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THE ECONOMIC EFFECTS OF COUNTERFEITING AND PIRACY: A LITERATURE REVIEW

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1. INTRODUCTION

1. Policymakers from around the world recognize the potentially harmful consequences of trademark counterfeiting and copyright piracy. Like other infractions of the law, infringements of intellectual property (IP) rights undermine trust in a rules-based system that is at the core of modern market-based economies. Yet, instituting a policy framework for combating counterfeiting and piracy poses substantial challenges.
2. An initial challenge is that the economic effects of IP infringements differ across different IP rights and economic sectors.¹ It is important to understand these differences at the theoretical and empirical levels in order to set priorities for IP enforcement policy. Governments are invariably resource constrained and completely eradicating violations of IP law—like violations of other types of law—is out of reach for even the best-resourced states.

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¹ See, for example, Fink (2009)

3. A second challenge stems from the effectiveness of IP enforcement measures themselves. IP rights are private rights and their enforcement is first a responsibility of the rights holders. However, governments exert considerable control over the effectiveness with which private rights are enforced—notably by establishing the legal mechanisms through which right holders can assert their rights, by providing the public infrastructure for private rights enforcement (e.g., courts, police, customs), and by initiating enforcement actions without right holders' complaint (so-called *ex officio* actions). At the same time, the same government measures may have different effectiveness in different jurisdictions, depending on the development of the legal system and other institutional variables. In addition, producers and distributors of pirated and counterfeit goods adapt to private and public enforcement actions and technological advances offer new opportunities for illicit businesses. The effectiveness of certain enforcement measures may therefore diminish over time, requiring new approaches.
4. This paper focuses on the first challenge, namely understanding the socio-economic effects of counterfeiting and piracy. It reviews the academic literature and other studies in the public domain to evaluate what we have learned about these economic effects, both theoretically and empirically. The paper also identifies important gaps in our understanding of the economic consequences of counterfeiting and piracy and develops recommendations on how governments might collect data and conduct studies as an input into the formulation of IP enforcement policy. For the most part, the paper ignores differences and limitations in the effectiveness of IP enforcement measures, which are equally important in formulating IP enforcement policy, but warrant a separate discussion.
5. The paper is structured as follows. Section II approaches the topic from a theoretical perspective. It first reviews the different market failures underlying trademark and copyright protection and explores what happens if these IP rights are violated. The discussion concludes with brief suggestions for future theoretical research. Section III reviews existing empirical evidence, including aggregate estimates of levels of counterfeiting and piracy, academic studies focusing on the effects of IP infringements in particular industries, studies on the effects of Internet file-sharing, and anecdotal evidence from selected case studies. The review of empirical evidence concludes with an evaluation of what approaches have proved most successful in generating credible empirical evidence and with suggestions for future empirical research.
6. Having reviewed existing work, Section IV develops recommendations for data collection and the conduct of future studies on counterfeiting and piracy. In particular, it suggests a role for international organizations in harmonizing the collection of statistics on counterfeiting and piracy. It also argues for greater emphasis on studies that seek to comprehensively evaluate the welfare consequences of IP infringements at the sectoral level.
7. Before proceeding, one caveat is in order. The economic and business literature on counterfeiting and piracy is large and this review cannot do justice to the large number of published studies. Instead, we focus on studies that have been widely cited in academia or in the public policy discourse on counterfeiting and piracy and try to give a flavor of the various approaches that researchers have adopted, without claiming to be comprehensive.

II. THEORETICAL CONSIDERATIONS

8. As is well documented in the literature, IP rights, from an economic perspective, seek to remedy the failure of markets to provide for an efficient allocation of resources. The relevant market failures that give rise to copyright and trademark protection differ.² Accordingly, the economic effects of trademark counterfeiting and copyright piracy are different and warrant separate conceptual discussion.

A. Economics of trademark counterfeiting

9. In the case of trademarks, the welfare effects of counterfeiting depend crucially on whether consumers are deceived by the purchase of a fake good—in other words, whether they (mistakenly) believe that their acquired good is produced by the owner of the trademark. The likelihood of this deception clearly varies across products, depending on their physical properties 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 tell apart an original handbag from its fake clone. We discuss the implications of deceptive and non-deceptive counterfeiting in turn and end with a comment on longer term welfare considerations applying to both forms of counterfeiting.

Deceptive counterfeiting

10. The most relevant market failure giving rise to trademark protection is an example of what economists call asymmetric information. The logic is that for many goods, consumers do not have enough information to ascertain the quality of a potential purchase. A trademark, which associates a product or a service with its producer, offers valuable information to consumers about the origin of a good. Producers establish a reputation for different levels of quality and by attaching trademarks to their goods they reduce the costs consumers would face in gaining assurance about those goods. By the same logic, trademarks enable high quality producers to distinguish themselves on the market, thereby giving them an incentive to undertake investments for improving product or service quality.
11. Deceptive counterfeiting employs copied trademarks, logos and designs to confuse consumers into believing they are buying the legitimate product. This is called “primary market” counterfeiting by OECD (2008). In the presence of information asymmetries, deceptive counterfeiting is bound to be welfare reducing.³ Purchasers of a counterfeit product derive a value from the product which is below the price they paid for it as soon as they discover it is fake.⁴ Rational consumers aware of the presence of fake goods on the market, though unable to distinguish them from the originals, will be unwilling to pay the full price of a high quality good. As a consequence, the incentive for producers to invest in

² The discussion in this paper focuses on infringements of trademark rights (counterfeiting) and copyright (piracy), though many of the arguments and conclusions apply to other IP rights as well

³ Grossman and Shapiro (1988a) confirm the welfare-reducing effect of counterfeiting when there is free entry into markets for original products. Surprisingly, they also find that welfare effects are more ambiguous if the number of original producers in a particular market is fixed. This counter-intuitive result is due to information asymmetries leading market outcomes to be second-best even in the absence of counterfeiting. The existence of counterfeiting, in turn, may alter the rivalry among original producers in a way that they supply products at higher quality, leading to consumer welfare gains. However, the policy implications of this special result are not clear, as governments would find it difficult to fine-tune trademark enforcement such as to maximize overall welfare.

⁴ See Liu et al. (2004) for a formal treatment.

higher quality is undermined and markets for high quality goods may not exist (Akerlof, 1970).

12. For certain products, the consumption of deceptive counterfeit products may 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. The presence of negative externalities calls for public action against counterfeit products, independent of any private incentive for enforcing trademark rights.

Non-deceptive counterfeiting

13. A more complex situation arises for products for which consumers are perfectly able to ascertain the quality attributes of a product at the moment of purchase, and therefore know whether they are buying a counterfeit. This situation is termed “secondary market” counterfeiting by OECD (2008). Since no information asymmetry prevails, trademarks, at first sight, seem irrelevant. However, for a certain class of goods—so-called status goods—the display of the product’s or the producer’s name may confer prestige on the purchaser, yielding utility independent from the utility derived from the goods’ physical or functional characteristics. Counterfeiting of status goods may affect the prestige value that consumers derive from their purchases.
14. Prestige value has psychological and social roots. It may be purely imaginary—for example, when a consumer derives pleasure by wearing the same fashion apparel as a celebrity. It may also arise from peer pressure to conform to a particular trend or from the knowledge of belonging to an exclusive club of consumers able to afford a high-end consumer product. Whatever its origin, prestige value is real, as is manifested by the substantial marketing outlays of producers of luxury goods and, indeed, the large presence of counterfeits for status goods.
15. In a seminal paper, Grossman and Shapiro (1988b) analyze the effects of non-deceptive product counterfeiting. In their simplified model, the status value associated with a product depends negatively on the number of consumers who purchase a product bearing the same brand name—whether genuine or fake. The logic of this assumption rests on the idea of an exclusive club of consumers, whereby all market participants are able to ascertain the true origin of a product at the point of purchase, but are unable to do so upon casual observation “at a distance”. In this particular setting, the social welfare consequences of product counterfeiting turn out to be theoretically ambiguous. Producers and consumers of the genuine product are worse-off from counterfeits—largely because the greater club size reduces the status value of the genuine product. However, producers and consumers of the counterfeit product are better off. In particular, consumers of counterfeits can derive status value or try out a brands “personality” without paying the full price of the genuine product. The overall effect on social welfare depends on the values of the relevant market parameters and is thus an empirical question.
16. In Grossman and Shapiro’s model, consumers of counterfeit goods impose a negative externality on consumers of original goods by enlarging the size of the exclusive club. One can think of alternative scenarios, where prestige value is independent of the number of consumers purchasing the same good or where the presence of counterfeit goods even enhances the status value of original products. All other things equal, the welfare consequences from counterfeiting would likely be more positive, though the direction of the overall welfare effect remains ambiguous.
17. Qian (2009) provides a general theoretical framework for analyzing the impacts of entry by counterfeiters and the subsequent legitimate responses under weak IPR laws. Based on

