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THE POLITICAL ECONOMY OF INTELLECTURAL PROPERTY PROTECTION: THE CASE OF SOFTWARE

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The Political Economy of Intellectual Property Protection: The Case of Software

(Revised Version)

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Abstract

The end of the 20th Century was marked by a sea change in global governance in the realm of intellectual property rights (IPRs). Whereas countries historically retained substantial autonomy in this policy domain, the 1990s witnessed the establishment of new global obligations regarding national practices for the treatment of intellectual property. This paper focuses on the case of software "piracy" to assess the mechanisms by which the new global obligations for the treatment of intellectual property are transmitted from the international to the national levels. We first consider a set of national-level factors that many scholars have shown to affect IPP. We then supplement the standard emphasis on domestic factors with an analysis of new transnational factors: countries' multilateral obligations under the World Trade Organization's IPRs provisions; and bilateral pressures from the United States to increase the protection of IPRs. Population averaged panel data models are used to assess the effects of these national and transnational determinants on levels of software piracy in 80 countries from 1994-2002. Our results indicate that membership in the WTO and bilateral pressures from the US – particularly pressures that offer reciprocal concessions – lead to substantial increases in levels of protection in rich and poor countries. There is, in short, a new *international* political economy of IPRs.

The Political Economy of Intellectual Property Protection:

The Case of Software

The end of the 20th Century was marked by a sea change in global governance in the realm of intellectual property rights (IPRs). Whereas countries historically retained substantial autonomy in this policy domain, the 1990s witnessed the establishment of new global norms regarding national practices for the treatment of intellectual property. At the heart of these changes were the introduction of the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), a binding international agreement that sets new universal standards for how countries grant and protect IPRs, and the increased attention given to IPRs in the foreign policy of the United States. The new standards stipulated by TRIPS and the new practices demanded by the US require countries to increase significantly the range of products and processes that qualify for protection as "intellectual property" and also to increase considerably the extent of protection provided for such products and processes.[1]

This paper assesses the mechanisms by which the new global obligations for the treatment of intellectual property are transmitted from the international to the national levels. To be sure, as IPRs have gained increased prominence on the international economic agenda, rich and poor countries alike have responded by reforming their copyright, patent, and trademark legislation, introducing new legislation, and creating new administrative and judicial institutions to facilitate the enforcement of these new rights. In so doing, most countries have brought their IPR regimes into conformity with—and at times exceeded—the standards required by TRIPS. Yet countries with similar laws and institutions can – and do – continue to demonstrate remarkably different practices with regard to IPRs. New international obligations and external pressures may usher in

[1]For explanations of this sea change in global regulation, see, among others, Drahos (1995, 1997); May (2000); Ryan (1998); Sell (1998, 2003); Sell and May (2001).

reforms that have little to do with day-to-day practices. In other words, the convergence in formal legal structure begs the more important questions regarding the conditions that lead to these new rights being practically enforced.

How are we to understand the political economy of intellectual property rights *protection*, rather than simply the enactment of relevant legislation? To address this question we focus on intellectual property enforcement in an especially critical sector: computer software. We chose this particular sector because of its manifest (and increasing) importance in the global economy, the centrality of IPRs to the development of the software industry, and its political influence in many of the largest economies—the very countries that placed IPR protection on the international agenda in the first place (Sell 2003, Chapter 5).

Software presents an ideal case for the examination of the ability of international norms and obligations to affect domestic outcomes. Because approximately 75 percent of the world's packaged software is produced in the United States (Schrank 2003; Carmel 1997), the benefits of increased protection outside the US are likely to accrue disproportionately to foreign rights holders. Enforcement raises costs for large segments of the population that rely on access to cheap software; and enforcing copyrights can impose substantial fiscal costs on the state as well.[2] Indeed, for most (especially developing) countries, the benefits obtained by increasing copyright protection would appear to be outweighed by direct and indirect costs (CIPR 2002: Chapter 5). Furthermore, even where governments decide to offer increased protection, software is an area where the differences between formal legal change and actual enforcement are likely to be

[2]One reason for this is that software protection is typically governed by criminal law, which implies significantly greater involvement of the state in investigation and prosecution. The United States (e.g. USTR 2002) maintains that piracy deprives financial authorities of revenues via diminished tax receipts, but other analyses demonstrate that for most countries increased protection implies substantial net fiscal losses (Finger and Schuler 2000; CIPR 2002).

particularly acute: the barriers to entry for copying others' software are remarkably low, piracy itself is difficult to monitor, and to the extent that the technology is imported rather then produced locally, new laws to enforce copyrights may have few local defenders.

What, then, are the cross-national and inter-temporal dynamics of IPR protection in computer software, and how can they be explained? Table 1 presents industry estimates of software piracy in a broad swath of countries from 1994-2002. Two features of these data are most striking. First, for most regions of the world there has been a dramatic increase in the protection of IPRs in software. At the same time, however, rates of change and overall levels of protection continue to vary widely, and certainly do not exhibit the degree of convergence evident in official legal norms.

Table 1 Here

Our aim in this paper is to provide a political-economic explanation for patterns of protection of intellectual property rights in the software sector. In doing so we examine a range of national and transnational factors, thus building upon and integrating a rich body of scholarship in the fields of economics, international relations, and law. Among the handful of economists who have attempted to explain patterns of IPR protection, for example, the standard finding is that levels of protection are closely related to levels of economic development: wealthier countries offer more protection then poorer countries.[3] These analysts deploy statistical models to distinguish the

[3]See, for example, Maskus and Penubarti 1995; Ginarte and Park 1997; Maskus 2000, 107-109; Marron and Steel 2000. Of these studies, only Marron and Steel (2000) focuses exclusively on copyrights. It is worth noting that most economic work in the field of IPRs, both theoretical and empirical, focuses on copyrights and patents as causal variables. That is, analysts assess the impact of stronger or weaker IPRs on economic outcomes, such as trade, investment, and technology transfer. For reviews of the economics literature, see Maskus (2000: 109-142); Primo Braga and Fink (2000). Although we consider the link between IPRs and economic outcomes in the conclusion, noting the ambiguous relationship and raising red flags about the effects of the

effects of a range of domestic economic, political, and social variables, such as the size of the economy, research and development expenditures, education levels, economic openness, political freedom, market freedom, and culture. This all-but-universal emphasis on domestic factors suffers from profound limitations, for the domestic variables that these studies emphasize change slowly, if at all, while the increase in IPR protection in recent years has been rapid. Moreover, a narrow domestically based approach is inappropriate in the contemporary international political economy. As a large body of international relations and legal scholarship has demonstrated, countries have new obligations that are derived from *global* political changes, changes that include extensive restructuring of the international arrangements for the treatment of IPRs (see the references in note 1). Thus, there are sound reasons to expect not only national but also transnational factors to be important determinants of intellectual property protection. Indeed, the extended recognition and enforcement of IPRs are part of the broader processes of economic reform and global economic integration, and students of these processes have been debating the relative weight of national and transnational causal factors for a considerable period of time (e.g. Stallings 1992; Kahler 1992; Haggard 1995).[4]

The key question regards the mechanisms by which the producers of intellectual property secure protection on the part of the users. We consider both multilateral and bilateral mechanisms. On the multilateral front, we analyze the effects of the WTO, in particular the TRIPS Agreement. As indicated, TRIPS requires countries to offer more protection to a wider

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global trend toward stronger protection, we concentrate in this paper on identifying the *determinants* of intellectual property rights and protection.

range of goods classified as "intellectual property," and by defining IPRs as "trade-related," countries that do not meet their new obligations are subject to painful trade penalties. With regard to software, for example, TRIPS defines software as a form of literary expression, thus making it eligible for copyright protection; and TRIPS requires countries to offer firms with copyrighted software significantly-increased rights of exclusion. On the bilateral front, we examine the IPR-based foreign policy of the United States, the principal advocate of the inclusion of IPRs in the WTO and the leading protagonist of the push towards stronger global protection of IPRs.[5] Each year the United States Trade Representative (USTR) produces an exhaustive report on the IPR practices of a wide range of countries throughout the world, threatening trade sanctions against those countries that do not offer a level of IPR protection equal to that provided in the US. The US also includes IPR obligations that go beyond TRIPS in the bilateral investment treaties (BITs) it negotiates with countries around the world. In light of these unprecedented multilateral and bilateral pressures, we would expect transnational factors to play an important role in driving levels of IPR protection.

Our findings suggest that the conventional economic wisdom – that more developed economies are likely to offer more protection of intellectual property – offers only a partial explanation for contemporary patterns of intellectual property protection in the world software industry. Multilateral and bilateral pressures, particularly membership to the WTO and the US

[4]Technology-owning firms in the developed countries place as much emphasis on IPR protection as banks from developed countries place on debt repayment, for example, and the importance of external pressure – from international institutions and from creditor governments – in debt negotiations is anything but controversial. See Ryan (1998) and Sell (2003) for analyses of lobbying for increased IPP by large US (and European) firms. Aggarwal (1996) and Kahler (1986) examine the effects of commercial banks' activism regarding debt repayment.

