similar process is underway in academic

[5] Maskus (2000) relates anecdotal evidence that this price moderation occurred in the software industry when Taiwan improved its enforcement activities in the 1990s.

publishing in the digital age, with dramatic increases in subscription prices for paper copies (Maskus 2012).

Finally, note that books, journals, music, and videos are "information goods" that can be shared across multiple uses through copying, rentals, and literal sharing. This fact affects strategies of the content producers and copyright owners, who must decide the formats, timing of releases, functionality, and prices of such goods. According to Varian (2000), copyright owners are likely to sell fewer copies at higher prices to manage the sharing problem. This strategy is likely to be profitable when there are low transaction costs in sharing (e.g., movie rentals) and when sharing markets permits separation of higher-valuation and lower-valuation users. The former will receive goods faster at higher prices, and the latter will have delayed access at lower prices or will enter lower-quality and, perhaps, pirated markets.

Network Effects

Piracy takes on interesting features in the presence of goods with network externalities, in which one consumer's valuation of a creative work increases with the number of other consumers owning the same product. Computer programs are an example, as the ability to share files with other users increases the attractiveness of a particular software package.

What happens if creative works subject to network externalities are pirated? Suppose that original and pirated copies are perfect substitutes, or at least highly interoperable as in the case of software. Consumers of original copies gain because the presence of pirated copies enlarges the network with which they can interact. In addition, sonsumers of pirated copies will benefit from inexpensive access to the work.

The effects of copyright piracy on the producer of the creative work and overall welfare are ambiguous. As Conner and Rumelt (1991) and Takeyama (1994) show, it is theoretically possible for the copyright owner to reap higher profits from certain levels of piracy. The

intuition is that the enhanced network value of the product may allow producers to charge a higher price for originals. Here, copyrights support profitable price discrimination. In theory, the copyright owner could achieve the same outcome by simply giving away a certain number of original works. In practice, this would not work because all consumers would expect a free legitimate copy. However, consumers differ in their willingness to use pirated copies, as determined, for example, by income levels. This difference allows the producer to segment the market and choose the profit-maximizing combination of price and network size.[6]

Effects on Tax Revenue and Employment

In policy discussions on trademark counterfeiting and copyright piracy, effects on tax revenue and employment have gained in importance, especially in richer countries where firms see their IPR infringed on abroad. From an economic perspective, these effects can be evaluated either in a shorter-term partial-equilibrium setting or a longer-term general-equilibrium setting.

The overall partial-equilibrium employment effects are theoretically straightforward and depend on how output shifts between genuine and illicit producers and the labor intensities of original and pirated copies. The same holds for tax revenues, which are nearly certain to fall because sales of pirated and counterfeit products occur in informal markets where taxes and import tariffs are usually not collected, and because sales of legitimate producers likely decline. No existing theoretical research examines the tradeoffs between employment in the formal and illicit informal sectors, including the setting of wages, the

[6] Conner (1995) offers a broader set of circumstances in which it might be profitable for copyright owners to accommodate copying in the presence of network effects and quality differences.

existence and impact of social safety nets, and the nature and length of possible unemployment spells.

The long-term general-equilibrium effects of IPR infringement are often ignored in policy discussions, but understanding them better is crucial. Again, direct impacts in affected sectors are surely negative. However, workers losing employment likely find other jobs, and governments facing a revenue shortfall likely adjust their tax structure to finance public spending. The key question is how workers and the efficiency of the tax system fare in the counterfactual equilibrium. No formal modeling work seems to exist in the literature that would offer conceptual guidance.

Impacts on Trade, Foreign Direct Investment, and Licensing

The theoretical literature on the relationships between IPR protection and international trade, FDI, and licensing is deep and sophisticated.[7] These linkages are important because they govern how policy reforms and enforcement affect market-based inward technology transfer (ITT) into developing economies. However, economic theory in this area focuses almost exclusively on IPR as technology protection, for example patents and trade secrets, and has ignored trademark counterfeiting and copyright piracy. Further, no models have considered the role of stronger enforcement as being distinct from basic legal reforms.

Thus, a comprehensive review lies beyond the scope of this paper and we simply state the primary theoretical findings. Because multiple channels exist for transferring technology, IPR in the recipient country has both scale effects and composition effects. Regarding scale, multinational enterprises (MNEs) seeking to deploy a new technology or sell a new good face a basic tradeoff when local IPR is enhanced (Maskus and Penubarti 1995). Because local

[7] Maskus (2012) offers a full review, while Arora et al. (2001) set out comprehensive models.

firms face higher imitation costs, their outputs are reduced and MNEs sell more, whether through trade or FDI. At the same time, MNEs face less elastic demand from consumers who continue to buy their goods, thus permitting higher prices at reduced (monopolistic) volumes. This tradeoff between market expansion and market power is fundamental to the theory of intellectual property and ITT. This tradeoff extends to licensing as well: MNEs can expand the number of contracts for technology use and production rights but they can also raise royalty rates (Branstetter et al. 2006). The key point is that IPR reforms have ambiguous impacts on ITT, at least in theory, making it an empirical question.

As for the composition of ITT, economic theory suggests that MNEs shift their emphasis from exports at weak IPR levels to FDI and then licensing as protection improves (Markusen 2001; Javorcik 2004). This theory assumes (with little evidence) that imported high-technology goods are relatively difficult to imitate and thus carry their own protection. As IPR is strengthened, MNEs gain more confidence that local affiliate production cannot readily be copied, and become more willing to take advantage of cost reductions through FDI. However, technology remains internal to the firm for purposes of control. At yet higher protection levels, MNEs become willing to license their technologies to local partners, thereby externalizing their knowledge assets. A related factor is that stronger patents and trademarks increase the confidence that contracts are enforceable, making arm's-length licensing more attractive.

One additional strategic response (among many) is worth mentioning here. Specifically, where MNEs fear losing their technological advantages to imitation and their trademark reputations to counterfeiting, they may fragment their production among multiple local plants at various locations to diminish information flows among them and gain more ability to deter infringement. This approach, which has been common among MNEs operating in China (Maskus 2000), is inefficient and likely reduces net technology transfer. For example, Sun et

al. (2010) demonstrate theoretically that an MNE worried about imitation in an emerging market may limit the range of technologies it offers to deter entry by local imitators.

As mentioned, there are no theoretical studies focusing on FDI, licensing, and ITT with respect to counterfeiting and piracy, our focus here. However, many of the tradeoffs above surely apply. For example, reducing trademark infringement can lower the local selling costs of MNEs and expand their markets, whether through trade or FDI. Regional fragmentation of production is a costly reaction to counterfeiting, as is the need to engage in private enforcement. And, because of weak copyrights, MNEs may deploy expensive software to deter copying or pay more for programs on the market, as noted above. Presumably, these factors are deterrents that companies take into account when deciding on investment locations.