the practical consideration that counterfeits are usually an inferior or similar “copy” of the authentic product, the theoretical model adopts a vertical differentiation setup. In particular, it incorporates two layers of asymmetric information that are potentially generated by counterfeits: (1) counterfeiters fool buyers (see the discussion on deceptive counterfeiting above), and/or (2) buyers of counterfeits fool other peer consumers by signaling fake status.

18. Non-deceptive counterfeiting can be analyzed within the model by simply setting the relevant asymmetric information parameters to special-case values that eliminate deceptive counterfeiting. One of the key theoretical predictions of this study 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. This threshold level is higher where consumers have more limited information, for then the quality of the legitimate product would have to be higher to induce sufficient demand. This helps to explain the innovation strategies that authentic firms employ in response to entry by their counterfeiters.⁵ It should be noted that the possibility that original producers may choose to innovate higher quality levels in response to competition from counterfeiters does not imply that welfare will be higher or that the induced innovation is efficient in the marketplace.
19. The impacts that counterfeits have on market prices are more complex than those of a low-quality competitor due to two opposing effects. On the one hand, asymmetric information deepens competition between the incumbent and the counterfeit entrant, which tends to reduce prices. On the other hand, the aforementioned incentive for improving quality may push up costs and prices. In addition, Qian’s model demonstrates how authentic producers could invest in “self-enforcement” strategies to limit the competition from counterfeit goods. Such strategies include private IP enforcement, conspicuous packaging of products, and specially-licensed company stores. These tactics can increase pressure on counterfeiters to cease selling to consumers desiring higher quality levels.
20. In Qian (2009), quality was broadly measured by the cost of producing a good, which is a one-dimensional measure. In practice, quality can take on multiple dimensions. For instance, there are tangible, or “searchable”, elements of quality, such as the general appearance of shoes and other characteristics that are visible to consumers at the time of the purchase. There are also characteristics that consumers may not observe immediately, such as the technology that went into producing a pair of shoes. These functional features usually take time to experience and infer. Qian et al (2009) study the effects of counterfeiter entry on decisions by original producers to upgrade the searchable and experiential dimensions of quality of the authentic incumbents. Building a vertical differentiation model with these two dimensions of quality, they find that entries by counterfeiters induce an authentic producer to invest more in improving visible quality and less in improving experiential quality, as compared to how that firm reacts to competition from legitimate, lower-quality entrants. They additionally show theoretically that visible quality can serve as a positive signal for the degree of experiential quality.

Longer term welfare considerations

21. In cases of either deceptive or non-deceptive counterfeiting, producers of genuine products are bound to generate lower profits, due to restrained pricing power and reduced demand for their products. If original IP holders anticipate lower profits in the presence of

⁵ As identified in Qian (2008).

counterfeiting their willingness to invest in developing new goods would be diminished, ultimately reducing the rate of new product development and lowering consumer welfare. As pointed out in the above discussion, however, the competitive pressure exerted by the presence of counterfeit and pirated goods may also encourage certain forms of innovation among genuine producers, especially as they seek to differentiate their product offerings from available clones. These Schumpeterian trade-offs are well-recognized in the industrial organization literature (see Scherer, 1967 and Aghion et al., 2005).

B. Economics of copyright piracy

22. In the case of copyright, the key point of departure is the public-good nature of creative expressions. Books, music, films, and other expressions can be reproduced at low marginal cost—in the case of the Internet, at virtually zero marginal cost—and enjoyed in a “non-rival” way by many consumers. As the famous slogan has it: information wants to be free. However, the creative process takes real resources and if competitive market forces were to provide creative works at marginal cost, actors, artists, authors, producers, and publishers would have no direct financial incentive to undertake the investments for creating those works in the first place.
23. Copyright offers a solution to this well-known market failure. It affords producers of creative works with exclusive rights and thereby enables them to reap a profit from the commercial exploitation of those works, allowing for the financing of creative investments.
24. Copyright protection is not without limits. To establish a balance between the need for incentives for creating new works and the desirability of wide availability of those works, copyright has a limited term and certain exceptions and limitations to exclusive rights exist in areas where society reaps special benefits from the rapid dissemination of creative works.
25. In light of this essential economic rationale for copyright protection, what are the implications of copyright piracy? The basic answer is that sufficiently large levels of copyright infringements will undermine incentives for creating new works, ultimately lowering social welfare.⁶ Indeed, copying tends to flourish where originals command a high price relative to the cost of producing copies. It also is endemic where copying is cheap (it is essentially free in the case of digital goods) and the likelihood of detection or meaningful punishment is perceived to be low. In such circumstances, widespread copying can significantly diminish the incentives to develop and produce new software, music, books, films, and other cultural goods with high development costs.
26. That said, there are a number of additional considerations and special cases that nuance this basic conclusion.

⁶ Johnson (1985) shows that additional welfare losses occur if the production of a copy uses more resources than the production of an original product. However, digitization has arguably reduced the costs of copying, such that original producers are unlikely to have a substantial production cost advantage. Besen and Kirby (1989), in turn, show that original producers might even benefit from copying if the marginal cost of producing copies is increasing in the number of copies. Yet again, with modern copying technology, this assumption is unlikely to hold. Finally, Bakos et al. (1999) show that the sharing of copyrighted material among small social communities (e.g., family or friends) can increase or decrease copyright holders' profits, depending on the structure of consumer preferences. However, their analysis does not apply to large-scale commercial piracy—the main focus of this paper

27. One relevant question is how consumers of original works fare in the presence of pirated copies, in particular whether the price of original works will be higher or lower if there are competing pirated copies. Industrial organization theory suggests an ambiguous impact (Besen and Kirby, 1989; Takeyama, 1997). The direction of the price effect depends critically on the demand elasticity of those consumers still buying originals, compared to the total demand elasticity. If the former is sufficiently lower than the latter, it is possible for prices of originals to be higher in the presence of pirated copies, despite the competition exerted from the latter. To put this differently, if consumers who prefer to buy legitimate software, music, and other copyrighted works have relatively inelastic demand, the effect of copying can be for original producers to concentrate their sales on this group, which pushes up price. Overall sales of legitimate copies are likely to be lower, however, as the copying-oriented group may be abandoned.
28. A current example of this process in the literature is the model by Harbaugh and Khemka (2010). They 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 are able to charge higher-than-monopoly prices to those users. The remaining users in the market then purchase pirated copies, which are likely to be of inferior quality. When enforcement is spread more broadly through the market, however, original producers will sell more legitimate copies and the prices will fall to the monopoly level, even as the volume of pirated goods diminishes. In this situation it is possible to observe more IP-protected goods on the market and an increase in overall consumer benefits.⁷
29. A further simple reason that legitimate prices may rise in the face of piracy is that unauthorized copying may induce copyright holders to add features and functionality to legitimate copies in order to distinguish them in the marketplace. In turn, these features support higher prices, which consumers of originals are willing to pay, while pirated copies command lower prices (Varian, 2000). This idea was explained in detail by Liebowitz (1985), who presented empirical evidence that academic journals raised their prices after the introduction of photocopying (“reprography”) because they had become more valuable to consumers. In this case, perhaps paradoxically, the additional features were liberal conditions regarding the right to copy.
30. Finally, note that books, journals, music and videos are “information goods” that can be shared across multiple uses and users through copying, rentals, and literal sharing. This fact certainly affects strategies of the content producers and copyright owners, who must decide the formats, timing, functionality, and prices of such goods. As analyzed by Varian (2000), copyright owners are likely to sell fewer copies at higher prices in order to manage the sharing problem. This strategy is likely to be profitable where there are low transactions costs in sharing (e.g., movie rentals) and where sharing markets permit 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.

