AFRICAN GOVERNANCE AND DEVELOPMENT INSTITUTE

A G D I Working Paper

WP/14/035

The Impact of Software Piracy on Inclusive Human Development: Evidence from Africa

Simplice A. Asongu
African Governance and Development Institute,
Yaoundé, Cameroon.
E-mail: asongusimplice@yahoo.com

Antonio Rodríguez Andrés
Universidad Camilo José Cela
School of Law and Economics
Department of Economics,
C/ Castillo de Alarcón, 49 – Urb. Villafranca del Castillo
28692 – Villanueva de la Cañada, Madrid, Spain
E-mail: arandres@ucjc.edu

 WP/14/035

AGDI Working Paper

Research Department

Simplice A. Asongu & Antonio R. Andrés

December 2014

Abstract

This paper examines two dimensions of the software piracy-development nexus to complement existing formal literature. It empirically assesses the incidence of piracy on the Human Development Index (HDI) and its constituents and then the instrumentality of Intellectual Property Right (IPR) treaties (laws) in the linkages. An instrumental variable or Two-stage least squares is applied on panel of 11 African countries with data for the period 2000-2010. Three main findings are established: (1) software piracy has a negative incidence on inequality adjusted human development; (2) the unappealing effect of piracy on the HDI is fuelled by per capita economic prosperity and life expectancy components of human emancipation; (3) software piracy increases literacy. Two major policy implications have been retained from the findings. Firstly, adherence to international IPRs protection treaties (laws) may not impede per capita economic prosperity and could improve life-expectancy. Secondly, adoption of tight IPRs regimes may negatively affect human development by diminishing the literacy rate and restricting diffusion of knowledge.

JEL Classification: K42; O34; O38; O47; O57
Keywords: Software piracy; Human development; Intellectual property rights; Panel data, Instrumental variables.

1. Introduction

In recent years, there has been a wide consensus on the key role that Intellectual Property Rights (IPRs) protection play on promoting innovation processes and economic growth. Recent technological advancements have not only resulted in an increased availability of information and technology related products but also in the proliferation of technology used to copy or pirate such goods (Andrés & Asongu, 2013a). Thus, efforts are being placed on increasing and harmonizing the standards and enforcement of IPRs protection worldwide (Asongu, 2013a). Since the concern of solidifying IPRs and curtailing the proliferation of pirated goods is particularly pronounced in developing countries, the concern over how this will affect economic growth has been widely debated.

While some scholars postulate that increased protection of IPRs stimulates economic growth and development via the positive impact on factor productivity (see for example, Gould & Gruben, 1996; Falvey et al., 2006; Ramello, 2005), some skeptics are of the stance that IPRs protection and adherence to international treaties (laws) may impede, rather than encourage economic growth in developing countries (Ramello, 2011; Nicita & Ramello, 2007)[1]. A great chunk of the opposition to stronger IPRs asserts that because the existing technology in developing countries is more imitative and/or adaptive in nature (rather than suitable for creation of new innovations) developing countries will be greatly hampered by such changes in policy (Asongu, 2014a, p. 527). Moreover, it is disputed that weaker IPRs are necessary (at least on a temporal basis) for developing countries to obtain knowledge spillovers essential for growth and development (Asongu, 2014a, p. 527).

[1] "*The article agrees with the enounced thesis and tries to provide an explanation of it that relates to the fact that in specific circumstances property-rights can produce distinct market failures that affect the social cost and can consequently prevent attainment of social welfare*" (Ramello, 2011, p. 123). Even religious institutions with the supreme mission of spreading the Gospel have resorted to copyright for intellectual rents (Carla & Ramello, 2011). "*While property rules reduce transaction costs in the standard case of bilateral monopoly over the exchange of information goods, they might increase transaction costs*" (Nicita & Ramello, 2007, p. 767). This evolution may be in part be traceable to the phenomenon of 'causal economic thinking', highlighted by Fleury & Marciano (2013).

In light of the current debate, there is growing importance in the impact of IPRs protection on technological advancements, promotion of innovation and economic development. Still, whereas the theoretical literature has attempted to tackle this concern, little scholarly attention has been paid to the empirical literature. Accordingly, the bulk of empirical studies have examined the socio-economic determinants of piracy in several copyright industries (Andrés, 2006a; Banerjee et al., 2005; Bezmen & Depken, 2006; Goel & Nelson, 2009; Peitz & Waelbroeck, 2006).

Recent studies on software piracy can be classified into four main strands, inter alia: nexuses with some factors, its determinants, surveys and others. First, the relationship between software piracy and the following have been investigated: socio-economic development (Banerjee, 2005); influences on software piracy (Bezmen & Depken, 2006); technological output (Charoensukmongkol & Elkassabgi, 2011); inequality (Asongu, 2014a; Andrés, 2016b); shadow economy (Goel & Nelson, 2012); taxation (Gomes et al., 2014a); intellectual rights protection (Hamister & Braunscheidel, 2013; Asongu, 2015); scientific publications (Asongu, 2014b); implications for users and software companies (Jamil & Zaki, 2011); economic wealth and natural culture (Moores, 2008; 2010); Kuznets curves either through per GDP (El Harbi et al., 2011) or extended to other determinants of industrialisation (Panas & Ninni, 2011); trade liberalisation and corruption (Robertson et al., 2008); per capita Gross National Income (Reinig & Plice, 2011) and the decision to adopt a video game console (Goode & Kartas, 2012).