It is important to note that high-technology imports and FDI support localized learning and productivity gains in developing countries (Keller 2004; Branstetter et al. 2006), which are important for supporting productivity growth. To the extent that weak IPR diminishes such prospects, they have a negative dynamic impact on development.

Recommendations for Future Theoretical Research

While the economic literature offers useful theoretical guidance on the economic effects of counterfeiting and piracy, several questions deserve further exploration. We highlight three such questions here. First, as we described previously, the presence of (non-deceptive) counterfeit goods exerts an externality on consumers of originals. In their analysis, Grossman and Shapiro (1988b) assume that this externality is negative and takes the form of counterfeits diluting the exclusivity value of status goods. This assumption is appropriate for some classes of goods but not for others, and survey evidence suggests there is substantial heterogeneity in consumers' decisions to purchase counterfeit versus authentic products.

Other types of externalities are conceivable, and it would be important to analyze how their presence affects consumers, the strategic reactions of producers, and overall welfare.

Second, hardly any theoretical study has formally analyzed the short- and long-term employment effects of counterfeiting and piracy. It would be especially important to obtain conceptual guidance on how the different nature of formal and informal labor markets affects the welfare of different types of workers. Such guidance would seem especially important for developing countries, where informal employment often accounts for a larger share of total employment. Developing a better understanding of broader labor-market linkages may also be important for designing effective IP enforcement policies (Fink 2010).

Finally, it would be interesting to focus theoretical attention specifically on counterfeiting and piracy in terms of their potential impacts on technology transfer and localized learning. Little is known, for example, about how the enforceability of IPR affects relationships between MNEs and local suppliers and distributors. Nor is there much analysis of how piracy and counterfeiting influence global franchising decisions, which often embody considerable knowhow regarding market organization.

Review of Empirical Evidence

Economic theory is helpful for rigorously examining the likely effects of trademark counterfeiting and copyright piracy. However, as we noted previously, some effects are theoretically ambiguous and require empirical investigation. In addition, even when the overall direction of effects is conceptually clear, empirical insights into the scale of effects are needed for policy makers to set priorities for public policy.

Notwithstanding the need, generating credible empirical evidence poses a significant challenge. Counterfeiting and piracy, by their very nature, are illegal activities and thus largely escape official statistical recording. The basis for empirical research is thus weak, and

studies must rely on indirect official data, selected information supplied by rights holders, and original surveys to gather evidence. In addition, welfare impacts such as producer and consumer surplus gains or losses are difficult to measure at both the individual and the aggregate societal level. Finally, the limited empirical evidence that is available comes mostly from developed countries. While this evidence can still inform policy makers in developing countries, there are special characteristics of poorer economies that caution against the direct applicability of this evidence—notably, different parameters of consumer demand and different legal and institutional frameworks.

In what follows we critically review relevant empirical studies, and focus on the extent to which the underlying methodologies produce credible results. We begin with a review of aggregate estimates of the level of counterfeiting and piracy. We then examine studies that have evaluated the welfare impact of these activities at the micro level, and review the studies that have specifically focused on the effects of Internet file sharing. We conclude by evaluating the advantages and disadvantages of alternative empirical approaches.

Aggregate Estimates of Levels of Counterfeiting and Piracy

We begin the review of aggregate estimates by considering efforts to ascertain the incidence of piracy and counterfeiting in international trade. Focusing on trade seems promising, because goods undergo processing when they cross borders. In particular, customs authorities investigate suspected infringements of IP rights, thereby generating indirect data on the incidence of pirated and counterfeit goods in different product categories and for different exporting and importing economies.

The most comprehensive study attempting to quantify the importance of counterfeit and pirated goods in international trade was conducted by the OECD (2008). This study estimated the value of pirated and counterfeit goods in international trade at U.S. $200 billion, or

approximately 2% of global merchandise trade in 2005. In an update of this study, the OECD (2009) estimated the value of illicit goods in international trade as having grown to $250 billion in 2007 (largely reflecting the growth in worldwide trade). These estimates do not include the value of Internet-related piracy of digital goods, which easily cross borders but are almost impossible to measure and, in any case, cannot be counted in any merchandise trade categories.

The OECD (2008) report recognizes that its estimates are only "a crude indicator" of the value of counterfeit and pirated products in international trade. This caution is warranted. For instance, the OECD estimate employs data on interceptions and seizures by customs authorities in selected countries to estimate the proportion of counterfeit and pirated goods in different product groups and across exporting economies. However, these values only provide information about the relative incidence of pirated and counterfeit goods across product groups or across exporting economies. To arrive at their estimates, OECD staff use a value of the absolute incidence of counterfeit and pirated goods in one particular "fix-point" product group (e.g., apparel, leather articles, tobacco products). The value in question is not based on any hard data, but rather seems to reflect the best guess of OECD staff.[8]

Notwithstanding these methodological caveats, the evidence on the relative incidence of counterfeit and pirated goods across product groups is insightful. It shows, for example, that trade in illicit goods is concentrated in a small number of "sensitive" product categories; the top five product groups (at the two-digit Harmonized System level) account for more than three-quarters of all customs seizures.

Industry Studies

[8] Another problem is that the analysis takes place at the highly aggregated two-digit Harmonized System categorization of traded goods. Within each such category, typically hundreds of goods subcategories may or may not be subject to much counterfeiting. The OECD (2008) analysis assumes that its average rates computed at the aggregate level apply to each subcategory. This list of methodological problems is not exhaustive. The OECD (2008) report describes several other important problems that likely bias the resulting estimates.

Moving beyond trade, a large number of studies—often sponsored by affected industries—attempt to quantify the incidence of pirated and counterfeit goods at the level of specific sectors and to estimate their effects on certain economic performance variables. The methodological approaches and quality of the data in these studies vary substantially. A detailed review of each of these studies would go beyond the scope of this article, but it is worth highlighting several common issues.

First, given the inherent difficulty of accurately measuring the prevailing levels of counterfeiting and piracy, the reliability of any underlying estimate is in many cases questionable. This difficulty applies to the results of original survey work. For example, industry associations in the major copyright-intensive industries publish annual surveys of piracy rates in major countries around the world. These questionnaires may collect useful information about attitudes toward piracy and means of unauthorized copying, but the resulting estimates of illegitimate use need to be treated with caution.