Demand linkages

31. Another important aspect is the possible influence of “demand linkages”, loosely defined as one consumer’s purchase of a creative work affecting the purchasing behavior of other

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Maskus (2000) relates anecdotal evidence that this price moderation happened in the software industry when Taiwan improved its enforcement activities in the 1990s

consumers. One form of demand linkage is network externalities (sometimes also referred to as demand-side economies of scale), whereby one consumer's valuation of a creative work increases with the number of other consumers owning the same product. Computer software serves as an important example. Clearly, the prospect of easily sharing data with other consumers increases the attractiveness of a particular software package.

32. What happens if creative works subject to network externalities are pirated? Assuming that original and pirated copies are perfect substitutes, or at least highly interoperable in the case of software, consumers of both types of products will likely be better off. For consumers of original copies, the presence of pirated copies will enlarge the size of the consumer network with which they can interact, increasing the value of the work for the individual consumer. Consumers of pirated copies will, in addition, benefit from royalty-free access to the work.
33. The effects of copyright piracy on the producer of the creative work and overall welfare are ambiguous. As shown in Conner and Rumelt (1991) and Takeyama (1994), it is theoretically possible for the copyright owner to reap higher profits from certain levels of piracy. The intuition for this result is that the enhanced value of the product for consumers of originals may allow the producer to charge a higher price supporting higher profits. The copyright system in this scenario acts as a vehicle for third-degree price discrimination. In theory, the copyright owner could achieve the same outcome by simply giving away for free a certain number of original works. In practice, such a strategy would not work, as all consumers would line up for a free legitimate copy. However, consumers differ in their propensity to break the law, 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.
34. The possibility of higher profits for the copyright owner in the presence of pirated copies raises the intriguing possibility of a Pareto-improving outcome—all market participants being better off with a certain level of piracy than without. The probability of such an outcome depends on the significance of the network effect and other relevant market parameters, which are ultimately empirical questions.
35. Conner (1995) takes a broader look at strategies of encouraging imitation, where the imitators are firms that sell (imperfect) “copies” in the open market and consumers knowingly purchase the copies. The model builds on Tirole’s (1988) treatment of vertical differentiation and Conner and Rumelt’s (1991) model of network effects in software piracy, and focuses on a set of basic factors that can drive the returns a firm might expect from imitation. In particular, the model suggests that key factors to consider in assessing whether encouraging cloning is the innovator’s best strategy are: the benefit to be derived in terms of added user base “contributed” by the clone sales and the unit sales that will be lost to the clone(s). These factors in turn depend upon the strength of the network externality and the degree to which the innovator’s product quality supersedes the clone’s in consumers’ minds. However, the model has a few simplifying assumptions that one needs to bear in mind. First, the clone is assumed to have identical costs to the innovator’s, instead of lower costs in many practical scenarios. Second, the results may not apply when consumer tastes for the innovator’s technology are unevenly distributed. For instance, if there are few high-valuation consumers, then clones may disproportionately “steal” away a large amount of sales, making cloning unappealing to the innovator. Third, the model is static in nature and does not consider dynamic impacts of cloning or the quality choices of the innovator.
36. A second form of demand linkage relevant to copyright piracy is the influence of peers on purchasing decisions. For example, the purchase of a creative work by one consumer may

offer a second consumer a “taste” of that work, stimulating additional purchases. Peering effects may also result from social pressure to conform to popular trends within certain communities.⁸ While being technically different from network externalities, their economic implications are similar. In particular, the spread of pirated copies may stimulate demand for original copies, softening the negative effect on producers and possibly even leading to higher profits. As will be discussed in the next section, peering effects have been important in discussions on the economic effects of Internet file-sharing, prompting a large number of empirical investigations.

C. Effects on tax revenue, employment, and organized crime

37. In policy discussions on trademark counterfeiting and copyright piracy, tax revenue and employment effects have played some importance. From an economic perspective, these effects can be evaluated either in a partial-equilibrium setting or in a general-equilibrium setting. The former better describes the short term effects of *changes* in levels of counterfeiting and piracy, whereas the latter more appropriately captures the longer term effects of a given *level* of these activities.
38. The overall partial-equilibrium employment effects are theoretically straightforward and depend on the output movements of the licit and illicit producers and the intensities with which labor is used in the production of original and pirated copies.⁹ The same holds for tax revenue effects, which are bound to be negative as sales of pirated and counterfeit products occur in informal markets and usually do not generate tax revenue (e.g., sales tax, corporate income tax, import tariff collection). In addition, to the extent that counterfeiting and piracy reduce sales of legitimate producers, tax collections from those firms are diminished.
39. No conceptual research seems to exist that looks at the circumstances of employment in the licit formal and illicit informal sectors, including the setting of wages, the existence and impact of social safety nets and the nature and length of possible unemployment spells.
40. Long term general-equilibrium effects are often ignored in policy discussions on IP enforcement, but they are crucial. Workers losing employment likely find other jobs and governments facing a revenue shortfall likely adjust their tax structure to sustainably 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 appears to exist in the literature that would offer any conceptual guidance.
41. Finally, a negative externality may exist through linkages producers of illicit goods have with organized crime. In particular, profits from sales of counterfeit and pirated goods may serve to finance other illegal activities (e.g., drug trafficking or alien smuggling) imposing harm on society. Again, the presence of this type of negative externality gives rise to self-standing public enforcement action, independent of private rights enforcement.

⁸ See Burnkrant and Cousineau (1975) for a formal exposition of these effects

⁹ See Maskus (2005) for an example of a partial equilibrium model that captures employment effects and a simulation analysis performed for several industries in the case of Lebanon

D. Recommendations for future theoretical research

42. While the economic literature offers useful theoretical guidance on the economic effects of counterfeiting and piracy, a number of questions deserve further exploration. We highlight two such questions here.
43. First, as described above, the presence of (non-deceptive) counterfeit goods exerts an externality on consumers of originals. In the analysis of Grossman and Shapiro (1988b) this externality was assumed to be negative and took the form of counterfeits diluting the exclusivity value of status goods. This assumption appears appropriate for some classes of goods, but not for others. Indeed, survey evidence suggests that there is substantial heterogeneity in consumers' decisions to purchase counterfeit versus authentic products (see Section 3.D). Other types of externalities—both positive and negative—are conceivable and it would be important to analyze how their presence would affect consumers, producers, and overall welfare. In addition, it would also be interesting to analyze how the type and strength of externality can be influenced by the marketing strategies of genuine producers and how such strategies affect market outcomes.
44. Second, as mentioned above, hardly any 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 affect welfare of different types of workers. Better understanding broader labor-market linkages may also be important for designing effective IP enforcement policies. Fink (2009) hypothesizes that fines or the short-term incarceration of offenders of IP rights may have little impact on the fundamental incentives of individuals to break the law. In particular, offenders are likely to discount the risk of punishment when they first break the law and are therefore bound to return to their illicit activities.