Second, the determinants of software piracy in: the Far East countries (Chen et al., 2010); worldwide (Gomes et al., 2013); European countries (Sonmez et al., 2010) as well as corrective measures (Theng et al., 2010). Third, surveys of: theoretical and empirical literature (Gomes et al., 2014b) and literature around the world (Kariithi, 2011). Fourth, a strand on varying other investigations: major trends in software piracy over the past decade

(Yang et al., 2013); comparative studies between Asian and Non-Asian industrialised economies (Ding & Liu, 2009) and the use of new methods like neuro-computational models to assess if they outperform statistical techniques of a traditional dimension (Mostafa, 2011).

In light of the above, there is scanty empirical literature on the effect of software on software piracy on economic growth (Asongu, 2013a, 2015; Andrés & Asongu, 2013ab; Bezmen and Depken, 2004; Goel and Andrés, 2012). Moreover, research on the influence of software piracy on an expanded conception of socioeconomic progress such as human development is clearly missing. Hence, the aim of this paper is to contribute to existing literature on software piracy in the following ways. (1) Assess the incidence of software piracy on human development and its constituents at the macro level. As far as we know, the rate of piracy can be seen more generally to proxy for piracy of other goods (books, sound recording, and motion pictures). In the process, we also examine which components of the inequality adjusted human development (IHDI) later in the investigated relationship. (2) Given the debate over whether adherence to international treaties (laws) may impede, rather than encourage economic growth in developing countries, this paper assesses how IPR treaties (laws) are instrumental in the effect of software piracy on the IHDI and its components.

The remainder of the paper is organized as follows. Section 2 provides existing theory and empirical evidence. Data and methodology are discussed and outlined respectively in Section 3. The empirical analysis is covered in Section 4. Section 5 concludes.

2. Theory and empirical evidence

2.1 Piracy and development

In line with Bezmen & Depken (2004), there are two main avenues along which IP and the strength of IPRs regimes are thought to influence the level of economic growth and development. The first captures the extent to which IPRs influence the creation of new

knowledge and information within individual nations, as well as the diffusion of existing knowledge across countries. The second is the indirect effect of a nation's IPR regime on international transactions[2] that provide factors imperative to the growth process.

2.1.1 Creation and dissemination of information

IPRs protection could be traced to the foundation of endogenous theories of economic growth in which investment in research and development (R&D) results in profit (returns) to individual investors and also increases society's stock of knowledge. By lowering the cost of future innovation, the accumulation of knowledge fosters economic growth (Romer, 1990; Grossman & Helpman, 1991). Fundamentally, the wisdom of tighter and more restrictive IPRs is premised on the notion that protection of IPRs serves as a stimulus to growth by encouraging innovations and inventions. It is only natural that individuals engage in innovative activities in response to expected payments for their efforts. As claimed by Bezmen & Depken (2004) from Baumol (1993), "*this expectation is the primary motivation for entrepreneurial activity, increasing total factor productivity, and culminating in increased levels of output*" (p. 5).

Patent holdings and R& D expenditures are more concentrated in the industrialized world and enforcement costs are positively associated with the tightening of IPRs. Hence stronger IPRs may increase gains (in the form of royalties) to developed countries (and the creators of technological advancements) at the expense of developing countries. In the same line of argumentation, some authors argue that net consumers of technological innovation have an incentive to enforce IPRs only when the innovation they consume differs from the type of innovation they supply to foreign markets (Diwan & Rodrick, 1991). It follows that the effectiveness of IPRs may be greatly dependent on the country's present stage of development. Strict IPRs regimes may restrict diffusion of knowledge and technological

[2] For example international trade flows, technology transfers and foreign direct investment.

development in ‘technology followers’ while at the same time stimulating innovation in ‘technology leaders’ (Bezmen & Depken, 2004).

Traditionally, industrialized nations have depended fairly heavily on the protection offered by IPRs. In contrast, less developed countries have often preferred rapid dissemination of knowledge at the cost of protecting the IPRs of foreigners. Recently, many newly industrialized countries have pushed for stronger IPRs through bilateral, multilateral and regional arrangements. This difference in approach might be attributed to the desire of developing countries to specialize in labor intensive production of agricultural industries. These industries until very recently have largely been supported by public expenditures on research and technology and have greatly benefited from shared knowledge spillovers. One application of this argument gaining widespread attention is the access to and affordability of life-saving drugs, especially with regard to the treatment of HIV/AIDS in developing countries. Immense pressure is being placed on pharmaceutical companies to ‘loosen’ their patent rights in order to allow poor countries the opportunity of better managing the AIDS pandemic.