For example, the Business Software Alliance (BSA) released their ninth study in May 2012, in which they argued that the global piracy rate for PC software stood at around 42% in 2011, representing more than $60 billion (BSA 2012). This finding came from a study of more than 110 countries, with piracy rates ranging from approximately 19% (United States and Japan) to over 90% (Georgia and Zimbabwe). To compute these rates, the study relied on surveys of sampled consumers and businesses in a smaller set of 28 countries to determine the number of computers in use and the share of legitimately procured software.[9] The study then estimated piracy rates for countries not in the sample surveys by means of a correlation between software usage and an "information development index" published by the

[9] The difference between the total installed software and legitimately purchased software is the amount of piracy. Although this approach is sensible in that it relies on reported measures of legitimate usage in relation to overall computer capacity, both of which may be reliable, the BSA report does not indicate what the underlying sampling biases may be. This approach also ascribes some use of open-source software and freeware to piracy.

International Telecommunications Union. The extent of bias in the estimates for these non-sampled countries arising from both the underlying approach and the application of the index is unknown. Regarding the latter, considerable variation is likely to exist in its applicability to countries of differing economic and social characteristics, as is the case for most such "development" indexes.

Second, estimates of the economic effects of counterfeiting and piracy often do not account for demand responses—the possibility that not all consumers would switch to the original product if the counterfeit or pirated version were unavailable. Again, the BSA (2010) piracy estimates illustrate this point. Based on estimates of the volume of unlicensed software, the BSA computes its commercial value by applying a vector of prices for various kinds of computer programs including retail, licensed, and open-source. This total value is then taken as a measure of lost sales for legitimate software producers in each country. This approach assumes that each unit of pirated software would be fully replaced by a purchased version if copying were eliminated. That their estimates of volumes and values foregone are likely substantially overstated emerges from a recent study estimating demand responses for one popular software product, Microsoft Office. Relying on original conjoint survey data from college students in Hong Kong, Leung (2013) estimated a discrete choice demand system for Microsoft Office from both legal and illegal sources; he concludes that the true gain from eliminating all sources of piracy is only 15% of the BSA's estimated cost of piracy.

Third, the counterfactual market equilibrium analyzed is often not clearly spelled out, nor does it seem realistic. In particular, studies provide estimates of the economic implications of certain *levels* of counterfeiting and piracy, and associate those levels with employment and tax losses without considering the longer-term general equilibrium

responses outlined previously. Possible employment effects in the informal sector are almost always ignored.[10]

Some studies attempt to consider cross-economy impacts, at least in an input-output framework. Consider, for example, a widely-cited calculation of U.S. copyright industry sales, employment, and tax revenue losses carried out by the Institute for Policy Innovation (see Siwek 2007). The author employed industry-generated measures, such as those from BSA and LEK, of global sales losses in motion pictures, recorded music, software, and video games. Siwek considered the sum of these losses to be an underestimate because not all countries are covered in all industry estimates. Making some adjustments for substitution between pirated and legitimate copies, and valuing all lost sales at legitimate prices, the study suggested a direct total loss of $25.6 billion for U.S. industries (including retailers).

Siwek (2007) then applied "multipliers" available from the U.S. Department of Commerce, derived from its input-output model of the U.S. economy, to determine how this lost sales figure translates into total (direct plus indirect) losses in economic activity and total employment lost. These basic calculations resulted in a total sales loss for the U.S. economy of $58 billion per year, along with 373,000 jobs lost as a result of global piracy. All of that translated further into an earnings loss of $16.3 billion and reduced tax collections of $2.6 billion. These are large figures but must be kept in context.

Although the multipliers account for cross-industry impacts in a static sense, the basic input-output approach again does not consider general-equilibrium linkages in the economy. If there really were $25.6 billion in reduced demand for U.S. copyright goods, consumers

[10] See, for example, Siwek (2007) and Frontier Economics (2009). The latter study considers the reemployment of workers "losing" their jobs as a result of counterfeiting and piracy but does not consider the effects of revenue-compensating tax policies. In addition, the assumption of a certain share of workers not finding reemployment implicitly assumes some form of historical shock that led to actual job losses. The latter assumption is difficult to reconcile with the more gradual evolution of counterfeiting and piracy activity observed in most sectors.

would focus their expenditures elsewhere in the domestic and international economies, while workers would move to alternative employment and output and tax payments would rise there. Thus, Siwek's (2007) study offers an assessment of the *gross* losses in sales and employment but greatly overstates the *net* losses. As we described previously, analysts would need to develop a general-equilibrium model for the latter calculations with endogenous changes in sectoral demands, output, and trade, while computing earnings losses at the difference between with-piracy and without-piracy wage rates.

The United States International Trade Commission Analysis

Because of the methodological shortcomings outlined above, we are skeptical that the results of the studies reviewed to this point offer useful guidance to policy makers. A more careful study was performed by the United States International Trade Commission (USITC: 2011); this project focused exclusively on the effects of IPR infringement in China, where concerns among major technology, fashion and content creators in the United States, the EU, and other rich countries are primarily focused.

The USITC's figures on gross sales lost due to Chinese infringement were taken largely from surveys of American firms. These firms claimed sizable damages, largely due to copyright piracy and trademark counterfeiting, though issues of indigenous innovation and industrial espionage were also considered. Analysts at the USITC applied these reported reductions in demand to their well-regarded computational general-equilibrium model. Such models are more flexible and more informative than simple computations with input-output tables, for they permit endogenous responses in prices, outputs, factor use, trade, and product demands. At any rate, the USITC model computed losses of nearly one million jobs in the United States in the sectors most affected by Chinese infringement. There was, however, considerable uncertainty about this estimate depending on the scenarios considered.

After having conducted this review, we observe that capturing the impacts of global infringement of IPR is a complex and uncertain problem that could use far more analytical and data attention. Moreover, there are no reliable computational general-equilibrium studies on how infringement affects the economies of developing countries.[11] This is not to say that the economy-wide effects are negligible and do not deserve the attention of policy makers in both developed and developing countries. We merely emphasize the challenge those policy makers face in addressing counterfeiting and piracy problems with limited empirical guidance on offer.

Micro-data Studies on the Effects of Counterfeiting and Piracy

Although obtaining aggregate estimates of the levels of counterfeiting and piracy is important for understanding the scale of the problem, effective policy cannot be devised without considering the micro level of firms and consumers.