[5]To be sure, the European Union and individual European governments have been active on this front as well, but most analysts attribute the broad changes in global governance in IPRs to a

BIT program, strongly circumscribe software piracy in rich and poor countries. We show that these international commitments and external pressures have an enormous impact on domestic political outcomes, even where these forces appear to be at odds with the interests of local economic elites and national governments. There is, in short, a new *international* political economy of IPRs.

The paper has five sections. We begin with a discussion of the political and economic trade-offs involved in protecting intellectual property, in general and with specific regard to software. We then discuss conceptualization and measurement of the outcome we seek to explain: intellectual property *protection*, as distinct from intellectual property rights—that is, public practice as opposed to public policy. After having established the analytic puzzle and presented our approach to measuring the outcome, we consider competing accounts of intellectual property protection. We then subject the hypotheses derived from contemporary scholarship in economics and international relations to systematic cross-national analysis. Lastly, in the conclusion we discuss the significance of our findings and explore avenues for future research.

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fundamental shift in US foreign economic policy since the mid 1980s (Sell 2003; Ryan 1998; Drahos 1995, 1997).

The Politics of Intellectual Property Rights

Two of the principal forms of intellectual property rights are copyrights and patents. Copyrights protect forms of expression (e.g. written materials and artistic works); patents protect underlying ideas used for industrial products or processes. Where computer software receives protection it is ordinarily under copyright law, though in recent years software developers (particularly in the US) have been granted patent protection as well.[6]

If a government fails to enforce copyrights and patents, the processes of artistic creation and invention may take on the character of public goods, and, subsequently, be subject to traditional collective action problems. IPRs are designed to solve the collective action problem by offering inventors and authors temporary monopolies or, in the language of public choice theory, "selective incentives" to pursue their crafts. Consequently, patents and copyrights should prove attractive to producers of intellectual property. At the same time, however, strengthened IPRs may prove unattractive to consumers, who are likely to face higher prices on protected goods.

Managing the trade-offs between producers and consumers is particularly complex with regard to intellectual property. The complexities are derived from the characteristics of expressions and ideas as distinct types of goods. Intellectual property rights are different from "normal" property rights, because ideas are different from tangible goods. Most importantly, ideas are non-rival in consumption and non-exhaustible, meaning that an unlimited number of people can use the same idea simultaneously and repeated use does not deplete or even diminish the stock of the idea.

[6]Trademarks, which protect names and symbols associated with particular products, constitute a third form of IPR. Software owners receive protection via trademarks as well. Besen and Raskind (1991) provide a useful introduction and overview.

On account of these distinct characteristics, many of the standard rationales for giving property owners extensive rights to control the use of their goods go by the wayside. To be sure, without proper incentives to producers, ideas – like tangible goods – run the risk of being under-supplied. But it is not necessary, for example, to endow owners with strong rights to control distribution and restrict use so to avoid depletion of goods that by their very definition are non-exhaustible. To the contrary, restricting use can freeze ideas and stifle innovation. Indeed, a significant body of literature warns of the dangers of too much protection of IPRs. For example, by providing the owners of ideas with more protection, stronger IPRs may *reduce* incentives to innovate and introduce new technologies (e.g. Helpman 1993; Bessen and Maskin 2000). With too much protection, the "tragedy of the commons" may be replaced by the tragedy of the "anticommons" (Heller and Eisenberg 1998), as diminished access to upstream ideas can deter downstream innovation. Thus, the challenge for the management of intellectual property is to create incentives for provision that do not unnecessarily inhibit distribution.[7]

To strike the necessary balance between provision and distribution, IPRs historically have been *limited*. For example, private rights over ideas are not automatically conferred upon possession. Nor are rights indefinite: copyrights and patents expire, after which what is private property enters into the public domain. And the private rights are also limited in the sense of being subject to a range of automatic exceptions, in that third parties also have rights to use ideas and goods protected by IPRs. In the case of copyrights these rights fall under the doctrine of "fair use," which allows third parties to use copyrighted material regardless of the intent of the copyright owner. Indeed, prior to the 1980s most governments throughout the world offered

[7]These are, effectively, the fundamentals (or "first principals") of intellectual property.

porous and weak copyright protection, precisely to encourage diffusion and use (Lessig, 2001: 249).[8]

The sea change in IPRs since the 1980s introduces fundamental changes to the limitations that have traditionally distinguished the treatment of intellectual property from tangible property (May 2000). With regard to software, in addition to making copyrights easier to obtain by simplifying the process of registration, the current arrangements provide the copyright owner with significantly greater rights of control and exclusion (i.e. third parties' rights of "fair use" have been significantly reduced). And by granting software extensive periods of protection, the private rights are made effectively permanent. As Lessig (2001: 252) notes, by the time most operating systems or an applications fall into the public domain it is unlikely that any machine on earth will be able to use them. In sum, the sea change includes introduction of software under copyright law, significantly greater scope of protection for copyright owners, and longer periods of protection.[9]

At the national level, conforming to the new obligations for increased protection of intellectual property involves extraordinarily difficult trade-offs. Increasing protection can potentially stimulate innovation and generate higher economic output, but, as discussed, doing so can lead to diminished diffusion of new goods and, subsequently, higher prices and less

[8]Not only might stronger protection reduce innovation, it is also the case that weaker protection can potentially stimulate innovation. In the case of software, for example, although we may expect individual software programmers to be less willing to dedicate their resources to develop new programs if the finished products are to be delivered free of charge to any and all interested users, the thriving open-source community of software designers suggests otherwise. A quick visit to a website of the open-source community (e.g. http://sourceforge.net) underscores this point.

[9]The effects of increased protection in software are made even more important by a number of the mechanisms that lock in high demand for particular products, even those that are technologically inferior. For example, Schrank (2003) shows that network externalities and the

innovation downstream. Developing countries in particular may have strong incentives to offer minimal protection of intellectual property. In the simplest terms, countries may opt to offer low levels of protection to IPRs to favor users of IP over (usually non-local) producers and to avoid the negative welfare effects of raising the price of potentially key inputs. In addition, because it is expensive to organize and administer an IPR protection system, both in terms of fixed and variable costs, if the size of the sector creating intellectual property – and thus benefiting from the incentives that emerge from protection – is small, then the system may not yield enough benefits in the aggregate to make the investment worthwhile.

The trade-offs involved in granting and protecting IPRs are particularly acute in software, given the sheer domination of the sector by firms from a single country, the United States. While a number of countries have established their own software industries, "none," according to *The Economist,* "has even come close to challenging America on the world market" (1996: p. 6). The US currently dominates the market for software products and services. According to the United Nations Conference on Trade and Development, seventeen of the world's twenty largest software companies are North American, and US firms currently account for more than 50 percent of the world's supply of software and a substantially larger share of packaged software (UNCTAD 2002: 6-9; see also Eischen 2000: 34). And this advantage appears to be growing: while the US played host to three-quarters of the world's top software firms in 1990, it would play host to 85 percent of their counterparts by the late 1990s (see Table 2).

Table 2 Here

The stark divide between the world's producers and users of software suggests that the costs of increased protection in this sector are likely to exceed the benefits for most countries. Thus,

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high costs of switching from one program to another (and coordinating this switch throughout

we should expect most countries to resist the pressures to increase protection. That the world has actually witnessed a dramatic increase in software protection in the 1990s, as reported in Table 1, is indeed puzzling. Why have net consumers changed their behavior and offered strengthened protection of disproportionately US IPRs in software? In the remainder of this paper we seek to explain this puzzle. To do so, we examine both national and transnational factors to which previous scholars have attributed variation in arrangements for creating and enforcing IPRs. Before doing so, however, we first need to explain how we conceptualize and measure the outcome being explained in this study, intellectual property protection.

Conceptualizing and Measuring Intellectual Property *Protection*

Most analysts of IPRs tend to focus on "inputs," such as copyright and patent laws, along with administrative and judicial institutions and practices for enforcing such laws. Rapp and Rozek (1990), for example, developed an index of IPRs by consulting the texts of national patent laws and assessing their conformity with the guidelines for IPRs established by the US Chamber of Commerce (USCC). They ranked countries from zero (lacking patent law) to five (full conformity with the USCC). Ginarte and Park (1997) also use a text-based approach to coding patent systems, but develop a more nuanced and variegated index by scoring countries along five different dimensions: extent of coverage, membership in international treaties, loss of protection, duration of protection, and enforcement procedures.[10]

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public and private organizations) generate enduring first-mover advantages.

[10]Ginarte and Park's (1997) index also ranges from zero to five, but by coding each factor on a scale between zero and one, rather then as a single discrete number, their measure ultimately provides greater variation across countries: because there are more than six possible scores fewer countries share the same score.