2.1.2 International effects

Borrowing from Bezmen & Depken (2004), IPRs may also affect a nation’s growth and development process through their influence on a nation’s ability to engage in international transactions (e.g. trade, FDI flows and technology transfers). The potential growth rewards resulting from increased participation in international trade are well understood. It is generally accepted for instance that international trade can be an important stimulus to economic prosperity because access to world markets could spur greater utilization of idle human capital resources (Todaro & Smith, 2003). The endogenous growth theories argue that openness facilitates transmission of technology by providing contact with foreign counterparts and, directs domestic resources towards more research intensive sectors

and increases market size knowledge (see Rivera Batiz & Romer, 1991). Nevertheless, these models do not necessarily predict that openness leads to economic growth for all countries and all circumstances. The theoretical prediction depends on country specific conditions. A stronger IPRs regime may also prove to be a crucial factor in attracting inflows of FDI and technological transfers. More so, individual (investors and firms) perceptions regarding the strength of a nation's IPRs regime positively affects such nations' receipts of FDI and the willingness of foreigners to transfer newer technologies (Lee & Mansfield, 1996). Smith (2001) also finds a positive correlation between the sales of US affiliates and the strength of intellectual property rights protection in a host country. Moreover some authors have argued that a weak system of IPRs protection deters FDI in high technology sectors where IPRs play a key role (Smarzynska, 2004). It has also been established that stronger IPRs have a positive incidence on a nation's level of exports (Maskus & Penubarti, 1995; Smarzynska, 2004) and increases the likelihood of investment undertaken by multinational enterprises (Mansfield, 1994; Seyoum, 1996). One the other hand, stronger IPRs protection could also reduce the need for FDI (Yang & Maskus, 2001).

Like in the arguments in favor of lowered IPRs in certain pharmaceutical cases, access to productive computer software might have significant public good effects (Bezmen & Depken, 2004). As recently shown by Asongu (2014a, p. 526), software piracy could be good for the poor by mitigating inequality; hence positively contributing to inequality adjusted human development. Whether a piracy-instrumented[3] impact on the IHDI and its constituents could yield similar trends remains an empirical question this paper seeks to address.

2.2 Bases for instrumental variables

In this section, we devote space to providing theoretical justification for the empirical validity of the instruments. This justification is very crucial for the relevance of the empirical

[3] Using IPR laws (treaties) as instrumental variables.

analysis because a theoretical basis for the instruments is required for sound and consistent interpretation of estimated coefficients. In other words, the object of this paper is not only to assess the impact of piracy on human development, it also indirectly aims to examine how IP laws (treaties) are instrumental in the incidence of piracy on the IHDI. For clarity in presentation, the elucidation is in two main strands: the first strand providing a theoretical linkage between IPRs laws (treaties), piracy and human development; and the second strand justifying the instrumentality of income-levels, legal-origin and press-freedom quality.

In the first strand, logic and common-sense have it that piracy and IPRs protection move hand in glove. Accordingly, we cannot talk about one without the other. Hence only with the recognition and upholding of IPRs can 'piracy' be conceived and defined as a scourge to human development. The promulgation and enforcement of laws protecting IP is today an international concern owing to globalization and advancements in information and communication technologies (ICTs) that have rendered the dissemination of information and knowledge less subject to 'real sector' scrutiny as in the past decades. The most widely known government and international instruments in the fight against piracy are: main IP law, IP rights law, World Intellectual Property Organization (WIPO) treaties and Multilateral (Bilateral) treaties. These are the IP laws (treaties) we shall use as instruments in the empirical section of the paper.

In the second strand, we provide theoretical justification for the choice of income-levels, legal-origin and press-freedom quality instrumental variables. (1) From an income-level perspective, high-income countries inherently have tighter IPRs and higher human development in comparison to their low-income counterparts (Markus, 2000). Legal-origins inherently differ in the emphasis they place on private property rights vis-à-vis the powers of the state (La Porta et al., 1998; Beck et al., 2003). The theoretical underpinnings linking press-freedom to IPRs is mixed at best. Fundamentally, high-income countries with high

press-freedom qualities have been associated with more stringent IPR regimes. However today with globalization, ICTs and the Chinese model[4], the paradigm is being shifted as high growth and human development could be associated with low press-freedom and less tight IPRs regimes.

2.3 Scope and positioning of the paper

Many authors have examined determinants of the willingness and/or ability to pirate software by assessing the socio-economic factors that influence piracy. Strong conclusions have been drawn that nations with higher income and greater individualism have lower piracy rates (Husted, 2000; Marron & Steel, 2000, Depken & Simmons, 2004). Kranenberg & Hogenbirk (2005) have concluded that country-specific risk profiles predominantly explain software piracy in most industries. Albeit they find that countries with their own copyright protection system have significantly less piracy. Gould & Gruben (1996) have noticed a positive (negative) linkage between IPRs protection and national growth rates in open (closed) economies. This finding has been supported by Rushing & Thompson (1996, 1999) and Park & Ginarte (1997) from wealth-threshold and indirect standpoints respectively. Some studies have established the existence of a non-linear relationship between income-levels and IPRs (Kim, 2004; Maskus & Penubarti, 1995). A substantial bulk of recent empirical literature has also focused on the socio-economic determinants of piracy rates in several copyright industries (Andrés, 2006a; Banerjee et al., 2005; Bezmen & Depken, 2006; Peitz & Waelbroeck, 2006; Goel & Nelson, 2009; Andrés & Goel, 2012). Two issues result from above studies: there is a missing human development component and but for a few exceptions (Andrés & Goel, 2012 for instance) endogeneity and the instrumentality of IP laws (treaties) in the piracy-development nexus are missing.

[4] Consistent with Asongu & Aminkeng (2013), the Chinese model is characterised by state regulation and prudence in privatisation/liberalisation policies.