3. REVIEW OF EMPIRICAL EVIDENCE

45. Economic theory is helpful for rigorously thinking about the likely effects of trademark counterfeiting and copyright piracy. However, as pointed out in the previous discussion, some effects are theoretically ambiguous and require empirical investigation. In addition, even where the overall direction of effects is conceptually clear, empirical insights on the scale of effects are needed for policymakers to set priorities for public policy.
46. Notwithstanding the need, generating credible empirical evidence poses a significant challenge. Counterfeiting and piracy, by their nature, are illegal activities and thus largely escape official statistical recording. The base for empirical research is thus weak and studies have to 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 hard to measure at both the individual and the aggregate society level. In what follows, we critically review relevant empirical studies, focusing on the extent to which the underlying methodologies produce credible results.
47. We start with a review of aggregate estimates of the level of counterfeiting and piracy, then move to studies that have sought to evaluate the welfare impact of these activities at the micro level, review in some detail studies that have specifically focused on the effects of Internet file sharing, and conclude with an evaluation of the advantages and disadvantages of alternative empirical approaches.

A. Aggregate estimates of levels of counterfeiting and piracy

48. It is useful to start the review of aggregate estimates by considering efforts to ascertain the incidence of piracy and counterfeiting in international trade. Focusing on trade appears promising, as goods undergo processing when they cross borders. In particular, customs authorities investigate suspected infringements of IP rights, generating indirect data on the incidence of pirated and counterfeit goods in different product categories and for different exporting and importing economies.
49. The most comprehensive study seeking to quantify the importance of counterfeit and pirated goods in international trade was done by the OECD (2008). The study estimated the value of pirated and counterfeit goods in international trade at up to US\$ 200 billion, or around 2 percent of global merchandise trade in 2005. In a November 2009 update of this study, the OECD estimated the value of illicit goods in international trade to have grown to up to US\$ 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.
50. The OECD report recognizes that their estimates are only “a crude indicator” of the value of counterfeit and pirated products in international trade. This caution appears warranted. The OECD estimate employs data on interceptions and seizures by customs authorities in selected countries to estimate propensities of counterfeit and pirated goods in different product groups and across exporting economies. For example, the highest incidence of counterfeiting arises in wearing apparel, while China is the largest source nation. The final estimates are then derived by applying the estimated propensities to actual bilateral trade flows. This estimation process entails several methodological problems.
51. To begin with, the reported seizure rates are taken to capture the relative importance of counterfeit and pirated goods across different product categories. However, as the report acknowledges, seizure rates are equally influenced by profiling schemes employed by customs authorities to detect illicit goods and by inherent differences in the detectability of those goods. In addition, the depth and nature of information on interception and seizure rates reported by customs authorities varies (see also below), forcing the OECD to make a number of assumptions in the calculation of propensities to detect an illicit good.
52. More significantly, estimated propensities provide information about the relative incidence of pirated and counterfeit goods across product groups or across exporting economies, but do not say anything about the absolute incidence of such goods. To arrive at the US\$ 200 and US\$ 250 billion figures quoted above, OECD staff use a value of the absolute incidence of counterfeit and pirated goods in one particular “fix-point” product group (wearing apparel, leather articles and tobacco products). However, this value is not based on any hard data, but rather seems to reflect the best guess of OECD staff. The report also does not explain how counterfeit and pirated goods were valued in the “fix-point” product group and how differences in the market value of illicit goods across industries may affect the overall estimate.
53. A final problem is that the analysis takes place at the highly aggregated 2-digit Harmonized System (HS) categorization of traded goods.¹⁰ Within each such category there are

¹⁰ This list of methodological problems is not exhaustive. The OECD report describes several other important problems that likely bias the resulting estimates

typically hundreds of goods sub-categories that may or may not be subject to much counterfeiting. The OECD analysis assumes that its average rates computed at the aggregate level apply to each sub-category. When applying these averages to bilateral trade flows, which can vary across sub-categories considerably, this approach may seriously misstate the actual amount of counterfeit trade. The direction of bias is unclear but in many cases is likely to overestimate the underlying illegitimate trade flows.¹¹

54. Notwithstanding these methodological caveats and leaving aside the headline number, the evidence on the relative incidence of counterfeit and pirated goods across product groups presented in the OECD report 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 2-digit HS level) account for more than three-quarters of all customs seizures.
55. Moving beyond trade, a large number of studies—often sponsored by affected industries—are available that seek to quantify the incidence of pirated and counterfeit goods at the level of specific sectors and estimate their effects on certain economic performance variables. The methodological approaches and quality of the data in these studies varies substantially. A detailed review of each of these studies would go beyond the scope of this paper, but it is worth highlighting a number of common issues.
56. First, given the inherent difficulty of accurately measuring 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 turn up useful information about attitudes toward piracy and means of unauthorized copying but the resulting estimates of illegitimate use need to be treated cautiously.
57. To take one industry as an example, the Business Software Alliance (BSA) and consulting firm IDC released their seventh joint study in May, 2010, in which it is argued that the global piracy rate in business-oriented and PC software, including video games, rose from 41 percent in 2008 to 43 percent in 2009, with this piracy representing an economic value over \$50 billion.¹² This finding came from a survey of 111 countries, with the rates ranging from around 20 percent (United States and Japan) to over 90 percent (Georgia and Bangladesh). To compute these rates, IDC conducted surveys of sampled consumers and businesses in a smaller set of 28 countries to determine the number of computers in use. It also determined from respondents the number of these computers on which was installed legitimately procured software in several categories. The difference between the total software installed (assuming all computers need it) and legitimately purchased is the amount of piracy. While this approach is sensible in that it relies on reported measures of legitimate usage in relation to overall computer capacity, both of which figures may be reliable, it is difficult to tell from the BSA literature what the underlying

¹¹ Overestimation may result from the majority of reported counterfeit goods arising in a small number of aggregated categories, including wearing apparel, electrical equipment, leather goods and footwear. Each is assigned an aggregate counterfeiting propensity that may suffer from a positive sampling bias since they are based on customs data generated by policies that focus on such goods. When these estimates are applied to the multitude of sub-categories that are produced in different countries the approach effectively assumes that all similar countries produce the same relative bundle of within-category goods. This is unlikely to be true in practice, however, since countries specialize considerably even within broad categories

¹² See Business Software Alliance (2010)

sampling biases may be. It also ascribes to piracy some use of open-source software and freeware.