Marketing Analyses and Consumer Surveys

Several marketing studies have been conducted to help understand consumer psychology and behavior that characterize the demand-side origin of counterfeiting. Although many of these are surveys or case studies, a few are experiments. Generally, experiments—whether in the field or in the lab—generate more credible evidence, but they also face methodological limitations. Field experiments that randomly assign people to control and treatment groups potentially have higher external validity because participants are real-world consumers making statements or decisions about the products of interest in (close to) real-world settings. However, compared with a lab experiment, in a field study it is more difficult to avoid interferences among participants and to exert tight control over the randomized

[11] Maskus (2005) offers a simple partial-equilibrium model of the effects on employment and sales in several key sectors in Lebanon, using data for 1996. However, this approach cannot determine cross-industry equilibrium impacts and is only suggestive at best.

treatment manipulations. Field experiments therefore generate results that are more susceptible to these "internal validity" concerns.

Bloch et al. (1993) examined the consumer's role as an "accomplice" in the proliferation of product counterfeiting. These authors presented results from a field experiment showing that a surprisingly large proportion of adult consumers will select a counterfeit garment over the genuine good when there is a price advantage. The researchers also found that a significant price gap and negative attitudes toward large branded companies were the main factors driving counterfeit demand.

Wilcox et al. (2009) conducted lab experiments and found that products with branded logos were more likely to be valued for their ability to help consumers gain social approval and status. In turn, this characteristic makes consumers more willing to buy products from counterfeiters who use such logos or advertising campaigns.[12]

Vida (2007) summarized the determinants of why consumers purchase non-deceptive counterfeit products, based on consumer surveys from Slovenia. The results suggested that personal religiosity and education tend to reduce one's willingness to buy fake goods. Such was not the case in Kwong et al. (2003), who studied consumer attitudes toward pirated CDs in Hong Kong. These researchers found that approximately 70% of the respondents stated that they bought pirated CDs and that they thought this generated high social benefit and low social cost. However, both studies concluded that gender matters, in that men are more willing to buy counterfeits than women. Bian and Veloutsou (2008) surveyed consumers in China and the United Kingdom, and found that perceived financial, physical, and performance risks from consuming counterfeits were moderate. Still, consumer willingness to

[12] Bian and Moutinho (2009) find a similar result from surveying consumer attitudes in Scotland toward buying fake luxury watches.

buy fakes varied with each product and each country, which makes it difficult to draw general conclusions.

Casola et al. (2008) conducted three studies of consumer behavior in hypothetical situations. All three studies revealed that consumers were less willing to buy counterfeits when the victim was an individual rather than an organization. The average consumer would buy fakes if they cost about one-third of the genuine price. Finally, consumers' willingness to buy counterfeit goods decreased if they were informed of the harmful impacts imposed on others. Thus, spreading awareness about the negative consequences of counterfeiting may be effective at deterring demand.

Field Studies

Overall, studying consumer psychology is perhaps more useful for understanding why there is a demand for counterfeits than for estimating the economic impacts of counterfeiting. For the latter, it is more fruitful to collect field data over time to generate a sample panel on actual branded firms and their infringers. This is a challenging task because of the illicit nature of counterfeiting and the confidentiality concerns of both genuine and infringing companies. Nonetheless, a series of recent studies have been carried out in this direction.

Qian (2008) offers the most comprehensive empirical investigation on the economic impacts of counterfeits. This study also stands out in that it is one of a relatively few studies that focus on a developing country. Qian collected original panel data from Chinese shoe companies from 1993 to 2004 (after government enforcement efforts were reduced in the footwear sector) through stratified random sampling to identify and measure the effects of competition from counterfeit goods on the prices, qualities, and other market outcomes of authentic footwear. The results show that brands experiencing less government enforcement action differentiated their products by introducing higher visible quality. These brands also

engaged in forms of self-enforcement by establishing vertical relationships with licensed downstream retailers ("company stores") to control their sales, and setting higher prices to signal their legitimacy in the marketplace. All these reactions helped reduce counterfeit sales in the period studied.

It should be clearly noted that all the innovation and differentiation strategies mentioned above are costly. Although the authentic prices dropped initially under competitive pressure from counterfeits, the long-term effects on driving up authentic-product prices kicked in at various times for different firms. Larger firms with more human capital and research-and-development resources were faster in responding and differentiating their products from counterfeits. Firms with more exports responded slower, perhaps because they were more diversified and less influenced by domestic counterfeits (Qian and Xie 2010).

Field panel data of the kind used in the Chinese footwear study provide direct measures of how various economic variables change over time within each brand, but there are limitations that mean the results should be treated with caution. For example, even when field panel data are available for estimating how economic performance changes in response to counterfeiting, the underlying mechanism may be difficult to identify. Qian (2013b) explored the sales impacts of counterfeiting based on a combination of field data and lab experiments, and found that counterfeits have both a positive advertising effect (inducing more awareness of the brand) and a negative substitution effect on authentic products (reducing their sales). The advertising effect dominates the substitution effect for high-end authentic product sales, and the substitution effect outweighs the advertising effect for low-end product sales. The advertising effect is found to be larger for fashion products and for brands that were less well-known at the time of infringement. Another important observation about consumer attitudes toward counterfeiting is that a high degree of income inequality seems to cause a greater demand for fake goods (Qian and Rucker 2013).

Finally, several micro-data studies examine the economic effects of copyright piracy Notably, Hui and Png (2003) estimated the effects of physical CD piracy on the legitimate demand for recorded music in an econometric setting. These authors' model expressly accounts for the demand linkages outlined in the previous section (sales of pirated copies could stimulate more demand for originals). Their econometric results showed that piracy had a negative net effect on the demand for legitimate music, though Hui and Png's estimate of foregone sales by copyright holders was 58% lower than the music industry's estimate (see International Federation of the Phonographic Industry 2003). The latter assumed a one-to-one substitution of pirated with legitimate purchases, whereas Hui and Png's model allowed for a share of price-sensitive consumers to choose not to switch to legitimate goods in the counterfactual scenario. The Hui and Png analysis is limited, however, by an assumption that copyright holders do not adjust prices in response to lower piracy.

That demand is responsive to prices charged for pirated and original copies also emerges from an experimental study of the music consumption behavior of university students. Maffioletti and Ramello (2004) found that in general, students' willingness to pay for a CD is lower than the market price of a legitimate copy. Thus, the hypothetical elimination of piracy would not expand sales of legitimate copies on a one-to-one basis at existing prices. At the same time, the study reveals that students' willingness to pay for a pirated CD was substantially greater than its marginal cost. This finding clearly points to the possibility that copyright holders might respond to stronger copyright enforcement by lowering their prices to capture a larger number of consumers.[13]

The Effects of File Sharing on the Internet

[13] This outcome was noted in survey evidence of the pricing strategy of legitimate software producers in Asian countries as copyright enforcement improved (Maskus 2000).

One of the most frequently studied aspects of copyright infringement is how unauthorized downloading and file sharing have affected sales of recorded music offered by major music publishers. It should be noted that this "end-user piracy" is sometimes different in intent from commercial piracy. In particular, many people who download music for free and put music files on their computers in forms that can be readily shared by others rarely attempt to make money from these actions.