In light of above, the present paper is positioned on three pillars that merit elucidation to complement existing literature. Firstly, while a lot has been discussed on the socio-economic effects of piracy, little is known about the human development component. The introduction of this previously missing component will beef-up the literature on two counts: (1) using the most recent HDI first published in 2010 that has been adjusted for inequality corrects past works (that might have escaped our attention in the literature review) of the bulk of criticisms inherent in the first index; (2) the incidence of piracy on the IHDI is complemented with effects on constituents of the IHDI. Secondly, a corollary to the first motivation drawn from the literature derives from the postulation that; '*IPRs are thought to be successful at spurring economic growth and activity only after a nation has acquired or accumulated sufficient human capital and technology infrastructure for creative imitation to take place*' (Asongu, 2015, p. 11) (Also see: Maskus & Penubarti, 1995; Kim, 2004; Bezmen & Depken, 2004). Hence, the need to assess if this hypothesis is still relevant with respect to human development and updated data. Thirdly, the exclusive focus on Africa draws on the debate over the 'East Asian Miracle'[5]. While Nelson & Pack (1999) have postulated that the productive assimilation of existing (foreign) productive techniques and technologies 'was a critical component of the success of these countries' (see Asongu, 2015, p.10), Maskus (2000) cautions that weaker protection of IPRs will not necessarily be beneficial for developing countries because it may cause them to remain dependent on older and less efficient technologies (Asongu, 2015). This debate merits examination in the context of Africa with respect to human development.

[5] Additional support for the possibility that the changing strength of IPR regimes is based on a nation's level of development or current technological ability is found in the rapid growth witnessed by South-East Asia. Some evidence suggests that the "East Asian Miracle" could have been caused by weaker IPRs regimes at the early stages of these nations' development in addition to their accumulation of capital. These nations' capacity to absorb, replicate, and duplicate foreign innovations may have contributed to their relatively high growth rates. It has been further noted that as these countries became significant producers of new technologies and innovators, their IPR regimes tightened.

3. Data and Methodology

3.1 Data

3.1.1 Measuring piracy

Consistent with previous empirical studies (Asongu (2015) among others from SIIA (2000), software piracy is defined as *"the unauthorized copying of computer software which constitutes copyright infringement for either commercial or personal use*" (p.12). Due to software piracy potentially taking place in many avenues – e.g., organized copiers, piracy by individuals and commercial or business piracy– obtaining an accurate measure of the prevalence of software piracy remains a challenge. There are many types of piracy. According to the Business Software Alliance (BSA), we can distinguish among: 1) end user copying; 2) downloading; and 3) counterfeiting. The level of piracy is computed as the difference in demand for new software applications (estimated from PC shipments) and the legal supply of software. In our paper, the measure of piracy employed is the percentage of software (primarily business software) in a country that is illegally installed (without a license) annually and is taken to capture the level of software piracy. This variable is reported in percentages, ranging from zero % (no piracy) to 100 % (i.e., all software installed is pirated). Piracy rates are obtained from the Business Software Alliance, (BSA), (2007), (refer to Business Software Alliance (2009) for measurement details).[6] BSA is an industry group; nevertheless its data on software piracy, is the best cross-country measure currently available, though subject to some inherent upward bias.[7] The data on software piracy may be seen more broadly as proxying for the extent of digital piracy. The mean level of piracy rate in the

[6] The BSA data primarily measures the piracy of commercial software. We are unaware of any publicly available cross-national data on end-user software piracy. See Png (2010) for a discussion about the reliability of piracy data. Also see Traphagan & Griffith (1998).

[7] Among the many researchers that have used this data are Andrés (2006a), Banerjee et al. (2005), Goel & Nelson (2009) and Marron & Steel (2000).

sample was 60.5 percent, with the minimum piracy rate of 21 percent and a maximum piracy rate of 94.3 percent.

3.1.2 Human development, control and instrumental variables

Borrowing from recent African development literature (Asongu, 2013bc), the paper uses the HDI (adjusted for inequality) as a proxy for human development. In a bid to obtain more robust results and capture specific human development channels of piracy, the IHDI is decomposed into its constituents of literacy; life expectancy and per capita economic prosperity. Therefore four endogenous variables will be used in the analysis. These indicators are from the World Bank Development (WBD) Indicators. It should be noted that while the IHDI was first published in 2010; the algorithm for its calculation has been used to adjust historical data up to the year 1970.

Control variables include: population growth, financial depth, gross domestic savings, development assistance and democracy. While the first is in annual growth rate, but for the democracy index, the rest are in annual percentage of GDP. The choice of only five control variables is contingent on constraints in the Overidentifying Restrictions (OIR) test for instrument validity[8].

Instrumental variables entail: Main Intellectual Property Law, Intellectual Property Rights Law, WIPO Treaties, Multilateral Treaties, Bilateral Treaties, Income-levels, Legal-origin and Press-freedom quality. We have already provided theoretical justification for the bases of these instruments in Section 2.2. Beside the fact that 'IPR laws (treaties) instruments' fall within the framework of an original contribution in this paper, the other instrumental variables have been largely documented in the development (Beck et al., 2003; Stulz, & Williamson, 2003) and recent African growth (Agbor, 2011; Asongu, 2013bc) literature. The

[8] An OIR test is only possible in the presence of overidentification. That is, the instruments must be higher than the number of endogenous explaining variables by at least one degree of freedom. In the cases of exact identification (instruments equal to endogenous explaining variables) and under identifications (instruments less than endogenous explaining variables) an OIR test is by definition not possible.

imperative for employing IPRs instrumental variables is further justified by differing levels in software piracy across African countries (see. Asongu, 2015, p. 5-6). The differing piracy levels also reflect varying institutional capacities to address the problem.