Rather then focusing on inputs, we assess IPR "outputs" – the actual amount of protection delivered. Measures of inputs of intellectual property *rights* offer only a rough predictor of the output of intellectual property *protection* (IPP). As in most policy areas, the gap between rules and reality may be large, depending on the resources dedicated to implementation and enforcement. In trade, for example, it has long been known that nominal tariff levels—or even effective rates of protection—tell us little about the actual degree of competition local producers will face without also considering customs practices. Thus, in this area, rather than focusing exclusively on trade policy per se, analysts typically focus on "openness," the ratio of imports and exports to GDP, which is in effect an output-based measure of trade policy.

Or consider the issue of labor rights. While national labor codes are often pro-labor in theory, national enforcement agencies are often pro-business or simply corrupt and predatory in practice. Consequently, a cross-national comparison of labor codes would tell us much less about the actual state of labor rights than a comparison of substantive outcomes. It is obvious, for example, that many states have made international commitments to labor protections (e.g., various ILO conventions) that far exceed what they actually deliver (Bohning 2003).

The gap between theory and practice is evident with regard to intellectual property rights as well. With IPRs integrated into the WTO and bilateral trade and investment treaties negotiated with the US (and with the EU as well), protecting intellectual property has become an expected practice for participants in the global economy. Yet while virtually all countries pay lip-service to the importance of IPRs and have implemented new legislation, enforcement of the new global standards is a different matter (Watal 2001). The distinct importance of enforcement is particularly acute in the realm of software. Designing new legislation to protect copyrights is

considerably easier then enforcing said legislation. For with barriers to entry so low for copying software, the burdens states face in investigation and prosecution can be extensive.[11]

Output measures, then, would seem to be appropriate as they capture the essential role of enforcement. Such measures are also more dynamic, for they allow for the possibility that in any year a country may provide different levels of protection to intellectual property without any change in laws and formal rights. In sum, because the conditions under which governments are both willing and able to actually protect intellectual property in practice may be different from the conditions leading to legislative changes, we seek to explain changes in IPP rather than IPRs.

While IPP is a more useful concept than intellectual property rights *per se*, it is not easily measured. To continue with the analogy to trade protection, the realm of intellectual property lacks a well-accepted indicator comparable to openness. Scholars attempting to focus on outputs have typically used subjective measures, relying, for example, on surveys of US executives' perceptions of actual IPP abroad (e.g. Mansfield 1994; Lee and Mansfield 1996) or elite interviews filtered through their own in-country experience (e.g. Sherwood 1997).[12] The principal problem with these studies is that they deal with small number of countries at a single point in time, and their underlying methodologies make it difficult to apply the measures to more countries and to update the codings. There are even potential selection problems—the only firms willing to enter such markets may be those that are already convinced that at least some level of protection is available, while those firms with less sanguine observations may never enter the

[11]That enforcement presents the greatest challenge of IPR reform in the realm of software was made evident during the Uruguay Round's negotiations of TRIPS. In contrast to pharmaceutical producers and other industries most concerned with patents, which placed greatest emphasis on changing countries' laws, software producers and other industries most concerned with copyrights dedicated themselves to strengthening countries' enforcement procedures (Subramanian 1990: 513).

potential sample. Perhaps the most ambitious attempt to develop a less subjective and more replicable measure of IPP is Ostergard (2000), which combines codings of patent and copyright laws (similar to Ginarte and Park 1997) with US State Department evaluations of actual enforcement practices.[13]

As a proxy for IPP we follow a number of scholars who have used data on global software piracy provided by the Business Software Alliance (BSA 2003), previously summarized in Table 1 (see, e.g., Marron and Steele 2000; Knapp 2000; Teran 2001). The BSA provides annual data, from 1994 onward, on estimated software piracy levels in more than eighty countries. The BSA and the local trade associations with which it works estimate software piracy in three steps. First, they use a country's existing and newly purchased hardware infrastructure to estimate national software demand, i.e., how much software demand one would expect given a country's hardware infrastructure. Second, they obtain industry data on "legitimate" or licensed software sales from local distributors and retailers. And third, they treat "piracy" as the difference between estimated demand and legitimate sales.[14] The BSA's methodology is reasonable, because hardware installations are indeed more easily monitored than software use. And because the calculations are based on available information and are thus verifiable by third parties, we believe that the BSA dataset improves on previous measures.

To be sure, the BSA estimates offer an imperfect measure of IPP, for they assume that all "pirated" sales displace "legitimate" sales regardless of how information technology price and

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[12]These and other measures are reviewed in Ostergard (2000) and Primo Braga and Fink (2000: 39, Box 1).

[13]Though Ostergard proposes a useful methodology for deriving measures of IPP, the actual dataset is of limited utility for our purposes, because it measures IPP prior to the onset of the WTO's TRIPS agreement and the period of increased pressure from the USTR.

[14]Piracy figures are then converted into percentages by dividing piracy by expected software demand. Note that a decrease in piracy is an increase in protection.

purchasing behavior might be affected by stronger copyright protection.[15] In other words, the BSA calculations fail to account for the fact that hardware and software consumption patterns would be altered by the prevalence of higher market prices, and thus likely include an upward bias in levels of piracy. The figures may also have an upward bias on account of underreporting of "legitimate" sales by local vendors seeking to conceal revenues from tax authorities.[16] Yet these shortcomings should be mitigated by our use of the data to evaluate change over time as well as variation over space, for there is no a priori reason to expect these biases to be more acute in one country or one year more than another country or another year. In sum, the verifiability of BSA's calculations, the large number of countries included in the surveys, the extended annual coverage, and the degree of revealed variation make this an appropriate source for our purposes.

Explaining IPP: National and Transnational Determinants

Virtually all econometric studies, whether examining inputs (Maskus and Penubarti 1995; Ginarte and Park 1997; Maskus 2000) or outputs (Marron and Steel 2000), have established the existence of a strong and positive correlation between national income and the treatment of intellectual property. National income, usually in combination with other factors such as secondary school enrollment, research and development expenditures, or the nature of political institutions, is conventionally considered a strong predictor of intellectual property rights and protection. Indeed, in reviewing the literature, one prominent observer notes that the strong

[15]According to Maskus, the methodology is "simplistic" (2000: 101).

[16]Take the example of a country where the expected software demand is estimated at 50 million francs (the unit of currency is irrelevant) and where the local software association reports sales of 30 million. The BSA would report a 40 percent piracy rate. But suppose that with increased copyright protection and subsequently increased prices that a more realistic figure for expected demand were 48 million, and suppose that an accurate reporting of local sales were 32 million, the adjusted piracy rate would be 33 percent.

positive relationship is “obvious” (Maskus, 2000: 102). Obvious or not, there remains a great deal of uncertainty and disagreement about the causal mechanisms at play – it is not clear what it is about national income that matters.

Explanations for the relationship between national income and intellectual property can be thought of in terms of the *demand* and *supply* of IPP. With regard to demand, as countries become wealthier and experience a changed composition of economic activity, they may generate new domestic constituencies for IPP. That is, as local producers come to dedicate more resources to inventive activities, they are likely to pressure local authorities to increase the protection of intellectual property.

Some have attempted to clarify the relationship between income and IPP by introducing data on research and development (R&D) expenditures. Ginarte and Park (1997), for example, examine a panel of 48 countries for the years 1965, 1975, 1985, and 1990, regressing their IPR index (discussed above) on real GDP per capita, R&D expenditures as proportion of GDP, secondary school enrollment ratios, a dummy variable of openness to trade, and indices of political rights and market freedom. The authors conclude that “it is not the level of development per se that influences the provision of patent rights but rather the determinants of economic development” (Ginarte and Park, 1997: 297). In particular, they find that the strongest positive effect came from R&D expenditures.

Many of Ginarte and Park’s findings are supported by Maskus (2000: 107-109), who extends the analysis to more countries by limiting the years to 1985 and 1990, where more R&D data is available. With a larger sample of 72 countries, Maskus also finds income level in combination with size of the scientific sector to be most important: wealthier countries that dedicate more resources to inventive activity appear to have a greater demand for IPP. With regard to human

capital, while Ginarte and Park (1997) found secondary school enrollment to have a positive but only marginally significant effect, in Maskus's (2000) respecification the relationship between human capital and IPRs loses significance.[17]

An alternative demand-based explanation, offered by Marron and Steel (2000) highlights the effect of culture, more so than GDP or R&D, on the protection of intellectual property. Marron and Steel regress the BSA's data on software piracy rates, averaged over the 1994-1997 period, on per capita GDP and a number of other potential determinants of piracy. They find piracy to be negatively correlated with income levels, as expected, but also with the strength of contracts and a measure of cultural individualism (as opposed to collectivism). Indeed, the authors argue that the latter two factors, institutions and culture, are more important determinants than income. Though Marron and Steele make an important contribution by introducing the BSA dataset, the static measure of culture that they use cannot account for dynamic changes in IPP. Furthermore, their results are based on relatively few observations. Because the dependent variable is each country's average four-year piracy rate, they can have a maximum of the 85 observations provided by the BSA. And because they are forced to drop many countries because of unavailable data, they base some of their findings on as few as 42 observations.