Furthermore, some surveys suggest that many such users see little wrong with freely taking and sharing digital information products. For example, a recent survey of 1,607 people in the United Kingdom found that more than 80% admitted to having downloaded at least one file without authorization, and 47% said they did not think it was a crime (Bonnett 2010). In a survey of 1,000 U.S. college students in 2003, 69% said they had downloaded music, and 75% of those indicated they never paid for it (IPSOS Public Affairs 2003). Moreover, 76% responded that they would download even if they suspected the music file was illegal. These perceptions are among the reasons this form of unauthorized use is exceptionally difficult to control by copyright owners.

Regardless of the motivation, downloading and file sharing through peer-to-peer (P2P) networks is common. The OECD (2005) calculated that one-third of Internet users in its member nations have downloaded files from P2P networks. Regarding the effects of downloading and file sharing, U.S. shipments of recorded music on CDs fell by 25% between 2000 and 2005 (Recording Industry Association of America 2006), and representatives of the music publishers blamed this trend on illegal downloads and P2P file sharing. Most recently, a global music industry association noted a 7% drop in music sales in 2009, though it was unclear how much was due to unauthorized activity (International Federation of the Phonographic Industry 2010). That report claims that P2P piracy accounted for more than 20% of global Internet traffic, with higher shares in Latin America and Europe.

This proliferation of file sharing has negatively affected authorized music sales. For example, Rob and Waldfogel (2006) collected data on albums obtained through downloading or purchase and used surveys among students at the University of Pennsylvania to measure their valuation of this music. Using changes in Internet access as an instrumental variable, they found that downloading reduced the per-capita student expenditure on hit albums from 1999 to 2003 from $126 to $100, though it raised per-student welfare by $70.

The most widely debated analysis surrounds the work of Oberholzer-Gee and Strumpf (2007), who suggest that downloading could, in theory, increase or decrease album sales due to the peering effects we outlined previously. These authors regressed the volume of sales by album on the number of downloads of songs on the album and other factors. To control for a possible simultaneity bias, they used as a primary instrumental variable the number of German secondary school children on holiday when they had more time to wait for downloads. Their results were striking; in a basic ordinary least squares regression, the coefficient of sales on downloads was 1.09 and highly significant, suggesting a large positive impact. However, after adding album fixed effects and first-stage instrumentation, they could find no evidence that the number of times an album was downloaded had a statistical impact on music sales, while the implied economic effects were small.

This finding has been criticized on several grounds, primarily by Liebowitz (2005; 2006; 2007). In their more recent study, Oberholzer-Gee and Strumpf (2010) acknowledged that file sharing has reduced music sales, but by more modest amounts than generally supposed. Furthermore, they argue that offsetting increases in demand for complementary music services have increased incentives for the creation of new music, books, and movies. In other words, file sharing may be damaging to music publishers but not necessarily to artists themselves, especially those who are younger and less well-known. However, this possibility deserves further study. Unfortunately, empirical studies on the effects of copyright

piracy—whether physical or online—are almost exclusively confined to developed countries. To a good extent, this reflects the availability of data and the "home bias" of researchers in developed economies. However, there are reasons to believe that copyright piracy is more widespread in poorer countries. For example, across a wide range of countries, Fink (2009) reported a correlation coefficient between software piracy rates and per capita GDP in 2004 of -0.89. This likely reflects poorer consumers turning more frequently to pirated goods, the greater importance of the informal economy as a source of employment, and less developed and more resource-constrained legal systems.

Copyright-based industries exist in most developing countries. In some—such as the Philippines, Malaysia, and Mexico—these industries account for larger employment shares than in developed economies.[14] Copyright piracy is bound to affect the prospects of earning a livelihood from creative and artistic activities in poorer countries. One study on the music industry in West Africa reported anecdotal evidence confirming both the high incidence of piracy and its negative effect on musicians' incomes (Penna et al 2004). However, this study also pointed to a large number of other barriers—from ineffective collection societies to tax policies—that render the recording activities unprofitable for most musicians. How a reduction in piracy levels alone would affect artists and those involved in the distribution of creative works remains an open question.

Conclusions

We conclude this review with some observations on what the literature suggests about the importance of policy initiatives for dealing with counterfeiting and piracy in developing nations. We then discuss the need for further work to improve data collection and analysis.

[14] See WIPO (2013).

Implications for Policymaking in Developing Countries

As we have noted, most of the studies we reviewed above offer evidence about the impacts of counterfeiting and piracy in more developed economies, with the notable exception of Qian (2008; 2013b). Thus, readers may question their applicability to developing countries and policy authorities. Indeed, there are important differences to note. First, the classic "intellectual property industries" (high-end fashion, digital content, publishing, software, and research-based pharmaceuticals, food products, and plant varieties) play a smaller role in the production structures of poor countries. Rather, local firms may be more focused on imitation and copying, while consumers may be more open to buying fake goods. In this context, the immediate gains from stronger IPR enforcement are likely to accrue to foreign content providers and multinational enterprises, most of which develop the bulk of their intellectual property in rich economies. It is thus not surprising that many developing countries face demands for more stringent IP enforcement in bilateral and regional free trade agreements they negotiate with developed countries.[15] Notwithstanding the broader welfare gains that such agreements could offer, policymakers in developing countries reasonably wonder whether it makes sense to devote scarce development resources to IPR enforcement.

A second difference to note, however, is that there is considerable and growing heterogeneity among developing countries in this context. Rapidly emerging economies such as Brazil, Mexico, China, and Turkey see increasing interest among growing middle classes for higher quality goods protected by recognizable brands. There is also a rapid trend among innovative local firms toward brand development, investments in product variety and quality, and R&D expenditures in numerous industries, including software and digital content

[15] See Fink (2013) for a discussion of how trade agreements treat intellectual property rights and how they may affect economic welfare.

(Maskus 2012). In this regard, domestic interests in stronger IPR protection and enforcement are rapidly emerging and challenging the political-economy equilibrium that favors weaker enforcement. These countries presumably can learn from the experience of developed countries.