Due to constraints in data availability, the data include a panel of annual observations from 11 African countries for the years 2000-2010. The sample is limited because the software piracy data is only available for this number of countries on annual basis. Details about the variable definitions and data sources (Appendix 3), summary statistics with presentation of countries (Appendix 1) and correlation analysis showing the basic correlations between key variables used in this paper (Appendix 2) are presented in the appendices.

3.2 Methodology

3.2.1 Endogeneity

While piracy could be exogenous to human development, the reverse effect cannot be ruled-out, as human development engenders more respect for IPRs. As sustained by Bezmen & Depken (2004), studies investigating the piracy-development nexus are subject to potential endogeneity problems, because it is likely that a nation's level of development is a crucial factor in its choice of or adherence to a particular IPR regime. This confirms an earlier study by Ginarte & Park (1997) who found strong evidence that the level of economic development explains the strength of patent protection provided by individual countries. We are therefore confronted here with an issue of endogeneity owing to reverse-causality since the piracy indicators are correlated with the error term in the equation of interest. Beside the reverse-causality, the human development indicator (adjusted for inequality) is subject to omitted variables that also cause endogeneity. The HDI consists of three components: life expectancy, income and literacy. However we know from reality that human development is a multidimensional and complex phenomenon, with quantitative and qualitative aspects. To

tackle this endogeneity concern, we shall assess its presence with the Hausman test before employing an estimation technique relevant to the outcome of the test.

3.2.2 Estimation technique

Borrowing from Beck et al. (2003) and recent African development literature (Asongu, 2013bc), the paper adopts a Two-Stage Least Squares (henceforth 2SLS) or Instrumental Variable (IV) estimation technique. IV estimation tackles the puzzle of endogeneity and thus avoids the inconsistency of estimated coefficients by Ordinary Least Squares (OLS) when the exogenous variables are correlated with the error term in the main equation. In accordance with the literature (Beck et al., 2003), the 2SLS estimation will entail the following steps:

First-stage regression:

$$Piracy_{it} = \gamma_0 + \gamma_{1i}(Instruments)_{it} + \upsilon_{it} \qquad (1)$$

Second-stage regression:

$$HD_{it} = \lambda_0 + \lambda_1(Piracy)_{it} + \beta_i X_{it} + \mu_{it} \qquad (2)$$

In Eq. (2), X is a set of control variables while HD denotes the human development indicator. For the first and second equations, v and u, respectively represent the error terms. Instrumental variables are: Main Intellectual Property Law, Intellectual Property Rights Law, WIPO Treaties, Multilateral Treaties, Bilateral Treaties, Income-levels, Legal-origin and Press-freedom quality.

We adopt the following steps in the analysis: (1) justify the choice of a 2SLS over an OLS estimation technique with the Hausman-test for endogeneity; (2) verify the instruments are exogenous to the endogenous components of explaining (piracy channel) and control variables; (3) ensure the instruments are valid and not correlated with the error-term in the main equation with an Over-identifying Restrictions (OIR) test. Further robustness check will be ensured with robust Heteroscedasticity and Autocorrelation (HAC) standard errors.

4. Empirical analysis

This section aims to examine three main issues: (1) the ability of the instruments to explain the endogenous components of the piracy channel and control variables; (2) the capacity of the exogenous components of the piracy channel to explain human development dynamics and; (3) the ability of the instruments to explain human development dynamics beyond the piracy channel. While the first issue is addressed with the first-stage regressions, the second and third concerns are tackled with the second-stage regressions.

4.1 Presentation of results

Table 1 below summarizes first-stage regressions in which the piracy indicator and second-stage control variables are regressed on the instrumental variables. This is the first condition for the 2SLS estimation where-in the instruments must be correlated with the piracy channel and second-stage control variables. The findings overwhelmingly demonstrate that the instruments taken together enter significantly at the 1% level (Fisher statistics). Hence the instruments are strong, indicating distinguishing sampled countries by IP laws (treaties), income-levels, legal-origin and press-freedom quality help explain cross-country differences in piracy and control variables. On a specific note, the following could be established. (1) With the exception of IPRs law, other IP laws (treaties) mitigate the rate of piracy. (2) Piracy decreases with income-levels. (3) The incidence of the instruments on second-stage control variables is overwhelmingly significant and most estimated coefficients have the rights signs. For instance, financial depth and savings increase with income-level (Beck, 1999; Asongu, 2013d); with the exception of IPRs law and bilateral agreements, mainstream IP treaties (WIPO and Multilateral) exert a positive incidence on democracy. Discussing linkages between the instruments and 'second-stage control variables' to elaborate detail will be space consuming and out of scope since the object of this section is simply to demonstrate that the

instruments are strong, by providing evidence that they are correlated with the endogenous components of the second-stage exogenous variables.