Before proceeding to a discussion of supply-based explanations of IPP, it is worth noting that Marron and Steele (2000), in stark contrast to Ginarte and Park (1997), find that R&D spending is not significant, at least where controls for national income are included. Given that both sets of authors draw their data for income and R&D spending from the same sources, a principal reason for the very different results might be their distinct measures of the dependent variable. Ginarte and Park explain "inputs" (IPRs) while Marron and Steel explain "outputs" (IPP). Yet perhaps

[17]Note, however, that Maskus's previous work (e.g. Maskus and Penubarti 1995) suggests that secondary school enrollment *does* matter.

the most important reason is that the authors operationalize "intellectual property" differently. Ginarte and Park base their IPR index exclusively on national *patent* systems while the BSA data on software piracy used by Marron and Steel regard *copyrights*. Just as it is reasonable to expect different causal factors to explain inputs and outputs, we might expect these causal factors to work differently in the different realms of intellectual property.[18] In any case, the effects of R&D (and human capital) on IPRs and IPP share less universal consensus then the effects of national income.

In addition to generating new demands for IPP, increased national income might also increase government capacity to supply increased IPP. That is, growth might lead to increased IPP by generating additional resources for the enforcement of laws protecting intellectual property. As indicated, enforcing IPRs imposes costs on governments, ranging from higher price of software in the public sector, to staffing and training police, prosecutors, and judges (see Finger and Schuler 2000; Rodrik 2001; Watal 2001). These large fixed and variable costs suggest that the protection of IPP may depend on the wealth of the economy.

Of course, each of these studies has examined primarily domestic determinants, searching for the determinants of IPRs and IPP in national-level characteristics. As we have discussed, however, studying changes in intellectual property as an endogenous process is overly restrictive for two reasons. First, the endogenous factors are unlikely to have changed rapidly enough to account for sharp declines in piracy in the 1990s. And, second, there are solid reasons to expect external , transnational pressures to be important determinants of piracy as well. Countries throughout the world face intense multilateral and bilateral demands to increase IPP. In light of these changes in the global political economy, we complement the economic literature's

[18]Other factors explaining the different findings might be the time periods and country samples, though the two studies display substantial overlap with regard to the latter.

emphasis on domestic factors with an analysis of countries' new obligations as members in the WTO and the pressures emanating from US foreign policy.

Though TRIPS went info effect in January 1995, and a number of provisions were to be respected immediately by all members, obligations for full implementation vary by level of development. Developed countries were granted a one-year transition period, until January 1996, and developing countries were granted a five year transition period, with full implementation expected by no later then January 2000.[19] Importantly, many countries in our study were not founding members of the WTO, and the transition periods only apply to countries that were members as of 1995. Application of TRIPS obligations for countries joining the WTO after 1995 were negotiated in the terms of accession, and in such cases full implementation was expected immediately upon entry. Some countries in our study, however, were not members of the WTO at any point during our time period, and thus had no TRIPS obligations.[20] Given that virtually all countries currently are either members or applicants for accession, the differential effects of WTO membership per se will be of less importance in the future when all countries have similar obligations. But during the time period under consideration here, countries had varying obligations with regard to TRIPS.

Does TRIPS matter? Much of the scholarly analysis about the effect of TRIPS on developing countries is predicated on the assumption that because of TRIPS the actual protection of intellectual property will increase (e.g. Maskus 2000; CIPR 2002). Yet in considering the potential effects of TRIPS obligations, it is worth noting that the agreement is not self-executing:

[19]For the forty-seven countries classified by the UN as "least developed," of which thirty are WTO Members, the deadline for full implementation was January 2006. Note that we include none of these countries in our study.

[20]China, for example, did not become a WTO member until December 2001, and negotiations for Russia's accession are on-going as of the time of writing.

the effects of TRIPS depend on national-level changes to IPR laws and practices. Indeed, previous findings that have shown membership in international treaties and organizations (e.g. the Berne Convention, the Paris Convention, and the World Intellectual Property Organization) to have only minimal effect on state behavior (e.g. Sell 1998; Ginarte and Park 1997; Schiff 1971). For more than a century, countries have routinely ignored their international commitments in the realm of intellectual property (and for that matter, in many other realms). Because TRIPS imposes significantly greater obligations on states then was the case under previous treaties, as discussed above, one might expect the agreement to have an even weaker effect on states' practices.

Nevertheless, we hold that there is good reason to expect the effect of TRIPS to be different then the effect of previous agreements. In the first regard, because TRIPS is part of the WTO, the realm of intellectual property is now subject to the disciplines of an international organization with a binding dispute resolution process. The Berne Convention and other previous agreements formally constituted international law, but, to use common parlance, these laws lacked teeth. Moreover, not only does TRIPS have teeth, but the teeth are quite sharp. By introducing IPRs into the global agreements governing international trade, the Uruguay Round codified intellectual property's new status as "trade-related," meaning that violating countries can be penalized with retaliatory trade sanctions. So unlike previous internationally-derived obligations to protect intellectual property, the consequences of non-compliance with TRIPS are likely to be more painful and serious. Indeed, to make the obligations binding and the penalties painful were crucial motivations for industry's insistence on integrating IPRs into the Uruguay Round negotiations in the late 1980s (see Drahos 1997; Ryan 1998; Sell 2003).

In addition to the multilateral pressures derived from membership in the WTO, countries also face bilateral pressures from the US to increase IPP. After all, TRIPS only establishes "minimal standards." WTO Members can go beyond these standards and exceed their TRIPS obligations, but they are under no multilateral obligation to do so. And even though TRIPS includes enforcement procedures, the "minimal standards" alone will not necessarily increase IPP to the levels sought by software producers (Watal 2001; Sherwood 1997; Subramanian 1990). Indeed, bilateral pressures originating in the United States—home of most of the world's packaged software exporters—should be expected. And, unsurprisingly, increasing IPP has been a core element of American foreign trade policy since the 1980s (Sell 1995, 2003; Drahos 1995, 2001; Getlan 1995).

Even after the Uruguay Round was completed and a new global IPR regime was integrated into the WTO, the US made no secret of its intent to continue to use bilateral instruments to secure increased IPP. Trade authorities and business constituencies in the US regarded the TRIPS transition periods as excessive, and both the standards and enforcement mechanisms as too lax; and throughout the 1990s the USTR pushed for higher levels of protection. Developing countries were discouraged from taking advantage of the transition periods, for example, and in bilateral negotiations many countries committed themselves to higher standards, sometimes referred to as "TRIPS Plus." In fact, the Uruguay Round Agreement Act of 1994 amended US trade statutes to stipulate that even countries in compliance with TRIPS could still be targeted under Special 301 for inadequate protection of IPRs (Getlan 1995: 212-215).

The USTR's annual Special 301 Reports on IPRs provide an excellent source for studying the US bilateral trade strategy. These reports list states whose treatment of intellectual property

fails to meet US standards. Countries are included in one of three categories, in increasing order of severity: Watch List (WL), Priority Watch List (PWL), and Priority Foreign Country (PFC).[21] To be on the WL simply indicates the USTR's registration of deficient policies and practices in IPP. The PWL, however, indicates a greater degree of unease in Washington and signals heightened US vigilance. In the seven years after the WTO entered into effect, the USTR placed 225 countries on the Watch List (an average of 32 countries per year) and 89 countries on the Priority Watch List (an average of nearly 13 countries per year) for what the US regarded as insufficient protection of intellectual property (USTR data). The category of PFC, which Drahos (1995: 423) labels "trade's death row," is reserved for those countries whose treatment of intellectual property, according to the USTR, is most "egregious" and 'harmful" to US investors and producers. According to US trade law, when a country is given PFC status the USTR has thirty days to decide whether or not to investigate a formal investigation that could lead to trade sanctions.[22] In addition, as part of the Special 301 process, the USTR also publicizes "out-of-cycle reviews." These special reviews, which saw increased use beginning in 1995 just as WTO Members' Uruguay Round commitments were entering into effect, purportedly subject countries' IPR regimes to focused, intensive scrutiny.

We might expect this sort of USTR pressure to matter with respect to on-the-ground enforcement of IPRs in part because Washington has premised its diplomatic activity on an *outcome*-based measure of IPP. In general the USTR is not satisfied with mere legal "improvements" in the IPR regime unless they are accompanied by real increases in protection.

[21]In some years the USTR also included an "Other Observations" section that included countries of "concern," with this being a step below the WL. This classification was not used consistently and the "Other Observations" section has not appeared in the Special 301 reports since 1998.