58. More problematically, piracy rates are estimated for countries not in the sample surveys by means of a correlation between software usage and an “information development index” published by the International Telecommunications Union (ITU). The extent of bias in the estimates for these non-sampled nations arising from both the underlying approach and the application of the ITU index is unknown. Regarding the latter there is likely to be considerable variation in its applicability to countries of differing economic and social characteristics, as is the case for most such “development” indexes.
59. Other studies rely on secondary sources of the incidence of counterfeiting and piracy, of which the precise origin and reliability is not clear (see Frontier Economics, 2009 and the studies cited in Screen Digest, 2010).
60. 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/IDC piracy estimates illustrate this point. On the basis of their estimates of the volume of unlicensed software, the authors compute its commercial value by applying a vector of prices for various kinds of computer programs, including retail, licensed, and open-source, to this measure. This total value is then taken as a measure of lost sales for legitimate software producers in each country. BSA/IDC take pains to assign prices based on the situation in each country, which is more accurate than assigning a global price vector or one based on software values in a reference country. Still, this approach assumes that each unit of pirated software would be fully replaced by a purchased version if copying were eliminated. Accordingly, one may anticipate that their estimates of volumes and values foregone, and therefore economic damages, are overstated to an unknown degree.
61. In other studies, it is unclear how the figures reported are actually calculated. One example is a prominently cited study of the costs of illegal copying of movies, performed on behalf of the Motion Picture Association.¹³ This study placed global losses in sales of the major U.S. studios at \$6.1 billion in 2005, with 80 percent of those losses arising in foreign markets. Including both DVD copying and internet downloads, the study found the highest piracy rates in China (90 percent) and Russia and Thailand (79 percent). It also claimed that the worldwide movie industry, including producers, distributors, theaters, video stores, and pay-per-view sellers, lost \$18.2 billion in sales. The approach was to survey 20,600 movie consumers in 22 countries and extrapolate these results to another 42 nations based on an unspecified regression model. The calculations of lost sales values were based on the assumption of a one-to-one substitution: each consumer who admitted to buying an illegal DVD or downloading a film was assumed to be willing to buy it at prevailing legitimate DVD and ticket prices. The study did not examine any biases that might result from its sample selection or interview techniques.
62. Some studies take into account demand responses, but do not carefully model price formation in the counterfactual scenario. In addition, where demand responses have been incorporated, they usually rely on ad-hoc assumptions about consumer behavior rather

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L.E.K. Consulting, *The Cost of Movie Piracy: an Analysis Prepared by LEK for the Motion Picture Association*, available at <http://www.archive.org/details/MpaaPiracyReport>

than rigorously estimated behavioral parameters (see, for example, Frontier Economics, 2009).

63. 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 in the previous section. Possible employment effects in the informal sector are almost always ignored.¹⁴
64. 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 produced by the Institute for Policy Innovation (see Siwek, 2007). The author employed industry-generated measures, such as those from BSA/ICD and LEK, of global sales losses in motion pictures, recorded music, software, and video games. He considered the sum of these losses to be an underestimate since 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 for U.S. industries (including retailers) of \$25.6 billion.
65. The author then applied “multipliers” available from the U.S. Department of Commerce, derived from their 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 economy of \$58 billion per year, along with 373,000 jobs lost due to 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.
66. Although the multipliers do 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 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, the Siwek study offers an assessment of the *gross* losses in sales and employment, but greatly overstates the *net* losses. As described in the previous section, 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.

¹⁴ See, for example, Siwek (2007) and Frontier Economics (2009). The latter study considers the re-employment of workers “losing” their jobs due to counterfeiting and piracy, but does not consider the effects of revenue-compensating tax policies. In addition, their assumption of a certain share of workers not finding re-employment implicitly assumes some form of historical shock which 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.

B. Micro studies on the effects of counterfeiting and piracy

67. While obtaining aggregate estimates of the levels of counterfeiting and piracy are important for understanding the scale of the problem, effective policy cannot be devised without getting down to the micro-level of firms and consumers. Examining the origins and impacts of counterfeiting are necessary for guiding policy remedies.
68. As with any product, the origin of counterfeiting is rooted from both supply and demand. One can argue that illicit suppliers are the culprit of the deceptive types of counterfeiting. Yet consumers who knowingly buy illegal products formulate the other part of the equation that explains the persistence of non-deceptive counterfeits. A number of marketing studies have been conducted to understand consumer psychology and behaviors that underline the demand-side origin of counterfeiting. Many of them are survey or case studies and will be discussed in the next section.
69. There are, however, a few experiments of interest. The methodological limitation of two common types of experiments (field experiments and lab experiments) lies in the tradeoffs between internal and external validities. Field experiments that conduct random assignments of people into control groups and treatment groups, and gather data directly from the field, potentially have higher external validity since participants are real-world consumers who are making statements or decisions about the products of interest in (close to) real-world settings. However, as compared to a lab experiment, it is harder to block off interferences among participants and to exert tight control over the randomized treatment manipulations in a field experiment. Field experiments therefore generate results that are more susceptible to these internal-validity concerns.
70. Consider an example from each of these two types of experiments. First, Bloch, et al (1993) examines the consumer's role as "accomplice" in the proliferation of product counterfeiting. They discuss 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. They also investigate product perceptions and decision criteria used by consumers and the potential implications for marketers. They found that a significant price gap and negative attitudes toward "large branded companies" (as phrased in the original survey) were the main factors in driving counterfeit demand. Second, Wilcox et al (2009) conduct lab experiments and find that products with large-branded logos were more likely to be valued for their ability to help consumers gain social approval and status, a characteristic referred to as a social-adjustive function. In turn, this characteristic makes consumers more willing to buy products of counterfeiters that use such logos. Additionally, they found that a consumer's willingness to buy a counterfeit was correlated with the existence of advertising campaigns that emphasized the social-adjustive function of the good.
71. The existing experimental studies, represented by the two described above, suffer from several other limitations. First, they rely on self-reported attitudes and preferences by a limited sample of participants. Second, the participants agreeing to take the studies are usually more interested in, or have stronger views about, the subject matter of counterfeiting. They also are potentially more price sensitive and therefore respond more to monetary rewards of the studies than would a random selection of individuals from the general population. These are serious self-selection problems. Third, these studies can only present a limited number of stimuli (usually three to four variations of a particular product) to the participants in order to solicit reasonable responses within the limited study time and budget. Fourth, the studies mostly capture only a snapshot of consumer attitudes, rendering them imperfect reflections of true attitudes and behaviors. Fourth, expressed attitudes could also be influenced by different interpretations of question

wordings. In the example of the Bloch et al (1993) study, “large branded companies” could be interpreted as companies with large sales or high-fashion brands.

72. Overall, studying consumer psychology is perhaps more useful for understanding the origins of counterfeits than for estimating the economic impacts of counterfeiting. For the latter, it is most fruitful to collect field data, over a period of time to generate a sample panel, on actual branded firms and their infringers. This is a challenging task due to the illicit nature of counterfeiting and to the confidentiality concerns of most companies. Nonetheless, a series of recent studies have been carried out in this direction.
73. Qian (2008) offers what is to date the most comprehensive and econometrically sound empirical investigation on the economic impacts of counterfeits. She collects original panel data from Chinese shoe companies from 1993–2004 through stratified random sampling. She combines survey and interview data with the companies’ financial statements. The author was able to exploit a “natural experiment” of sorts in that in 1995 there were a number of safety concerns associated with counterfeiting and sub-quality products in several industries such as the food and agricultural sectors. In response, government enforcement efforts were reduced exogenously for the footwear sector at that time, inducing entry of counterfeit products because of the lower likelihood of detection and punishment. It was important that the enforcement reduction was less for some brands than for others, permitting an analysis across legitimate companies.
74. Qian identifies and measures the effects of this competition from counterfeit goods on the prices, qualities, and other market outcomes of authentic footwear. The results show that brands with less government protection differentiate their products through innovation of higher visible quality, engaging in “self-enforcement” (see above), establishing vertical relationships with licensed downstream retailers (“company stores”) in order to control their sales, and higher prices to signal legitimacy in the marketplace. These reactions have the effect of reducing counterfeit sales. Interestingly, the brands for which enforcement efforts remained largely unchanged were less affected by counterfeiting in this regard.
75. The analysis further shows that counterfeit entry may exert downward pressure on prices by lowering expected quality in the short run. However, it also may stimulate the original producer to offer a higher quality product at a higher price. This suggests that innovation can be a successful business strategy to mitigate copycat competition. Moreover, as shown by Qian et al. (2009), based on detailed shoe characteristics data, branded companies improved their shoe surface materials and various other tangible appearance dimensions after infringement by counterfeits, whereas the functionality dimensions did not experience significant improvements. Note, however, that all of these innovation and differentiation strategies are costly. Although the authentic prices dropped initially, the long-term effects on driving up authentic-product prices kicked in at different 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, potentially because they were more diversified and less influenced by domestic counterfeits (Qian and Xie, 2010).
76. These empirical findings have implications for enforcement policies. First, other evidence from the case of the Chinese footwear industry reveals that public enforcement efforts outperformed private ones. After the loosening of government enforcement in footwear, authentic companies had to tolerate a higher level of counterfeiting even after implementing a set of business strategies against counterfeits. The importance of government enforcement is also reflected in the fact that the high-priority safety sectors, to which enforcement resources were reallocated, experienced no major health or safety accidents during those years when they were monitored under close scrutiny.