Table 1: First-stage regressions

	Dependent Variables					
	Piracy	**Finance**	**Population**	**Democracy**	**Foreign-aid**	**Savings**
Constant	**1.090*** **	**-0.450*** **	**5.993*** **	**6.199*** **	**32.925*** **	**35.493*** **
	(8.485)	**(-5.512)**	**(26.61)**	**(8.816)**	**(5.552)**	**(11.17)**
MIPLaw	**-0.070*** **	-0.007	**0.152*** **	0.013	**-0.094** **	**-1.482*** **
	(-10.19)	(-1.219)	**(55.31)**	(0.742)	**(-2.056)**	**(-7.898)**
IPrlaw	**0.070***	**-0.079** **	-0.007	**-0.480*** **	0.291	**2.362** **
	(1.870)	**(-2.230)**	(-0.550)	**(-11.16)**	(1.582)	**(2.019)**
Wipo Treaties	**-0.036** **	**0.048*** **	**0.179*** **	**0.434*** **	**-4.058*** **	**-2.053***
	(-2.431)	**(2.747)**	**(3.382)**	**(2.732)**	**(-2.941)**	**(-1.783)**
Multilateral	**-0.028***	**0.047*** **	**-0.014*** **	**0.103*** **	-0.118	**-1.689*** **
	(-1.867)	**(3.236)**	**(-2.972)**	**(3.902)**	(-0.875)	**(-2.954)**
Bilateral	0.070	0.011	**0.286*** **	**-6.524*** **	**-9.440*** **	**5.275***
	(0.627)	(0.129)	**(2.955)**	**(-23.90)**	**(-4.283)**	**(1.935)**
LM Income	**0.208***	**-0.420*** **	**1.807*** **	**-4.188*** **	**-3.489** **	**-13.401*** **
	(1.880)	**(-3.791)**	**(42.60)**	**(-19.93)**	**(-2.577)**	**(-3.575)**
M. Income	**-0.257*** **	**0.496*** **	**-1.230*** **	**3.679*** **	**-5.162*** **	**12.396*** **
	(-2.796)	**(7.314)**	**(-15.92)**	**(19.34)**	**(-2.870)**	**(5.068)**
English	**-0.054***	**0.175*** **	**0.746*** **	**-2.705*** **	**-9.449*** **	---
	(-1.911)	**(4.283)**	**(21.37)**	**(-22.54)**	**(-10.31)**	
Freedom	-0.103	0.013	**0.248*** **	**0.767*** **	**-8.435*** **	-2.316
	(-1.047)	(0.209)	**(2.802)**	**(3.281)**	**(-3.778)**	(-0.764)
Adjusted R^2	0.882	0.902	0.980	0.881	0.680	0.716
Fisher	**50.001*** **	**74.420*** **	**403.70*** **	**59.418*** **	**17.837*** **	**20.314*** **
Observations	72	72	72	72	72	72

*;**;***: significance levels of 10%, 5% and 1% respectively. MIPLaw: Main Intellectual Property Law. IPrlaw: Intellectual Property Rights Law. Wipo Treaties: World Intellectual Property Organization Treaties. LM: Lower Middle. M. Middle. t-statistics in brackets.

4.2 Two-stage least squares regressions

4.2.1 Presentation of results

This section investigates the second and third issues: the ability of the exogenous components of the piracy channel to explain human development dynamics conditional of other covariates (control variables); and the capacity of the instruments to explain human development dynamics beyond the piracy channel. To makes these assessments we use the 2SLS with IP laws (treaties), income-levels, legal-origin and press freedom qualities as instrumental variables.

Whereas the second issue is addressed by the significance and signs of estimated coefficients, the third concern is solved with the OIR-Sargan test. The null hypothesis of this

test is the stance that the instruments explain human development dynamics only through the piracy and control variable channels. Hence a rejection of this null hypothesis is a rejection of the view that the instruments do not explain human development beyond the piracy mechanism (conditional on control variable channels). A Hausman test is performed before the 2SLS approach is adopted. The null hypothesis of this test is the stance that estimated coefficients by OLS are efficient and consistent. Thus a rejection of this null hypothesis points to the concern of endogeneity due to inconsistent estimates and hence lends credit to the choice of the IV estimation technique. For all models under consideration we find significant evidence of endogeneity and proceed with the IV estimation. While the 2nd to the 5th column of Table 2 presents results without HAC standard errors, estimates from the 6th to the 9th column have standard errors that are HAC consistent. In the regressions: we first of all regress the HDI on piracy to obtain a general trend on how IPRs protection play-out on human emancipation (adjusted for inequality); then we decompose the HDI into its constituent elements and further assess the incidence of piracy on each distinct component in order to reveal specific human development transmission mechanisms.

As concerns the second issue, the following could be drawn. (1) Piracy has a negative incidence on inequality adjusted human development. (2) The unappealing effect of piracy on the HDI is fuelled by the 'GDP per capita' and 'life expectancy' components of human emancipation. Hence it could be inferred from the first establishment that piracy mitigates human development through per capita economic prosperity and life expectancy. (3) Piracy increases the literacy rate. This linkage is logical from common-sense and to some extent economic theory since the imposition of IPRs severely limits the free dissemination of knowledge to the poor and uneducated who cannot afford the high cost of scholarly material. (4) Most of the control variables are significant with the right signs: foreign-aid exhibits reverse economics (Asongu, 2013c) and; population growth has a negative incidence on GDP

per capita growth, especially when the population growth rate is higher than the GDP growth rate (as it is the case of most African countries). (5) Findings without HAC standard errors on the first part of the table are robust to HAC standard error estimates in the second half of the table.

Looking at the third concern, overwhelming failure to reject the null hypothesis of the OIR test points to validity of the instruments; since they are strictly exogenous and not correlated with the error term in Eq. (2), hence they do not suffer from endogeneity. In other words, the instruments explain the HDI and its dynamics through no other mechanisms other than the piracy channel (conditional on the control variables). The validity of the instruments is consistent with robust HAC standard error regressions.