As indicated, two identical IPR laws may yield significantly different outcomes, depending on the resources dedicated to implementation and enforcement. Many of the countries listed in the Special 301 reports are cited not for their laws per se, but rather for the enforcement of their laws and the extent of de facto intellectual property protection. The USTR cites countries for having lax customs and police procedures, for example, along with criminal codes that include penalties for IPR infringement that the US regards as too weak. In the 1997 report on Thailand, for example, the USTR acknowledges that the Thai copyright law was TRIPS consistent, but expressed concern that the law was not being enforced, noting that since 1994 "the numbers of arrests and seizures of illicit goods has plummeted. To date, no pirate or counterfeiter has served time in prison for copying or selling protected goods, and fines and sentences remain too low to deter offenders" (USTR 1997). Similarly, consider the following passage from the 2001 report on Costa Rica, which highlights the deep-seated concerns with both legislation and enforcement:

> Despite positive steps by Costa Rica in 2000, including amending its 1982 copyright law to comply with the TRIPS Agreement, there is growing concern regarding the lack of effective enforcement activity by the Government of Costa Rica. This lack of effective enforcement has been exacerbated by weaknesses in a new law on criminal procedures and penalties for intellectual property crimes passed last year. The law, among other things, provides lesser penalties for intellectual property crimes than for non-IP crimes, and de-criminalizes infringement deemed of "insignificant character" or that is committed "without intention of profit." (USTR 2001: 17)

The US explicitly regards the Special 301 process as an instrument to pressure countries into increasing their levels of protection. In the words of former United States Trade Representative

[22]These categories are defined and explained in the annual USTR's annual reports. See also,

Charlene Barshefsky, "The Special 301 annual review is one of the most effective instruments in our trade policy arsenal. It is much more than an in-depth review. It provides a direct route to press countries to improve their IPR practices" (USTR 1997). Or, from a more recent publication: Special 301 "has vastly improved intellectual property standards around the world. Publication of the Special 301 list warns a country of our concerns. And it warns potential investors in that country that their intellectual property rights are not likely to be satisfactorily protected. The listing process itself has often helped win improvements in enforcement" (USTR 2002).[23]

But are these assessments of Special 301 correct? To be sure, such external pressures may alter the incentives facing political leaders. Regardless of domestic preferences for a given policy, bilateral pressures can raise the costs of not implementing a particular policy change (see Martin 1992). Thus, it might be that low levels of IPP elicit increased USTR pressure, which generates increased protection. Yet bilateral pressures may be insufficient to overcome local resistance to changing national and subnational practices. Such pressures, particularly if they are regarded on the receiving end as bullying and "aggressive unilateralism" (Bayard and Elliott 1994), can lead to domestic backlash and strengthen resistance to change (Elliott and Richardson 1996; Hirst 1998; Knapp 2000). Furthermore, Special 301 does not constitute pressure so much as it signals a potential threat of pressure. We do not know if the Special 301 process represents a credible threat, for example. Depending on the targeted countries' export profile, trade sanctions imposed by the US may hurt American importers and therefore may face strong opposition in

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Sell (2003: 125).

[23]Some key IPR-related business constituencies agree with this assessment. Eric Smith, President of the International Intellectual Property Alliance (IIPA), testifying to the US House of Representatives in March 1996, noted that Special 301 "has done more then any other provision

Washington (Zeng 2002).[24] Or perhaps countries simply pay little attention to the Special 301 reports, especially when they are listed only on the WL, because they regard them as idle threats with uncertain consequences. Considering the large number of countries included in the annual Special 301 reports and the very few countries whose status is ever escalated to Priority Foreign Country, not to mention the even fewer cases of countries that are actually sanctioned, this is not an unthinkable possibility.

Likewise, there is good reason to question the effectiveness of the out-of-cycle reviews. This is largely an ad hoc process. It is not at all clear, for example, how such reviews are undertaken. Nor does there exist any institutionalized link between the selection of countries to be subjected to review or the outcome of the review, on the one hand, and changed status on the Special 301 lists, on the other hand.

Indeed, the hypothesis that direct USTR pressure may lead to little change in behavior has found support in previous research. Sell (1995) found that USTR pressure in the late 1980s and early 1990s was effective in getting countries to change their laws and policies (inputs), but not the actual IPP (outputs) provided. Writing about USTR pressure in the late 1980s and early 1990s, for example, Sell concluded that USTR pressure "largely has failed in intellectual property protection" (1995: 318). She finds that "targeted states acquiesce on paper and do just enough to free themselves of US pressure – but not more" (1995: 332). Similarly, Noland (1997) also finds USTR pressures to be relatively ineffective in the realm of intellectual property.[25]

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of US trade law to improve the level of worldwide protection of US products embodying copyright" (cited in Sell 2003: 123).

[24]Getlan (1995) provides evidence of precisely this phenomenon in the case of US bilateral IPR disputes with Brazil and China.

[25]See also, Hirst (1998) and Getlan (1995). In contrast, Sykes (1992), in an analysis of Special 301 that is not limited to IPRs, finds US *sanctions* (not just pressure) to be effective.

In addition to pressures exerted through the Special 301 process, we also consider the role of Bilateral Investment Treaties (BITs). Since the 1980s, the US has signed BITs with nearly fifty countries. Importantly, these agreements address intellectual property by treating it as an aspect of investment. The BIT program stipulates that providing high levels of IPP is a prerequisite for all prospective BIT partners, and the subsequent BITs that the US has negotiated invariably include provisions that commit countries to levels of IPP that exceed TRIPS obligations (Drahos 2001; US Department of State 2001).

We might expect BITs to be effective because they reward countries positively. Unlike the status quo reciprocity built into the Special 301 process, where countries change their IPR practices simply in order to avoid penalties, BITs offer the possibility of real reciprocity, in which increased IPP might elicit increased foreign investment.[26] Similarly, to the extent that the BIT is a stepping stone to tighter trade and investment relations with the US, e.g. negotiating a free trade agreement, these arrangements could provide genuine incentives for countries to change their practices regarding the treatment of intellectual property (Drahos 2001).

The Evidence

As discussed, the economic literature attributes variation in intellectual property rights and protection to cross-national differences in income per capita in combination with a broad range of national-level variables, such as scientific infrastructure (i.e., R&D spending), human capital, institutional or state capacity, the overall size of the economy, openness to trade, or national cultural attributes. At the same time, the international relations literature expects transnational variables, such as TRIPS and US pressures, to change countries' practices regarding the

[26]Subramanian (1990) makes this distinction between status quo reciprocity and real reciprocity in the context of the Uruguay Round negotiations.

protection of intellectual property. Yet while the prevailing economic literature has been overly narrow, in the sense of neglecting the effect of the new transnational factors that have emerged as part of the global sea change in IPRs, the IR literature has focused on the emergence of new international regulations without sufficiently problematizing the processes by which these new international obligations are transmitted from the international arena to the national level. In this section, we build upon both bodies of research. By including national *and* transnational variables in a single analysis, we achieve a superior synthesis of contemporary scholarship. We present a broader, global perspective that is more appropriate for analyzing the contemporary political economy of IPP, and we subject the prevailing hypotheses advanced by IR scholars to systematic cross-national analysis.

The BSA data on software piracy are available for 80 countries for the period between 1994 and 2002.[27] We seek to take full advantage of the rich cross-sectional and longitudinal variation available in the BSA data set, treating each country-year as a discrete observation and thereby generating a theoretical maximum of 720 observations. To that end, we have collected data on all but one of the relevant predictor variables used in previous research (see Table 3). The excluded variable is culture, used by Marron and Steel (2000), for the data on cultural attributes were missing for a disproportionately large number of cases; and, as discussed above, we doubt that a relatively static variable like culture can account for the short term dynamics described in Table 1.[28] In some instances we use different indicators than those used in previous studies. For

[27]The BSA survey includes 85 "countries." We drop "Belgium/Luxemburg" and "Ukraine/CIS," because the observations for these countries are merged and therefore do not correspond to data on the independent variables, Puerto Rico and Reunion, on account of overwhelming problems of missing data, and the United States, since one of the independent variables being examined is US bilateral pressure.

[28]In any case, we believe that the regional-level indicator variables we have deployed will absorb a good deal of the cultural variation.

example, for scientific and technical infrastructure we use a measure of scientists and technicians in research and development per 1,000 inhabitants of the country, which is available for a relatively large number of countries, rather than the more commonly used but less widely available percentage of R&D expenditures in GDP. And for state capacity we use the measure of "government effectiveness" provided by Kaufman *et al.* (2002), rather than the measure of government institutions used by Marron and Steele (2000). The Kaufman dataset offers two principal advantages: first, it covers more countries than other measures of government efficacy, and therefore allows the use of larger samples; and second, it does not incorporate a measure of property rights protection into the definition of government efficacy, and therefore avoids problems of endogeneity.