77. Field panel data of the kind used in the 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 some caution. First, correlations among variables in observational data do not always imply causality because there may be many confounding effects. The footwear study overcomes this limitation to a large extent through identifying a natural experiment where the variations of counterfeiting across brands came primarily from an exogenous policy shift rather than endogenous brand characteristics.
78. Second, even when field panel data are available for estimating how economic performance changes in response to counterfeiting, the underlying mechanism may be difficult to pin down, especially when the mechanism may arise through counterfeits altering consumer psychology. For instance, Qian (2010) collects additional product-line level data on authentic and counterfeit footwear products to explore the sales impacts of counterfeiting and examines whether it has heterogeneous effects on products of three different quality tiers. In particular, sales of the high-end authentic products increased after entry by counterfeits but those of the low-end authentic products declined. She argues that counterfeits have both an advertising effect on the brand (inducing more awareness of the brand) and a 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. This idea could not be tested in the available field data, so Qian (2010) supplements her empirical investigation with lab experiments. She discovers evidence that there are such heterogeneous effects of counterfeits on consumer purchases of branded products of three quality tiers.
79. A further 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, 2010).
80. Finally, some micro studies are available that look at the economic effects of copyright piracy (in addition to the evidence on Internet file sharing that will be reviewed in the next section). Notably, Hui and Png (2003) estimate the effects of physical CD piracy on the legitimate demand for recorded music in an econometric setting. Their model expressly accounts for the demand linkages outlined in the previous section (sales of pirated copies could stimulate more demand for originals). The economic results show that piracy had a negative net effect on the demand for legitimate music, though Hui and Png's estimate for forgone sales by copyright holders is 58 percent lower than the music industry's estimate.¹⁵ The latter assumes a one-for-one substitution of pirated with legitimate purchases, whereas Hui and Png's model allows for a share of price-sensitive consumers to choose not to switch to legitimate goods in the counterfactual scenario. As a limiting feature, however, their model assumes that copyright holders do not adjust prices in response to lower piracy. If the presence of pirated copies in the market had led copyright holders to lower prices on the volume of sales in their sample, the revenue losses would have been higher than estimated.
81. 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) find that students' willingness to pay for a CD is generally 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-for-one basis. At the same

¹⁵ The latter is available in IFPI (2003).

time, the study revealed 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. This outcome was noted in survey evidence of the pricing strategy of legitimate software producers in Asian countries as copyright enforcement improved (Maskus, 2000).

C. The effects of file sharing on the Internet

82. 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 the commercial piracy discussed in the remainder of this review. In particular, many individuals 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.

83. Of course, there are also circumstances in which file downloaders make those files available to others in order to make money. Evidently, there are music services that permit uploads of unauthorized files in return for some payment by users or to sell advertising on their sites, though it is unclear how common the use of such sites is. Indeed, the U.S. Supreme Court, in its decision in the *Grokster* case, confirmed that file-sharing with commercial intent was illegal. As that decision noted:¹⁶

"StreamCast and Grokster make money by selling advertising space, by directing ads to the screens of computers employing their software. As the record shows, the more the software is used, the more ads are sent out and the greater the advertising revenue becomes. Since the extent of the software's use determines the gain to the distributors, the commercial sense of their enterprise turns on high-volume use, which the record shows is infringing."

84. Further, 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 UK found that more than 80 percent admitted to having downloaded at least one file without authorization, while 47 percent said they did not think it was a crime.¹⁷ In a survey of 1,000 American college students in 2003, 69 percent said they had downloaded music and 75 percent of those indicated they never paid for it.¹⁸ Moreover, 76 percent responded they would download even if they suspected the music file was illegal. These perceptions are one of the reasons why this form of unauthorized use is more difficult to control by copyright owners.

85. Regardless of the motivation, downloading and file-sharing through peer-to-peer (P2P) networks is common. The OECD (2005) calculates that one-third of internet users in its member nations have downloaded files from P2P networks. As for the effects of downloading and file-sharing, U.S. shipments of recorded music on compact disks fell by

¹⁶ *Metro-Goldwyn-Mayer Studios Inc., et al v. Grokster, Ltd. et al*, 27 June 2005, p. 22. Decision available at http://w2.eff.org/IP/P2P/MGM_v_Grokster/04-480.pdf

¹⁷ Reported by Sky News at http://news.sky.com/skynews/Home/Technology/Free-Music-Searches-For-Illegal-Downloads-Prompt-Survey-Into-British-Attitudes-To-Online-Piracy/Article/201003315576542?lpos=Technology_First_Technology_Article_Teaser_Region__3. The report does not describe the sampling techniques used in the survey

¹⁸ IPSOS Public Affairs, Internet Piracy on Campus, (Washington DC), September 16, 2003

25 percent between 2000 and 2005 (RIAA, 2006). Representatives of the music publishers blamed this trend on illegal downloads and peer-to-peer (P2P) file-sharing. Most recently, a global music industry association noted a seven percent drop in music sales in 2009, though it was unclear how much may be attributed to unauthorized activity (IFPI, 2010).¹⁹ That report claims that P2P piracy accounted for more than 20 percent of global internet traffic, with higher shares in Latin America and Europe.

86. This proliferation of file-sharing presumably has affected authorized music sales. A number of economists have investigated this claim. In an early study, Rob and Waldfogel (2006) collected data on albums obtained via 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 some displacement: each download was estimated to reduce album sales by a lower bound of 0.2, which mimicked the overall data fairly closely. They also computed 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. Student downloaders were winners, even if music publishers and record stores were losing control of distribution. The study did not consider impacts on employment in the sector.
87. The most widely debated analysis was by Oberholzer-Gee and Strumpf (OS, 2007), who pointed out that downloading could, in theory, increase or decrease album sales because displacements could be offset by increased demand from learning about new music and sampling different artists—precisely, the peering effects outline in Section 2. They compiled data on 1.75 million P2P file transfers in a sample of countries over the last four months of 2002 and determined which recordings were most commonly downloaded. They matched song titles to weekly sales in the United States over the same period of commercially available albums that included the same songs. Thus, the dependent variable was weekly sales of a sample of individual albums that appeared in a commercial database. They found, as might be expected, that the most popular songs were downloaded far more frequently than average and that the median song in the sample was not downloaded at all.
88. The authors regressed the volume of sales by album on the number of downloads of songs on the album, album characteristics, time effects, and album fixed effects. To control for the obvious simultaneity problem that popular songs would be consumed via both album sales and file-sharing, the OS analysis relied on a two-stage approach. In the first stage their primary instrumental variable was the number of German secondary-school kids who were on holiday. The argument is that free time permits users to wait for lengthy file transfers, which may then be uploaded for use by consumers in the United States. They also interacted these holidays with certain album characteristics as further instruments. Their results were striking. First, in a basic OLS 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. In short, they concluded that the notable decline in album sales in the early part of the decade was not a result of the massive amounts of file sharing but some other factors.
89. This finding has been criticized on a number of grounds, primarily by Liebowitz (2005, 2006, and 2007). First, OS claimed that the decline in album sales was due to

¹⁹ IFPI, *Recording Industries in Numbers 2010*, at http://www.ifpi.org/content/section_news/20100428.html

idiosyncratic features of the music industry in the early 2000's and that trend sales were not falling. These observations are not consistent with subsequent sales figures. Second, there are questions about the difficulty of accurately measuring download trends over a short time period. Third, the basic instrumental variable, German school kids on holidays may not adequately capture variations in the global supply of songs for file uploads. For example, this choice ignores the file-sharing propensities of college students in various international markets.