Table 2: Two-stage regressions

	Dependent Variables							
	Regressions without HAC standard errors				**Regressions with HAC standard errors**			
	IHDI	GDPpcg	LifeExp	Literacy	IHDI	GDPpcg	LifeExp	Literacy
Constant	**73.631****	**8.576*****	**2.688*****	**-4.313***	**73.631*****	**8.576*****	**2.688*****	**-4.313*****
	(2.493)	**(6.149)**	**(12.87)**	**(-1.679)**	**(2.941)**	**(5.335)**	**(16.08)**	**(-4.040)**
Piracy	**-62.18*****	**-0.926*****	**-0.055****	**0.674***	**-62.18*****	**-0.92*****	**-0.055****	**0.674*****
	(-6.636)	**(-5.420)**	**(-2.166)**	**(1.778)**	**(-12.24)**	**(-3.870)**	**(-2.016)**	**(3.967)**
Finance	**-46.50*****	**-0.995****	-0.010	**1.660****	**-46.50*****	**-0.995****	-0.010	**1.660*****
	(-3.343)	**(-2.511)**	(-0.170)	**(2.442)**	**(-4.692)**	**(-2.555)**	(-0.183)	**(6.028)**
Population growth	-2.926	**-0.587*****	**-0.114*****	**0.684****	-2.926	**-0.58*****	**-0.114*****	**0.684*****
	(-0.937)	**(-3.879)**	**(-5.056)**	**(2.338)**	(-1.023)	**(-3.164)**	**(-6.127)**	**(5.561)**
Democracy	0.022	---	---	---	0.022	---	---	---
	(0.031)				(0.033)			
Foreign-aid	-0.213	**-0.044*****	**-0.004*****	-0.001	-0.213	**-0.04*****	**-0.004*****	-0.001
	(-0.544)	**(-5.459)**	**(-3.353)**	(-0.260)	(-1.315)	**(-13.73)**	**(-12.02)**	(-0.892)
Savings	---	0.004	**-0.005*****	**0.023*****	---	0.004	**-0.005*****	**0.023*****
		(0.739)	**(-6.205)**	**(3.567)**		(1.052)	**(-11.59)**	**(9.476)**
Hausman	**190.66*****	**268.23*****	**60.758*****	**89.703*****	**190.66*****	**268.2*****	**60.75*****	**89.70*****
Sargan OIR	**3.898**	**5.155**	**4.325**	**3.889**	**3.898**	**5.155**	**4.325**	**3.889**
	[0.272]	**[0.160]**	**[0.228]**	**[0.273]**	**[0.272]**	**[0.160]**	**[0.228]**	**[0.273]**
Adjusted R^2	0.632	0.886	0.885	0.431	0.632	0.886	0.885	0.431
Fisher	**20.123*****	**78.299*****	**72.469*****	**7.537*****	**154.12*****	**6942**	**292.2*****	**230.48*****
Observations	54	50	50	41	54	50	50	41
Instruments	Constant; Main_IP_law; IP_rlaw; Wipo_treaties; Mutilateral; Bilateral; LM_Income; M_Income; FreeD; English							

IHDI: Inequality adjusted Human Development Index. GDPpcg: GDP per capita growth. LifeExp: Life Expectancy. Finance: Financial depth. GDPpcg: Log of GDP per capita(constant 2005). *;**;***: significance levels of 10%, 5% and 1% respectively. OIR: Overidentifying Restrictions. [] :P-values. z-statistics in brackets. HAC: Heteroscedasticity and Autocorrelation Consistent standard errors.

4.2.2 Further discussion of results and policy implications

Before embarking on further discussion of results, it is worthwhile highlighting the intuition motivation this paper. Its object has been to assess the incidence of piracy (IPRs protection) on human development. In other terms, we have sought to examine how IP laws (treaties), multi(bi)lateral treaties, income-levels, legal origin and press-freedom qualities are instrumental in the incidence of piracy on human development. In a bid to obtain relevant and more targeted policy implications, we have decomposed the IHDI into its constituent elements and independently assessed the impact of piracy on each component. Three main findings have been established: (1) piracy has a negative incidence on inequality adjusted human development; (2) the unappealing effect of piracy on the IHDI is fuelled by the 'GDP per capita' and 'life expectancy' components of human emancipation; (3) piracy increases the literacy rate. The third point is consistent with Asongu (2014b) which has concluded that piracy in software boosts scientific publications in African countries.