We also introduce potential external considerations, thus extending analyses that focus exclusively on the domestic determinants of IPP. The external considerations include pressure from the WTO via TRIPS and direct pressure from the US, through the USTR's Special 301 process and BITs. We measure multilateral pressure through the WTO with two different indicator variables. We code countries as "1" for each year where full compliance with TRIPS is required, and we code a country as "1" for any year in which the country has been a defendant in a WTO case involving IPRs.[29]

We measure direct US pressures in three ways. First, we develop a measure of Special 301 that scales the degree of USTR pressure over time. Studies that attempt to measure the effectiveness of US trade policy by concentrating on cases of US action miss the hundreds of cases that are resolved without ever reaching the stage of formal action. Thus, Noland (1997)

[29]Note that we do not limit this latter measure exclusively to cases regarding software and copyrights, but rather any IPR-related case, expecting such multilateral attention to bring a country's entire IPR regime under close scrutiny.

rightly suggests the importance of examining not just USTR "actions" but also USTR "attention." Whereas Noland uses the number of pages in annual trade reports dedicated to a given country as an indicator of attention, however, we have scored the level of attention according to how a given country was classified in the USTR's annual Special 301 reports on IPRs. Countries not listed are coded as zero, being on the Watch List is coded as one, the Priority Watch List is two, and Priority Foreign Countries are coded as three. Second, for the USTR's periodic out-of-cycle reviews, we use an indicator variable that assumes a value of "1" when the relevant country is subject to such a review in a given year. Third, to measure the effects of BITs, we use an indicator variable that assumes a "1" for any year in which a BIT with the US was signed or in place for at least half the year. In addition, to assess economic vulnerability, as opposed to direct US political pressure, we also include a measure of trade dependence, operationalized as the percentage of a country's exports that are sold in the US market.[30]

Insert Table 3 Here

We explore the relationship between piracy and the relevant predictors using population averaged panel data models appropriate for short time series. The variables on the right hand side are lagged by a single year; first order autocorrelation is assumed; the standard errors are semi-robust; and regional-level control variables are included (though the results are suppressed to simplify presentation since they are not of substantive interest). We also consider the potentially confounding effects of non-stationarity in our time-series by evaluating the robustness of our findings in the presence of a control for a linear time trend.

[30]As indicated in Table 3, the measure of trade dependence is actually based on exports to the US and Canada.

We present the results of a regression of piracy on GDP per capita in Model 1 and find the usual inverse relationship (see Table 4).[31] The coefficient is placed above the standard error and is statistically significant at the $p < .025$ level. While the coefficient would imply a bit more than a percent reduction in piracy for every additional $1,000 of GDP per capita, the precise estimate will vary slightly depending on the inclusion of additional predictors.

Insert Table 4 Here

While the economic literature is in consensus with regard to the relationship between national income and IPP, there is less agreement as to the precise causal mechanisms. The following models in Table 4 explore the relevance of human capital, national scientific and educational infrastructure, and political institutions. Model 2, which incorporates an index derived from the combined gross primary, secondary, and tertiary enrolment ratio as a measure of human capital, suggests that the stock of human capital at a given level of economic development is associated with a rise in IPP. This finding is consistent with some, though certainly not all, of the previous econometric analyses we discussed previously. Model 3, which introduces a measure of scientific infrastructure, suggests that the weight of R&D workers in overall employment may be associated with lower levels of IPP. And when we control for both national income and levels of human capital (Model 4), the effects of scientific infrastructure on lower levels of IPP appear to be even greater.[32]

To examine the effect of institutional factors, argued by some (e.g. Marron and Steel 2000) to have greater influence on piracy than economic variables, we include a measure of "government effectiveness" in Model 5. Initially the results comport with previous findings, and suggest that

[31]Recall that a decrease in piracy amounts to an increase in IPP, so variables with negative coefficients should be read as having a positive effect on protection.

states with higher quality bureaucracies are likely to protect intellectual property more effectively. But the results are not robust to alternative specifications of the model: as Model 6 makes clear, the initial linkage between government effectiveness and IPP was due to the correlation of the former with (then-unincluded) measures of human capital and scientific infrastructure. Once appropriate controls are included, the effectiveness of public bureaucracies appears to be unrelated to IPP.

As in all time-series datasets, there are always potential concerns about the confounding effects of time trends in the independent and dependent variables, trends that might induce spurious correlations. To examine the robustness of our baseline models linking national socio-economic characteristics with IPP, we include a linear time-trend indicator variable in Model 7. This is a simple indicator that begins at "1" for the first year in the dataset and increments by a unit for each successive year. Since the dependent variable in our study—software piracy rates—is trended downward, the indicator takes on an appropriately-signed and statistically significant coefficient. Importantly, the oft-cited effects of general levels of education and development remain statistically significant and substantively important in their impact. The

[32]This effect may be a consequence of the utilization of unlicensed software by scientists and engineers in some rapidly developing countries.

earlier result linking scientific infrastructure with lower levels of IPP does not, however, survive this strong control.[33]

The models we have presented so far are consistent with much of the prevailing economic literature on intellectual property protection. Cross-national and longitudinal variation in IPP can be attributed to differences in national income and human capital. We now seek to broaden our analytic focus by taking into account the global context of national-level decision-making. For reasons discussed throughout this paper, there are sound reasons to expect transnational factors – unilateral, bilateral, and multilateral – to combine with internal factors to produce differing levels of IPP. Thus, in the following models we use the national characteristics that showed a robust relationship to IPP in Table 4 as a "baseline" upon which to build our analysis of transnational influences.

Insert Table 5 Here

In Table 5 we examine the direct pressures that are brought to bear by the United States in order to induce foreign states to more effectively protect intellectual property. Models 8 and 9 consider separately the effects of two different forms of USTR pressure on the outcome of IPP, the Special 301 process and the out-of-cycle reviews. Surprisingly, neither a country's classification under Special 301 nor being subject to an out-of-cycle review has an impact on the

[33]An alternative model that utilized annual dummy variables (for each year in the dataset save one) was estimated, producing similar results. We present, however, only the control for the time trend since it is more appropriate for avoiding the potential for spurious correlation between trended independent and dependent variables—something that year-dummies are less appropriate for. Furthermore, using annual fixed effects as controls will make little sense later in the analysis, since we know that many of our substantive variables of interest were applied in discrete years (e.g., when full-compliance with TRIPS became obligatory). Including annual dummy variables in models that include such variables would by construction obscure the effect of theoretically-interesting variables while highlighting atheoretical controls. Since we have no expectation that there are year-specific omitted variables of importance, and being concerned principally with the effects of trends in the data, we have opted to focus on an incremental time-trend variable rather than annual fixed effects.

level of protection that is actually delivered. Such pressures may well affect the structure and content of local legal norms governing IPRs, but as has been suspected by many (e.g. Sell 1995), this is no guarantee of the enforcement of such rights.

Indeed, to ensure against wrongly denying the efficacy of either Special 301 or out-of-cycle reviews, we considered an array of alternative specifications of the variables. For example, in place of the 0-3 scale we used two different dichotomous codings. In a more inclusive formulation, following Drahos (2001), we scored countries as subject to US pressure if they were included in the Special 301 report, without distinguishing between countries on the Watch List, those on the Priority Watch List, and those named as Priority Foreign Country. In a more exclusive formulation, hypothesizing that lower-level pressures from the USTR may simply be ignored, we scored as subject to US pressure only those countries that were on the Priority Watch List or labeled as a Priority Foreign Country. But the use of these dichotomous classifications had no meaningful effect on our results. We also examined whether the effects of bilateral pressure might be conditional upon the structure of trade relations with the US (Zeng 2002), interacting Special 301 and out-of-cycle reviews with trade dependence. But, here again, neither of these measures predicted the level of IPP that was delivered, either directly or in interaction with trade dependence. At least in the case of software, this kind of bilateral pressure does not necessarily produce on-the-ground results.

In marked contrast to Special 301 and OOCR, however, BITs and countries' dependence on the US market for exports are strongly related to the protection of software copyrights (Model 10). Of the two, the more substantively powerful is that of a BIT. Controlling for other effects, the presence of a BIT is associated with a five percent reduction in software piracy. The effects of BITs are to be expected, since the reality of inward foreign investment is therein conditioned

on actual performance in terms of the protection of intellectual property. Indeed, it is this linkage between the countries' desired outcome of increased investment and US demands for increased IPP that constitutes the BIT bargain (see Drahos 2001). Furthermore, BITs are in many instances regarded as stepping stones to preferential trade agreements with the US, countries have increased incentive to continue to comply with their obligations under BITs. Dependence on the US market for exports can provide a similar material incentive, and the data indicate that software piracy declines by roughly ½ percent for each percentage point increase in a country's exports that are sold in the North American market.

It is also worth noting that the results reported in Table 5 are complementary to the explanations of IPP that emphasize national socio-economic characteristics. The inclusion of alternative measures of bilateral pressure does not diminish the importance of stocks of human capital or the level of development in predicting the overall level of IPP delivered (and indeed in some cases they strengthen these basic results). Rather, what we do here is to begin to tease out the factors that account for the relatively large declines in piracy experienced in the 1990s which are both highly variable and unexplained by national characteristics.