90. In a more recent study, Oberholzer-Gee and Strumpf (2010) acknowledge that file-sharing has reduced music sales, but by more modest amounts than generally supposed. They find that downloads explain at most 20 percent of recent declines in legitimate music sales. Further, they argue that offsetting increases in demand for complementary music services, including concerts and sampling, have increased incentives for creation of new music, books and movies. Thus, their argument has shifted from arguing that copyright owners (music studios) are unharmed by file-sharing to claiming that copying of that kind has increased overall creativity. These conclusions are based on a review of available broad data rather than econometric estimates.
91. Those papers aside, the bulk of other available studies suggests that downloads are harmful to legitimate music sales. For example, Zentner (2006) analyzed a sample of 15,000 European consumers in 2001. Simple OLS estimation found that high-frequency P2P users also tended to buy more music, indicating the need to control for tastes. He chose as instruments individual-level of sophistication in internet use and availability of broadband. Zentner's instrumental variable estimation found that access to P2P services reduced the probability of the average person buying music by 30 percent. In turn, he computed that this lowered CD sales overall by around 7.8 percent in 2002. Note that Zentner assumed a one-to-one substitution: people who downloaded an album would buy an album in the absence of the ability to copy music. Thus, while this is a sensible econometric study, its result, while suggestive, likely overstates the potential costs to music publishers.
92. Blackburn (2004) pointed out that file-sharing can be a two-edged sword for musicians. Such downloading is more likely to target songs by established artists, tending to reduce their sales as consumers substitute copying for music purchases. However, newer and lesser-known artists may gain from a penetration effect as their music is downloaded and shared, generating potential buyers in the future. He analyzed the effect of the growing stock of music files on P2P networks, controlling for album fixed effects. Blackburn found in his fullest specification, including endogeneity controls for the stock of available music files, that download availability reduced significantly the sales of successful (large-volume) artists, while raising sales of lesser-known artists.
93. However, this distributional impact was asymmetric, because the destruction of sales of high-volume established musicians far outweighed the creation of sales on behalf of new artists. Since the former musicians are the primary source of revenues for music companies their concerns about file-sharing reducing their sales are understandable. In his counterfactual calculations using the statistical estimates, Blackburn found that a 30-percent reduction in music files available for P2P sharing would have raised industry sales by 10 percent in 2003, or approximately 66 million albums. This is the only available estimate of the elasticity of original album sales to file-sharing, computed here to be - 0.34.²⁰

²⁰ It should be noted that this prediction is based on a market change that lies well outside the sample estimation range.

94. Peitz and Waelbroeck (2004) used a sample of 16 countries over the period 1998-2002. They regressed the growth in the number of physical units of pre-recorded music in each nation on the change in the percentage of adult internet users who downloaded music files in MP3 format at least once during the period, along with controls for GDP size, broadband penetration, and the percentage of household with digital media players. They found a significantly negative impact of the increase in illegal downloading on growth of recorded music sales, attesting to the fact that the problem is international. Their estimates suggested that downloads reduced the number of compact disks sold by up to 20 percent. This result should be treated cautiously, however. The coefficients on download percentage were significant at the ten percent level in just two of eight specifications. Further, the authors did not account for the two-way causality between music sales and internet access, which omission likely biases the download coefficient upward. At the same time, they only had data on the percentage of households that downloaded music at least one time, rather than the number of downloads made by each household. It would be better to know the volume of downloads, and whether some share of those were authorized, before making strong claims about the impacts on demand. Finally, it is difficult to translate the number of physical units not sold into a meaningful dollar figure for sales lost.
95. The most recent analysis appears to be Bhattacharjee, et al. (2007). In that paper the authors correlated data file-sharing from a P2P network called WinMX with weekly rankings of albums on the Billboard Top 100 charts for matched 34-week periods before and after file-sharing became common. They found that the period during which albums survived on the charts was significantly shorter in the file-sharing era than before. However, two-stage least squares analysis, controlling for the endogeneity of the albums available for file-sharing, found little effect of the P2P network on the time period an album was actually available in the stores. This analysis said nothing about implied impacts on overall sales or profits.
96. Overall, while there are cross-cutting results, and while finding reliable data and establishing clear-cut causality is difficult, the majority of the empirical literature seems to point to a negative impact of unauthorized downloading and file-sharing on the ability of music publishers to sell and control distribution of their products. As noted by Oberholzer-Gee and Strumpf (2010), however, this finding does not necessarily imply that the incentives to create new music and other cultural items has been diminished, since complementary income streams and the potential for expanded markets through sampling could offset the direct impacts on music sales. Put differently, 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 far more study. Finally, it is worth pointing out that the studies above focused on the sales impacts, not on employment, tax or other socioeconomic effects.

D. Evidence from consumer surveys

97. Consumer behavior is a growing research area because it helps observers understand why consumers buy counterfeit goods. In turn, this knowledge is critical to explain the nature of the demand for counterfeit products and to devise effective strategies to combat it. Almost all the studies in this area are based on surveys or specific cases.
98. A key limitation is whether the results may be generalized. To avoid “survey fatigue”, it is customary to ask survey participants about only a few products or product categories. The applicability of the results to other products cannot be guaranteed. In addition, the participants are usually recruited from college students or people at shopping malls, who

may not be representative of the consumer population in general. Another important limitation of survey studies is that people do not always mean what they say. Their answers may be biased because respondents feel they should state opinions that are socially desirable, guess what responses the researcher is looking for, or offer views that are specific to the interviewing context.

99. Vida (2007) summarizes the determinants of why consumers purchase non-deceptive counterfeit products. The paper conducted a study using surveys given to consumers in Slovenia with three different products: counterfeit t-shirts, software, and watches. For t-shirts, consumer willingness was a function of religiosity, gender (males are more willing to buy fakes than are females) and the consumer's attitude toward piracy and his perception of the consequences of piracy. For watches, religiosity only affected the consumer's attitude and education was only mattered in relation to the social costs of potential consequences of buying counterfeits. These are both indirect effects. For pirated software, religiosity was found to be a major factor reducing piracy, as was the likelihood that the consumer was at the forefront of adopting new products. Overall, consumer willingness to buy fakes varied with each product, which makes it difficult to draw general conclusions about how to approach the problem on the demand side. The results of this study, because it only looks at Slovenia, may not necessarily hold in other nations at different levels of development.
100. Bian and Moutinho (2009) also examine the determinants of a consumer's willingness to buy non-deceptive counterfeits. The study used the luxury watch market (Gucci and Rolex) as a model and handed out surveys at twenty malls in Glasgow. The study found that brand personality (what personality the brand reminds consumers of, as defined in the marketing literature) and social risk (concern or uncertainty in the buyer's mind that the purchase of the product under consideration will not be approved of by others) were the two largest determinants of whether a consumer bought a counterfeit. This finding supports the view that luxury items may be purchased more for what they signify (high status) than for what they actually are (fakes). This suggests that consumers will purchase a counterfeit when they feel that there is little social risk in purchasing it and when the counterfeit has a similar brand personality to the genuine product. The study, however, only applies to luxury non-deceptive counterfeiting and may not be representative of non-luxury counterfeits.
101. Casola et al (2008) look at consumer willingness to buy counterfeit goods. To do this, the paper conducted three studies, putting participants in hypothetical situations and recording their responses. The study looked at variables related to how acceptable people thought entering a counterfeit market would be and how much they would pay for counterfeit goods. All three studies observed that the perceived victim of counterfeiting was an important factor. Consumers were less willing to buy counterfeits when the victim was seen as an individual as opposed to an organization. The need of the consumer was another important factor; it was acceptable to go to a counterfeit market if survival was the motivation whereas simply saving money was viewed less favorably. Additionally, it was found that the average consumer would participate in such markets if he or she could buy goods for about one-third of the legal price. Finally, the study found that consumer willingness to buy counterfeit goods was reduced if they were given information about the consequences their actions would have on others. This hints that spreading awareness about the harmful consequences of counterfeiting may be an effective solution.
102. Bian and Veloutsou (2008) posit that one of the main factors in understanding consumer behavior is the consumer's perceived risk when they buy a counterfeit product, in this case sunglasses. The paper seeks to understand perceived risk by studying non-deceptive counterfeiting through surveys given to consumers in China and the UK. The study found