Third, even poorer countries have significant interests in stronger enforcement for at least two reasons. One is that their citizens disproportionately suffer from adulterated counterfeit medicines and ineffective or dangerous foods and beverages. Basic calculations suggest that this can be a major problem for sustaining public health in poor countries and that there is a positive payoff from working to reduce such risks (Maskus 2007). Another reason is that weak trademark enforcement can sharply diminish prospects for effective brand development, firm entry, and national marketing success among potentially innovative companies in poor countries. Indeed, local counterfeiting often targets domestic enterprises at least as much as foreign brands (Mertha 2005). Similarly, extensive unauthorized copying of music, designs, and other creative activities limits opportunities for artists and artisans to build local markets, ultimately harming their ability to sell globally as well. Thus, public investments in enforcement and creative infrastructures, perhaps in partnership with private entities, could help remove such barriers to entry. As a strategic matter, invariably scarce enforcement resources could focus on reducing deceptive counterfeiting (to deal with dangerous fakes) and educational campaigns on expanding consumer awareness of how unauthorized copying negatively affects local artists.

Recommendations for Data Collection and Future Empirical Work

Policy makers in countries at different stages of development are interested in better understanding the economic effects of trademark counterfeiting and copyright piracy. So what direction should future analytical work take? As discussed previously, many studies

exist that aim to quantify the extent of counterfeiting or piracy at the aggregate level, be it sectoral or economy-wide. Most of these studies have serious shortcomings, both in the data employed and in the adopted methodologies. More important, aggregate estimates of the incidence of piracy and counterfeiting by themselves offer policy makers little guidance on appropriate IP enforcement policies.

More useful guidance emerges from micro studies that take into account the specific characteristics of different industries and comprehensively assess the effects of illicit activities on prices, consumer demand, company revenues, innovative behavior, and overall welfare. Such studies are still scarce. The data challenges are no less, and creative approaches are needed to establish causality and derive credible estimates. Experimental studies could also play an important role, particularly in combination with broader empirical investigations. For example, researchers could gather field panel data to analyze the overall impacts of counterfeiting, and supplement them with lab experiments to understand the underlying mechanisms (see Qian 2013; Qian and Rucker 2013).

The quality of any future empirical work will largely depend on the quality of the underlying data, however. Given the illegal nature of counterfeiting and piracy, collecting representative and systematic data on all relevant economic variables will continue to be a challenge, and progress will only be gradual. Nonetheless, several promising avenues exist.

For example, more could be done to improve and harmonize data collection in the course of IP enforcement activities. Customs statistics are an obvious place to start because they are generally the most direct source of information about the extent of piracy and counterfeiting flows that cross international borders. Many customs offices already compile and publish data on seizures of counterfeit and pirated goods. Although the World Customs Organization has developed international guidelines for reporting on seized products, actual reporting practices differ substantially across countries. For example, some countries report

the number of seizures, whereas others focus on the quantity of seized goods, or the number of consignments. Substantial differences also exist regarding the valuation of seized goods (World Customs Organization 2009).

From an analytical point of view, it would be important to achieve as much consistency as possible in the treatment of firms, products, and sectors. Data collection needs to be done consistently over time to track trends and analyze the impacts of changes in enforcement policy. Sampling interceptions data could be extended to detailed subcategories of goods to gain a better understanding of the scope of counterfeit trade.

Beyond customs statistics, there is scope for collecting more comprehensive data associated with domestic law enforcement activities, notably through the judicial system. To our knowledge, no systemic effort exists at the international level to promote and harmonize the collection of such data. Intergovernmental organizations can play a more active role in coordinating data collection initiatives, promoting the harmonization of reporting standards, and offering technical assistance to developing country governments.

At the domestic level, governments may want to consider adopting an impact evaluation framework, especially when new IP enforcement policies and measures are introduced. Continuous data gathering would be an essential component of such a framework. Finding appropriate control groups against which enforcement activities could be evaluated may prove challenging but is possible in certain circumstances—especially when new initiatives are first implemented on a pilot basis.

In addition, there is scope for conducting original surveys to support targeted analytical work. Surveys of rights holders on key performance characteristics as they relate to counterfeiting activity could usefully complement firm-level data available through industry or official sources. Depending on the industry, rights holders may also possess valuable information on the nature of, and markets for, counterfeit and pirated goods that was gathered

in the course of their own market intelligence and enforcement activities. Surveys of rights holders could take place within existing cooperation programs between the public and private sectors. Such firm surveys should be designed to collect as detailed and comprehensive data as possible while guaranteeing the anonymity of respondents when submitting sensitive business information.[16]

In the longer term, as information from these surveys—especially across countries—becomes more standardized and comprehensive, econometric models could be developed to estimate important market parameters about which limited information exists. Most prominently, the demand characteristics and substitution parameters between legitimate goods and counterfeit goods are important to estimate to gain an accurate picture of damages imposed on rights holders and the associated effects on employment and research-and-development spending. Such estimates need to be subjected to significant sensitivity and robustness analysis to ensure that they can be deployed with confidence.

After these parameters are estimated, it would be feasible to develop computational general equilibrium models to assess the country-specific and international impacts of counterfeiting and piracy, particularly accounting for cross-industry effects and employment channels. Models of this sort would be particularly useful for assessing the potential impacts of additional policy efforts to counteract illicit trade and production. It is important to emphasize, however, that such models necessarily rely on strong assumptions that could be misleading in this context. For example, employment in the counterfeiting and piracy sector is largely informal, and few models can manage the linkages between informal sector and

[16] There are also recent attempts to employ surveys to estimate the incidence and characteristics of counterfeit and substandard drugs. For example, Bates et al. (forthcoming) studied 1,437 samples of Ciprofloxacin in 18 low-to-middle-income countries. These authors found that 9.88% of samples contained less than 80% of the correct active ingredient, and 41.5% of these failures are counterfeits. Counterfeit and substandard drugs tend to differ in two observable attributes: first, counterfeit drugs are more likely to mimic drugs registered with local drug safety regulators than substandard drugs. Second, after controlling for other factors, substandard drugs are on average cheaper than generics, whereas counterfeit drugs do not show any significant price difference.

formal sector employment. Still, with appropriate caveats, these models should be an improvement over existing estimates of economy-wide losses in employment and tax revenues because those estimates do not account for aggregate relationships in the economy.

Note

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References

Aghion, P., N. Bloom, R. Blundell, R. Grith, and P. Howitt. 2005. "Competition and Innovation: An Inverted-U Relationship." *Quarterly Journal of Economics* 120 (2): 701–28.

Akerlof, G. A. 1970. "The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanism." *Quarterly Journal of Economics* 84 (3): 488–500.

Anderson, E., Y. Qian, and D. Simester. 2010. "Spillover Effects of a Low-quality Entrant." Northwestern University and MIT Working Paper.

Arora, A., A. Fosfuri, and A. Gambardella. 2001. *Markets for Technology: The Economics of Innovation and Corporate Strategy*. Cambridge, MA: MIT Press.

Bakos, Y., E. Brynjolfsson, and D. G. Lichtman. 1999. "Shared Information Goods." *Journal of Law and Economics* 42 (1): 117–55.