Our final checks on the robustness of our findings included an examination of whether the effects of bilateral investment treaties operated in interaction with the level of development or were reflecting spurious correlations induced by time trends. With respect to the former it might be expected that bilateral investment treaties would be powerful pressures only for those countries that are most capital-scarce. Our results, however, do not bear this out. Model 11 indicates that BITs affect software copyright enforcement regardless of the level of development of the country in question. The inclusion of controls for time trends (Model 12) does diminish the size of the effect attributed to BITs, a finding that tempers our confidence in the size of the

effect that can be attributed to BITs. But, importantly, the fact that the BIT variable survives this very robust set of controls suggests strongly this bilateral instrument is indeed a central mechanism by which the norms of IPP insisted upon by the US are internationalized.[34]

It is important to emphasize that the time trend most likely captures the effects of the new multilateral obligations that countries have faced since the mid-1990s. Indeed, the simple bivariate correlation between the time trend variable and our measure of TRIPS is .65. We therefore test directly for the effects of the WTO in the next set of models.

Table 6 About Here

In Table 6 we carry forward the results from the two preceding analyses and embed them in an examination of the multilateral pressures emanating from the WTO that are designed to induce countries to increase IPP. The results indicate that multilateral pressures are important sources of increased intellectual property protection. Being obligated to be fully-compliant with TRIPS diminishes the rate of software piracy by an estimated three percentage points (Model 13), and having been subject to an IPR case at the WTO predicts a roughly two point decline in piracy (Model 14). The results initially suggest that the importance of the WTO dispute resolution mechanism is, however, not entirely robust. When examined in conjunction with TRIPS coverage, the effect diminishes and becomes less significant statistically (Model 15). On the other hand, the TRIPS variable is robustly relevant—even controlling for national economic characteristics and bilateral pressures (Models 15-17). Similarly, the effects of bilateral pressures remain quite strong, even controlling for multilateral pressures and national characteristics (Models 16 and 17), suggesting that multilateral and bilateral pressures are complementary, or

[34]In contrast, in Table 5, the effect of trade dependence on the US loses statistical significance in the presence of a control for time trends.

even potentially redundant, but not contradictory. In sum, TRIPS and BITs have strong effects on countries' day-to-day practices regarding the treatment of intellectual property.

It is only in the presence of a control for time-trends that the effect of the TRIPS protocol seems to weaken (Model 18). But, again, we regard this as a statistical artifact, given that application of TRIPS obligations was by construction trended (rich countries in 1996, developing countries in 2000, and least developed countries not until 2006). The consequence is that the decline in its estimated effect in the face of a control for time trends is to be expected—it is of necessity correlated with it.

Conclusion

The conventional wisdom in the economics is that levels of intellectual property protection are a function of domestic factors, particularly per capita income. The findings reported in this paper do not suggest that domestic factors are irrelevant – a quick glance across the top two rows of Tables 4, 5, and 6 should disabuse us of that naïve notion. But domestic actors do not act in a vacuum, and we cannot understand their real incentives, opportunities, and constraints without opening ourselves to a broader, international perspective. While such cautions are relevant for most issue-areas in political economy, the importance of embracing a broader analytic perspective that encompasses national and transnational factors is particularly critical for analyzing the contemporary political economy of IPRs. For as a number of scholars have shown, countries' practices with regard to the treatment of intellectual property have been made subject to unprecedented external scrutiny and pressures in the 1980s and 1990s.

In this paper we have sought to identify the mechanisms by which the new global obligations are internationalized. To that end, we have analyzed the effects that a range of

multilateral, bilateral, and unilateral factors have on the protection of intellectual property rights in the area of software. We find that the transnational factors highlighted by IR scholars have a significant impact on levels of IPP. Rich and poor countries around the world face new pressures to increase protection of intellectual property, and these pressures are effective. Bilateral pressures from the US – particularly pressures that offer reciprocal benefits – and membership in the WTO lead to substantial increases in levels of protection. The world of IPRs has indeed undergone dramatic change in the final decades of the 20th Century; and these changes are not limited to the confines of international organizations in Geneva, but rather are evident on a day-to-day basis in countries throughout the world.

By way of conclusion, and as a signal for future research, we wish to return and draw attention to two of the findings: the strong effect of BITs and the weak effect of the USTR's Special 301 process. Ultimately, we are dealing with a question of the conditions that make bilateral threats *credible* and the conditions that make credible threats *effective* (see Elliott and Richardson 1996; Noland 1997; Zeng 2002). Is there reason to believe the US will move from threatening a country under Special 301 to penalizing the country? As suggested, given the large discrepancy between the former and the latter, it is not at all unrealistic to think that many countries do not take these threats seriously, even when placed on the PWL. And, as illustrated by the US move to restrict EU steel exports in 2002, which the EU has since successfully challenged in the WTO, unilaterally removing trade benefits from another WTO Member is both contentious and difficult. An important dimension of BITs is that because they bring countries concessions that are beyond those granted on account of WTO membership, and because they offer the possibility of bringing even more extensive concessions in the form of an FTA, they include benefits that can be easily removed. For the US to withhold benefits from a BIT partner

for inadequate IPP is a simple process, one that it reserves the right to do without having to defend its actions in dispute settlement hearings. In short, when a country is a BIT signatory, there is little questioning the credibility of the US threat.

That our results suggest the Special 301 process to be less effective is somewhat surprising, in light of both the USTR's faith in the efficacy of such tools (see USTR quotations cited above) and the prevailing wisdom held by many business constituents, activist organizations and academics that such actions have been consequential. For methodological reasons that make it difficult to get a precise estimate of the effect of the Special 301 process, however, we caution against overly strong interpretations of the findings reported in the previous section. Table 5 indicates that the effect of Special 301 itself is statistically insignificant, but the interpretation is muddled by a potential of selection bias. After all, the countries included in the Special 301 obviously do not include all software-consuming countries. Moreover, the effects of USTR pressure that our models reveal may reflect recalcitrance on the part of a few key countries that are repeatedly the subjects of the USTR's attention, rather than a lack of influence on the broader population. Many countries whose practices might potentially be influenced by the USTR may change their practices on their own and therefore never be targeted. In other words, the Special 301 reports may be biased toward countries that for other reasons are not likely to increase IPP, while at the same time the reports may systematically omit countries that are more likely to change their practices under pressure. One way to assess this interpretation is to look for "preemptive compliance" on the part of countries that are particularly dependent on the US market. Do dependent countries accede to Washington's preferences preemptively and thereby avoid pressure under Special 301? The data in Tables 5 and 6, which demonstrate a strong

statistical significance of trade dependence, might counsel an affirmative answer.[35] In any case, further analysis along these lines that would shed a finer light on the precise effects of USTR pressure offer a useful avenue for future research.[36]

Finally, it is worth considering the implications of the international trend towards increased IPP. Although we have explained patterns of IPP, the overwhelming amount of research on this topic treats intellectual property rights as a causal variable. That is, analysts note the effects that different levels of protection are likely to have on trade flows, investment, technology transfer, and growth. It is important to underscore that findings so far are decidedly ambivalent. Though property rights, in the abstract, are expected to stimulate investment and innovation, *intellectual* property rights are significantly more complicated. "What should be considered property?," "Who are the rightful owners of intellectual property?," and "How strongly should intellectual property be protected?" are key questions to which there is little agreement on the answers – particularly with regard to developing countries (CIPR 2002; Maskus 2000; May 2000). But the advocates of the emerging global arrangements on IPRs have tended to gloss over these complex questions, calling for intellectual property to be treated increasingly like "normal" property. Given the uncertainty as to the optimal systems for and amounts of IPP, and the enormous technological superiority already enjoyed by a handful of developed countries, the new and

[35]Though, as indicated, in some specifications trade dependence has less statistical significance in the presence of time trends.

[36]Ideally, we would use a Heckman selection procedure to model this selection process. That is, we would estimate, first, the correlates and, second, the consequences of USTR pressures. Vreeland (2003) provides an example of such a model. The difficulty is that Heckman procedures presuppose the availability of an instrumental variable that is correlated with the first order selection process (i.e. USTR pressure) and uncorrelated with the second order outcome (i.e. IPP), and unfortunately, the principal sources of USTR pressure for increased IPP are in practice highly correlated with IPP outcomes.

intense transnational pressures that countries face to increase levels of protection are a genuine cause for concern.