that perceived financial, physical, and performance risks were moderate in the counterfeit context. Despite this general finding, there were some differences between the China and UK populations. The UK data were more robust and the regression analysis was more predictive than those of the Chinese dataset. Additionally, there were a number of statistically significant differences on determinants of perceived risk between the UK and China. Thus, it is evident that counterfeits are perceived differently in each country. This study was, however, limited solely to one good (sunglasses) and only to non-deceptive counterfeits, perhaps making the results not general.

103. Kwong et al (2003) address aspects of consumer attitudes and demographic factors and their effects on one's willingness to buy pirated goods. The paper conceptualized the attitudinal component in four categories: social cost, anti-big business attitude, social benefit, and ethical beliefs. The paper then surveyed consumers at stalls selling pirated CDs in Hong Kong. They found that a consumer's willingness to buy counterfeits was strongly positively correlated to their attitude on piracy. Additionally, it was found that approximately 70 percent of the respondents stated that they bought pirated CDs, which was seen as an activity with high social benefit and low social cost. It was interesting to note that increased consumer willingness to buy counterfeits was also correlated with youth and male gender. Further, socio-economic status and education level did not affect an individual's willingness to buy counterfeits.

E. Advantages and disadvantages of different empirical approaches

104. In reviewing the different empirical approaches, it is clear that no single approach exists that satisfies all the information needs of policymakers. Aggregate estimates of levels of counterfeiting and piracy can be useful in informing policymakers about the overall scale of illicit activities. However, given data limitations, they typically have to rely on crude assumptions on the incidence of piracy and counterfeiting and associated revenue effects, questioning the reliability of the resulting estimates. In addition, aggregate estimates reveal little about the effects of counterfeiting and piracy on social welfare.
105. Micro studies are more insightful in this respect and they can therefore provide better guidance in the design of enforcement policies. Data challenges are equally severe, but the numerous studies reviewed in this paper show that, with creativity, some inroads are possible. The bigger challenge lies probably in credibly establishing causality, given the many confounding influences on the key economic variables of interest, such as prices, quality, and output. "Clean" natural experiments, along the lines of Qian (2008), are not easy to find (though they do exist).
106. Experimental studies and consumer surveys offer a partial way out. The experiments in the existing literature, however, are usually confined to identifying consumer attitude and behavior, due to the difficulty of designing experiments that firms would be willing to participate and comply with. From an analytical viewpoint, it would be helpful to design experiments where authentic firms are randomly assigned to experience counterfeiting at different levels. The experimenter could then examine these firms' performances over time to evaluate the causal effects of counterfeit infringements. It is in practice a challenging task to convince any company to be a willing participant in light of the possibility of lost revenue and longer term brand devaluation, not even to mention the numerous legal hurdles such an experiment would entail. In addition, the results of lab experiments may not lend themselves to broader quantification, for example at the level of industries.

4. RECOMMENDATIONS FOR DATA COLLECTION AND FUTURE EMPIRICAL WORK.

107. Policymakers in countries at different stages of development are interested in better understanding the economic effects of trademark counterfeiting and copyright piracy. What direction should future analytical work take?
108. As discussed in the previous section, a large number of studies exist that seek to quantify the extent of counterfeiting or piracy at the aggregate—sectoral or economy-wide—level. Most of these studies have serious shortcomings, both concerning the data employed and the adopted methodologies. More importantly, aggregate estimates of the incidence of piracy and counterfeiting by themselves offer policymakers little guidance about appropriate IP enforcement policies.
109. More useful guidance emerges from micro studies that take into account the specific characteristics of different industries and that 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 in establishing causality and deriving credible estimates. There is also an important role for experimental studies, particularly in combination with broader empirical investigations. For instance, researchers could gather field panel data to analyze overall impacts of counterfeiting and supplement with lab experiments to understand the underlying mechanisms, as in Qian (2010) and Qian and Rucker (2010). Researchers could further use the findings in historical field data to guide fruitful manipulation conditions in field experiments and to establish firm causal relationships between counterfeit conditions and the various economic outcomes.
110. The quality of any future empirical work will depend to a large extent on the quality of the underlying data. 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, a number of promising avenues exist.
111. To begin with, 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, as they are generally the most direct source of information about the extent of piracy and counterfeiting flows that cross international borders. Many offices already compile and publish data on seizures of counterfeit and pirated goods. While international guidelines for reporting on seized products have been developed by the World Customs Organization, 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.²¹
112. 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 a period of time in order to track trends and analyze the impacts of changes in enforcement policy. Sampling of interceptions data could be extended to detailed sub-categories of goods to gain a better understanding of the scope of counterfeit trade.

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See also the World Customs Organization's *Customs and IPR Report 2009*

113. Beyond customs statistics, there is scope for collecting more comprehensive data associated with domestic law enforcement activities, notably through the police and the judicial system. To our knowledge, no systemic effort exists at the international level to promote and harmonize the collection of such data. Inter-governmental 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.
114. At the domestic level, governments may want to consider the adoption of 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 can be evaluated may prove challenging, but is possible in certain circumstances — , where new initiatives are first implemented on a pilot basis.
115. Invariably, customs and direct enforcement data at best can capture a subset of illicit activity and generally do not address Internet piracy. Moreover, they only capture a subset of the variables needed for comprehensive economic analysis. Additional data sources are needed to paint a more complete picture of counterfeiting and piracy activity and to enable credible economic analysis.
116. Indeed, there is scope for conducting original surveys to support targeted analytical work. To begin with, surveys of rights holders on key performance characteristics as they are related to counterfeiting activity can 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, gathered in the course of their own market intelligence and enforcement activities. Surveys of rights holders could take place within already 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. They should gather quantitative data (for example, sales, prices, and employment) as well as information on strategic responses (for example, price setting, quality and marketing adjustments, and innovative behavior).
117. Direct surveys of markets of counterfeit and pirated goods, including on-line markets, face practical and possibly also legal difficulties, but could still yield valuable information. As a general principle, surveys should be based on random (or stratified) sampling to promote the generalizability of subsequent empirical investigations. Ideally, they should be conducted at regular time intervals to enable an assessment of how changes in IP enforcement policy and market conditions affect market behavior.
118. 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 we have limited information. Most prominently, the demand characteristics and substitution parameters between legitimate goods and counterfeit goods are important to estimate in order to gain an accurate picture of damages imposed on rights holders and the associated employment effects and impacts on research and development (R&D) spending. Such estimates need to be subjected to significant sensitivity and robustness analysis to ensure that they may be deployed with confidence.
119. Once 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, 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 in the informal sector and few such models can manage the linkages between informal-sector and formal-sector employment. Still, with appropriate caveats they 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 (or do so in an ad-hoc manner).

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