Bates, R., G. Jin, and A. Mathur. "Falsified or Substandard? Assessing Price and Non-Price Signals of Drug Quality." *Journal of Economics & Management Strategy*. In press.

Besen, S. M. and S. N. Kirby. 1989. "Private Copying, Appropriability, and Optimal Copying Royalties." *Journal of Law and Economics* 32 (2): 255–80.

Bhattacharjee, S., R. D. Gopal, K. Lertwachara, and J. R. Marsden. 2007. "The Effect of P2P File-Sharing on Music Markets: A Survival Analysis of Albums on Ranking Charts." *Management Science* 53 (9): 1359–74.

Bian, X., and L. Moutinho. 2009. "An Investigation of Determinants of Counterfeit Purchase Consideration." *Journal of Business Research* 62 (3): 368–79.

Bian, X., L. Moutinho, and C. Veloutsou. 2008. "A Cross-National Examination of Consumer Perceived Risk in the Context of Non-Deceptive Counterfeit Brands." *Journal of Consumer Behaviour* 7 (1): 3–20.

Blackburn, D. 2004. “Does File Sharing Affect Record Sales?” Working paper, Department of Economics, Harvard University.

Bloch, Peter H., Ronald F. Bush, and Leland Campbell. (1993). “Consumer ‘Accomplices’ in Product Counterfeiting: A Demand Side Investigation.” *Journal of Consumer Marketing* 10 (4): 27–36.

Bonnett, T. (2010). “Four in Five People Download Illegally.” Sky News Online, March 19. Available at http://news.sky.com/home/technology/article/15576542.

Branstetter, Lee, Ray Fisman and C. Fritz Foley. 2006. “Do Stronger Intellectual Property Rights Increase International Technology Transfer?” *Quarterly Journal of Economics* 121 (1): 321–49.

BSA. 2012. “2011 BSA Global Software Piracy Study.” May. Available at http://globalstudy.bsa.org/2011/downloads/study_pdf/2011_BSA_Piracy_Study-Standard.pdf.

Burnkrant, Robert E. and Alain Cousineau. 1975. “Informational and Normative Social Influence in Buyer Behavior.” *Journal of Consumer Research* 2 (3): 206–14.

Casola, Luca, Simon Kemp, and Alexander Mackenzie. 2008. “Consumer Decisions in the Black Market for Stolen or Counterfeit Goods.” *Journal of Economic Psychology* 30 (2): 162–71.

Conner, Kathleen R. 1995. “Obtaining Strategic Advantage from Being Imitated: When Can Encouraging ‘Clones’ Pay?” *Management Science* 41 (2): 209–25.

Conner, Kathleen R. and Richard P. Rumelt. 1991. “Software Piracy: An Analysis of Protection Strategies.” *Management Science* 37 (2): 125–39.

Fink, C. 2009. “Enforcing Intellectual Property Rights: An Economic Perspective.” World Intellectual Property Organization WIPO/ACE/5/6, August 26. Available at http://www.wipo.int/edocs/mdocs/enforcement/en/wipo_ace_5/wipo_ace_5_6.pdf.

Fink, C. 2013. “Intellectual Property Rights: Economic Principles and Trade Rules.” In A. Lukauskas, R. M. Stern, and G. Zanini, eds., *Handbook of Trade Policy for Development*. Location: Oxford University Press.

Frontier Economics. 2009. “The Impact of Counterfeiting on Governments and Consumers.” Report commissioned by BASCAP. May. Available at http://www.icc.se/policy/statements/2009/BASCAP.pdf.

Grossman, G.M., and C. Shapiro. 1988a. “Counterfeit-Product Trade.” *American Economic Review* 78 (1): 59–75.

Grossman, Gene M., and Carl Shapiro. 1988b. “Foreign Counterfeiting of Status Goods.” *Quarterly Journal of Economics* 103 (1): 79–100.

Harbaugh, Rick and Rahul Khemka. 2010. “Does Copyright Enforcement Encourage Piracy?” *Journal of Industrial Economics* 58 (2): 306–23.

Hui, Kai-Lung, and Ivan Png. 2003. “Piracy and the Legitimate Demand for Recorded Music.” *Contributions to Economic Analysis and Policy* 2 (1): Article 11.

International Federation of the Phonographic Industry. 2003. *The Recording Industry Commercial Piracy Report 2003*. Available at http://www.ifpi.org/content/library/Piracy2003.pdf.

International Federation of the Phonographic Industry. 2010. *Recording Industries in Numbers 2010*. Available at http://www.ifpi.org/content/section_news/20100428.html.

IPSOS Public Affairs. 2003. Internet Piracy on Campus. Research report.

Javorcik, Beata Smarzynska. 2004. “The Composition of Foreign Direct Investment and Protection of Intellectual Property Rights: Evidence from Transition Economies.” *European Economic Review* 48 (1): 39–62.

Johnson, William R. 1985. “The Economics of Copying.” *Journal of Political Economy* 93 (1): 158–74.

Keller, Wolfgang. 2004. “International Diffusion of Technology.” *Journal of Economic Literature* 42 (3): 752–82.

Kwong, Kenneth, Oliver H.M. Yau, Jenny S. Lee, Leo Y.M. Sin, and Alan C.B. Tse. 2003. “The Effects of Attitudinal and Demographic Factors on Intention to Buy Pirated CDs: The Case of Chinese Consumers.” *Journal of Business Ethics* 47 (3): 223–35.

L.E.K. Consulting. 2005. *The Cost of Movie Piracy: An Analysis Prepared by LEK for the Motion Picture Association.* Available at http://www.archive.org/details/MpaaPiracyReort.

Leung, Tin Cheuk. 2013. “What is the True Loss Due to Piracy? Evidence from Microsoft Office in Hong Kong.” *Review of Economics and Statistics* 95 (3): 1018–29.

Liebowitz, S. J. 2005. “Pitfalls in Measuring the Impact of File-Sharing on the Sound Recording Market.” *CESIfo Economic Studies* 51 (2–3): 435–73.

Liu, Ke, Jing-An Li, Y. Wu, and K.K. Lai. 2005. “Analysis of Monitoring and Limiting of Commercial Cheating: A Newsvendor Model.” *Journal of the Operational Research Society* 56 (7): 844–54.

Maffioletti, Ana and Giovanni B. Ramello. 2004. “Should We Put Them in Jail? Copyright Infringement, Penalties and Consumer Behaviour: Insights from Experimental Data.” *Review of Economic Research on Copyright Issues* 1 (2): 81–95.

Markusen, James R. 2001. “Contracts, Intellectual Property Rights, and Multinational Investment in Developing Countries.” *Journal of International Economics* 53 (1): 189-204.