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Table 1: Estimated rates of software piracy across seven world regions, 1994-2002
(percent)

Region	1994	1995	1996	1997	1998	1999	2000	2001	2002
Western Europe	52	49	43	39	36	34	34	37	35
Eastern Europe	85	83	80	77	76	70	63	67	71
North America	32	27	28	28	26	26	25	26	24
Latin America	78	76	69	64	62	59	58	57	55
Asia and the Pacific	68	64	55	52	49	47	51	54	55
Middle East	84	83	79	72	69	63	57	50	50
Africa	77	74	70	60	58	56	52	54	48
World	49	46	43	40	38	36	37	40	39

Source: Business Software Alliance (BSA 2003, Table D). See text for description of estimation procedure.

Table 2: Top 20 software companies in 1990 and 1998-1999
(sales)

1990			1998-99		
Rank	**Company**	**Headquarters**	**Rank**	**Company**	**Headquarters**
1	IBM	USA	1	Microsoft	USA
2	Fujitsu	Japan	2	Oracle	USA
3	Digital Equipment	USA	3	Computer Associates	USA
4	Microsoft	USA	4	SAP	Germany
5	Computer Associates	USA	5	Compuware	USA
6	Hitachi	Japan	6	Peoplesoft	USA
7	Siemens Nixdorf	Germany	7	BMC Software	USA
8	Unisys Corp.	USA	8	Electronic Arts	USA
9	Oracle Corp.	USA	9	Cadence Design	USA
10	Bull Information	France	10	Novell	USA
11	Hewlett Packard	USA	11	Parametric Technology	USA
12	Novell Inc.	USA	12	Network Associates	USA
13	Cadence Design	USA	13	JD Edwards and Co.	USA
14	Adobe Systems Inc.	USA	14	Adobe Systems	USA
15	SAS Institute Inc.	USA	15	SAS Institute	USA
16	SAP AG	Germany	16	Sybase	USA
17	Informix Software	USA	17	Misys	UK
18	Sun Microsystems Inc.	USA	18	Autodesk	USA
19	Sybase Inc.	USA	19	Baan	Netherlands
20	Parametric Technology	USA	20	Informix Software	USA
USA: 75%			USA: 85%		

Source: OECD 1998 (Table 24, p. 43); UNCTAD 2002 (Table 1, p. 7); and company reports. UNCTAD actually claims that “only two companies in the top twenty listing are non-American high-technology companies, SAP from Germany and Misys from the United Kingdom,” but UNCTAD’s list of the top 20 software firms includes Baan, a Dutch firm (UNCTAD 2002, pp. 6-7).

Table 3: Variables and data sources

Variable	Annual variation	Source
Piracy. The estimated rate of software piracy for a given country and year, 1995-2001. Range: 24-100.	Yes	BSA 2003: Table D
GDPcap. GDP per capita in current international dollars. Range: US$247.2 to US$47064.4	Yes	World Bank 2003
R&D. The number of scientists and technicians in R&D per 1,000 inhabitants (average 1990-1996). Range: 0.1 to 7.1	No	UNDP 1999
Human capital. Gross primary, secondary, and tertiary enrollment ratio for 1997. Range: 43 to 100	No	UNDP 1999
Political Institutions. Index of government effectiveness (circa 1997-98). Range: -1.32 to 2.08	No	Kaufmann et al. 2002.
Size of the economy. GDP in current international dollars. Range: 21036.6 to 5.68e+12	Yes	World Bank 2003
US Special 301. An index of US pressure which assumes the value of 0 when a country is not included in the Special 301 Report; 1 when it is on the Watch List; 2 when it is on the Priority Watch List; 3 when it is a Priority Foreign Country.	Yes	USTR reports as described in text
BITs. An indicator variable which assumes the value of 1 when a bilateral investment treaty with the US has been signed or in effect for at least half the year.	Yes	US Department of State 2001
OOC. An indicator variable which assumes a value of 1 in years when the country has had an out-of-cycle review.	Yes	USTR reports as described in text
TRIPS. An indicator variable which assumes a value of 1 wherever a country is obligated to comply fully with WTO's TRIPS standards.	Yes	WTO
WTO Case. An indicator variable which assumes a value of 1 when a country has been the defendant in a WTO case involving IPRs in the relevant year.	Yes	WTO
Trade Dependence. Exports to US and Canada as percent of total exports. 1993-2001. Range: 0.01-90.1	Yes	UNCTAD, Handbook of Statistics
Regional indicator variables for Africa, East Asia, Eastern Europe, Latin America, the Middle East, and South Asia; reference category is Western Europe, Canada, and Oceania.	No	BSA with slight modifications

Table 4. Models of Software Piracy as a Function of National Characteristics
(population averaged panel models, robust standard errors)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
GDP/capita	-0.00123*** (0.00016)	-0.00111*** (0.00014)	-0.00178*** (0.00021)	-0.00174*** (0.00018)	-0.00103*** (0.000155)	-0.0017*** (0.00020)	-0.00067** (0.00022)
Human Capital		-0.389*** (0.113)		-0.688*** (0.137)		-0.663*** (0.150)	-0.613*** (0.120)
Scientific Infrastructure			3.620*** (1.502)	5.417*** (1.322)		5.284*** (1.332)	0.835 (1.434)
Government Effectiveness					-5.960*** (2.044)	0.978 (2.945)	
Regional Controls	[suppressed]	[suppressed]	[suppressed]	[suppressed]	[suppressed]	[suppressed]	[suppressed]
Time Trend†							-2.500*** (0.167)
Constant	75.99*** (5.071)	108.31*** (10.66)	75.35*** (5.651)	131.43*** (11.98)	79.66*** (4.347)	130.1*** (12.30)	128.2*** (10.65)
N	673	673	507	507	673	507	507

* $p < 0.10$; ** $p < 0.05$; ***$p < 0.025$

† An alternative model controlling for time-dependent processes using annual dummy variables was also estimated. The results were substantively and statistically almost identical to those that utilized a simple linear time-trend control.

Notes: All models estimated include heteroskedastic-consistent, country-clustered standard errors, and control for serial correlation (modeled as an AR-1process).

Table 5. The Efficacy of Bilateral Political Pressures to Prevent Software Piracy
(population averaged panel models, robust standard errors)

	Model 8	Model 9	Model 10	Model 11	Model 12
GDP/capita	-0.00111*** (0.00014)	0.00111*** (0.00014)	-0.00113*** (0.00015)	-0.00112*** (0.00015)	-0.00069*** (0.00011)
Human Capital	-0.386*** (0.112)	-0.389*** (0.113)	-0.415*** (0.120)	-0.423*** (0.122)	-0.451*** (0.107)
US Special 301	-0.232 (0.319)				
Out of Cycle Review		0.029 (0.291)			
Bilateral Investment Treaty (BIT)			-4.879*** (0.834)	-5.00*** (0.846)	-1.589*** (0.606)
Trade Dependence on US			-0.0546*** (0.0219)	-0.0599*** (0.0241)	-0.0257 (0.0158)
BIT * Country Wealth				4.536 (3.460)	
Regional Controls	[suppressed]	[suppressed]	[suppressed]	[suppressed]	[suppressed]
Time Trend					-2.50*** (0.141)
Constant	108.3*** (10.67)	108.3*** (10.66)	109.1*** (10.48)	112.7*** (11.37)	116.96*** 9.97
N	673	673	668	668	668

* $p < 0.10$; ** $p < 0.05$; ***$p < 0.025$

Notes: All models estimated include heteroskedastic-consistent, country-clustered, standard errors and control for serial correlation (modeled as an AR-1process).

Table 6. The Sources of IPP: Multilateral and Bilateral Political and Economic Pressure
(population averaged panel models, robust standard errors)

	Model 13	Model 14	Model 15	Model 16	Model 17	Model 18
GDP/Capita	-0.0010*** (0.00014)	-0.0011*** (0.00014)	-0.0010*** (0.00014)	-0.0011*** (0.00014)	-0.0011*** (0.00014)	-0.0007*** (0.00011)
Human Capital	-0.389*** (0.110)	-0.389*** (0.113)	-0.390*** (0.110)	-0.386*** (0.108)	-0.411*** (0.116)	-0.453*** (0.107)
TRIPS	-3.01*** (0.494)		-2.95*** (0.495)	-2.89*** (0.497)	-2.89*** (0.508)	-0.574 (0.528)
WTO Case		-2.18*** (0.911)	-1.77* (1.025)			
Bilateral Investment Treaty (US)				-4.53*** (0.918)	-4.41*** (0.914)	-1.59*** (0.587)
Trade Dependence (US)					-0.0459** (0.0227)	-0.0268* (0.0156)
Regional Controls	[suppressed]	[suppressed]	[suppressed]	[suppressed]	[suppressed]	[suppressed]
Time Trend						-2.567*** (0.147)
Constant	108.6*** (10.42)	108.3*** (10.72)	108.5*** (10.49)	109.2*** (10.28)	111.9*** (10.99)	117.2*** (9.956)
N	673	673	673	673	668	668

* $p < 0.10$; ** $p < 0.05$; ***$p < 0.025$

Notes: All models estimated include heteroskedastic-consistent, country-clustered standard errors, and control for serial correlation (modeled as an AR-1process).