Maskus, Keith E. 2000. *Intellectual Property Rights in the Global Economy*. Washington DC: Institute for International Economics.

———. 2005. “Strengthening Intellectual Property Rights in Lebanon.” In C. Fink and K. E. Maskus, eds., *Intellectual Property and Development: Lessons from Recent Economic Research*. New York: World Bank and Oxford University Press.

———. 2007. “Lack of Intellectual Property Rights.” In B. Lomborg, ed., *Solutions for the World’s Biggest Problems: Costs and Benefits*. Cambridge: Cambridge University Press.

Maskus, Keith E. and Mohan Penubarti. 1995. “How Trade-Related are Intellectual Property Rights?” *Journal of International Economics* 39 (3/4): 227–48.

Mertha, Andrew C. 2005. *The Politics of Piracy: Intellectual Property in Contemporary China*. Ithaca, NY: Cornell University Press.

Metro-Goldwyn-Mayer Studios Inc., et al. v. Grokster, Ltd. et al. 2005. 545 U.S. 913. Available at http://w2.eff.org/IP/P2P/MGM_v_Grokster/04-480.pdf.

Newton, Paul. N., Michael D. Green, and Facundo M. Fernández. 2010. “Impact of Poor-Quality Medicines in the ‘Developing’ World.” *Trends in Pharmacological Sciences* 31 (3-3): 99–101.

Oberholzer-Gee, Felix and Koleman Strumpf. 2007. “The Effect of File-Sharing on Record Sales: An Empirical Analysis.” *Journal of Political Economy* 115 (1): 1–42.

Oberholzer-Gee, Felix and Koleman Strumpf. 2010. “File-Sharing and Copyright.” Working paper, Harvard Business School, Harvard University.

OECD. 2005. *OECD Report on Digital Music: Opportunities and Challenges*. Paris: OECD. Available at http://www.oecd.org/dataoecd/13/2/34995041.pdf.

OECD. 2008. *The Economic Impact of Counterfeiting and Piracy*. Paris: OECD. Available at http://www.oecd.org/document/4/0,3343,en_2649_34173_40876868_1_1_1_1,00.html.

OECD. 2009. “Magnitude of Counterfeiting and Piracy of Tangible Products: An Update.” Research report. Available at http://www.oecd.org/dataoecd/57/27/44088872.pdf.

Peitz, Martin, and Patrick Waelbroeck. 2004. “The Effect of Internet Piracy on Music Sales: Cross-Section Evidence.” *Review of Economic Research on Copyright Issues* 1 (2): 71–79.

Penna, Frank J., Monique Thormann, and J. Michael Finger. 2004. “The Africa Music Project.” In J. M. Finger and P. Schuler, eds., *Poor People’s Knowledge: Promoting Intellectual Property in Developing Countries*. Oxford: Oxford University Press.

Qian, Yi. 2008. “Impacts of Entry by Counterfeiters.” *Quarterly Journal of Economics* 123 (4): 1577–1609.

———. 2013. “Brand Management and Strategies against Counterfeits.” *Journal of Economics and Management Strategy*. Forthcoming.

———. 2010. “Counterfeiters: Foes or Friends.” Working paper, Kellogg School of Management, Northwestern University.

Qian, Yi, Qiang Gong, and Yuxin Chen. 2013. “Untangling Searchable and Experiential Quality Responses to Counterfeiting.” Working paper, Kellogg School of Management, Northwestern University.

Qian, Yi, and Derek Rucker. 2010. “Income Inequality and Counterfeiting.” Working paper, Kellogg School of Management, Northwestern University.

Qian, Yi, and Hui Xie. 2010. “Bayesian SEM with Random Changepoints in Analyzing the Timing of Responses to Counterfeits.” Working paper, Kellogg School of Management, Northwestern University.

Recording Industry Association of America. 2006. “The Recording Industry Association of America’s 2005 Year-end Statistics.” Available at http://www.riaa.com.

Rob, Rafael and Joel Waldfogel. 2006. “Piracy on the High C’s: Music Downloading, Sales Displacement, and Social Welfare in a Sample of College Students.” *Journal of Law and Economics* 49 (1): 29–62.

Scherer, Frederick M. 1967. “Market Structure and the Employment of Scientists and Engineers.” *American Economic Review* 57 (3): 524–31.

Siwek, Stephen E. 2007. “The True Cost of Copyright Industry Piracy to the U.S. Economy.” Institute for Policy Innovation Policy Report #189.

Sun, Jiong, Laurens Debo, Sunder Kekre, and Jinhong Sun. 2010. “Component-based Technology Transfer in the Presence of Potential Imitators.” *Management Science* 56 (3): 536–52.

Takeyama, Lisa N. 1994. “The Welfare Implications of Unauthorized Reproduction of Intellectual Property in the Presence of Demand Network Externalities.” *Journal of Industrial Economics* 42 (2): 155–66.

Takayama, Lisa N. 1997. “The Intertemporal Consequences of Unauthorized Reproduction of Intellectual Property.” *Journal of Law and Economics* 40 (2): 511–22.

Taylor, M. Scott. 1994. “TRIPS, Trade, and Growth.” *International Economic Review* 35 (2): 361–82.

Tirole, Jean. 1988. *The Theory of Industrial Organization.* Cambridge, MA: MIT Press.

United States International Trade Commission (USITC). 2011. *China: Effects of Intellectual Property Infringement and Indigenous Innovation Policies on the U.S. Economy*. Investigation No. 332-519, USITC Publication 4226.

Varian, Hal R. 2000. “Copying and Copyright.” *Journal of Economic Perspectives* 19 (2): 121–38.

Vida, Irena. 2007. “Determinants of Consumer Willingness to Purchase Non-deceptive Counterfeit Products.” *Managing Global Transitions* 5 (3): 253–70.

Wilcox, Keith, Heyeong Min Kim, and Sankar Sen. 2009. “Why Do Consumers Buy Counterfeit Luxury Brands?” *Journal of Marketing Research* 46 (April): 247–59.

WIPO. 2013. “WIPO Studies on the Economic Contribution of the Copyright Industries.” Available at http://www.wipo.int/export/sites/www/copyright/en/performance/pdf/economic_contribution_analysis_2013.pdf.

World Customs Organization. 2009. “Customs and IPR Report 2009.” Available at http://www.wcoomd.org/files/1.%20Public%20files/PDFandDocuments/Reports/Extract_IPRReport2009.pdf.

Zentner, Alejandro. 2006. “Measuring the Effect of Music Downloads on Music Purchases” *Journal of Law and Economics* 49 (1): 63–90.