Two major policy implications could be retained from the findings. (1) Adherence to international IPRs protection treaties (laws) may not impede per capita economic prosperity and could improve life-expectancy. Hence results on GDP per capita and life expectancy lend credit to Maskus (2000) who cautions that weaker protection of IPRs will not necessarily be beneficial to developing countries as it may cause them to remain dependent on older and less efficient technologies. While from our empirical justification this theory could be valid for GDP per capita growth, its 'life expectancy' interpretation must be treated with extreme caution. Why? HIV/AIDs is a fundamental cause of mortality in the sampled countries and a growing chunk of the opposition to stronger IPRs assert 'permission' should be granted to enable 'copying' the life-saving pharmaceuticals; especially those used in the management of HIV/AIDS in developing countries most affected and least likely to afford such treatments. Their thesis has been premised on the reality that existing technology in African countries is

more imitative and adaptive in nature, rather than suitable for creation of new innovations. This cautious note is also based on the fact that the sampled countries do not significantly represent the entire African continent. (2) Adherence to international IPRs protection treaties (laws) may negatively affect human development by diminishing the literacy rate. We have found evidence that piracy improves literacy, thus confirming the postulations of Nelson & Pack (1999) that the productive assimilation of existing (foreign) productive techniques and technologies 'was a critical component of the success of Asian countries'. Hence we recommend adherence to less strict IPR laws (treaties) in the educational sector. This position supports the growing preference of multilateral and bilateral IPR laws (treaties) by developing countries in the stead of more stringent international IPR laws (treaties) which restrict diffusion of knowledge. As nations grow in capacities to become significant contributors to knowledge and educational innovations, they could adhere to tighter IPR regimes.

5. Conclusion

The present paper has been supported by three pillars that merit elucidation to complement existing literature. Firstly, while a lot has been discussed on the socio-economic effects of piracy, little is known about the human development component. The introduction of this previously missing component has beefed-up the literature on two counts: (1) the use of the most recent Human Development Index (HDI) first published in 2010 that has been adjusted for inequality corrects past works (that have escaped our attention in the literature review) of the bulk of criticisms inherent in the first index; (2) the impact of piracy on the HDI has been complemented with its (piracy) incidence on constituents of the HDI in a bid to capture piracy channels to human development which have provided the much needed guidance to policy makers. Secondly, a corollary to the first motivation drawn from the literature derives from the assertion that; IPRs are thought to be successful at spurring economic growth and activity only after a nation has acquired or accumulated sufficient

human capital and technology infrastructure for creative imitation to take place (Maskus & Penubarti, 1995; Kim, 2004; Bezmen & Depken, 2004). Hence there has been a need to assess if this hypothesis is still relevant with respect to human development and updated data. Thirdly, the exclusive focus on Africa has drawn on the debate over the 'East Asian Miracle'.

Owing to above motivations, the paper has sought to examine two dimensions to complement existing literature; (1) assess the incidence of piracy on human development and its constituents; (2) examine how international, multilateral and bilateral IPRs treaties (laws) are instrumental in the effect of piracy on human development and its components. Three main findings have been established: (1) piracy has a negative incidence on inequality adjusted human development; (2) the unappealing effect of piracy on the HDI is fuelled by the 'GDP per capita' and 'life expectancy' components of human emancipation; (3) piracy increases the literacy rate. Two major policy implications have been retained from the findings. (1) Adherence to international IPRs protection treaties (laws) may not impede per capita economic prosperity and could improve life-expectancy. (2) Adoption of tight IPR regimes may negatively affect human development by diminishing the literacy rate and restricting diffusion of knowledge.

Appendices

Appendix 1: Summary statistics and presentation of countries

Panel A: Summary Statistics

		Mean	S.D	Min	Max	Obser.
Dependent Variables	Human Development Index	1.732	7.191	0.376	45.325	113
	GDP per capita	3.543	0.362	3.012	4.106	121
	Life Expectancy	1.758	0.076	1.622	1.862	110
	Literacy ratio	1.826	0.097	1.572	1.956	110
Independent & Control Variables	Piracy	0.409	0.307	-0.288	0.720	106
	Finance	0.470	0.274	0.139	1.141	110
	Population growth	7.268	0.602	6.074	8.199	121
	Democracy	4.950	3.539	0.000	10.000	121
	Foreign-aid	3.684	5.017	-0.251	24.544	110
	Savings	21.511	12.838	2.754	57.539	106
Instrumental Variables	MainIPlaw	2.256	2.835	0.000	11.000	121
	IPrlaw	1.438	1.944	0.000	7.000	121
	Wipo Treaties	2.735	0.793	2.000	4.000	121
	Mutilateral	9.628	3.304	4.000	17.000	121
	Bilateral	0.322	0.535	0.000	2.000	121
	Lower Middle Income	0.454	0.500	0.000	1.000	121
	Middle Income	0.818	0.387	0.000	1.000	121
	Freedom	0.333	0.474	0.000	1.000	72
	English Common Law	0.545	0.500	0.000	1.000	121

Panel B: Presentation of Countries

Algeria, Botswana, Cameroon, Egypt, Kenya, Mauritius, Morocco, Nigeria, Senegal, South Africa, Zambia

S.D:Standard Deviation. Min:Minimum. Max: Maximum. Obser: Observations.

Appendix 2 : Correlation matrix

Dependent Variables				Independent and Control Variables						Instrumental Variables									
IHDI	GDPp	LE	LR	Piracy	Finance	Popg	Demo	Aid	Savings	MIPlaw	IPrlaw	Wipo	Multila	Bilater	LMI	MI	FreeD	English	
1.000	0.187	-0.059	0.217	-0.480	0.014	0.106	0.206	-0.130	-0.025	0.834	-0.038	-0.167	-0.294	-0.100	-0.165	0.089	0.365	0.158	IHDI
	1.000	0.494	0.670	-0.504	0.530	-0.404	0.273	-0.650	0.514	0.332	0.071	-0.273	-0.380	0.034	-0.400	0.578	0.873	0.095	GDPp
		1.000	-0.033	-0.270	0.870	-0.055	-0.229	-0.532	0.247	-0.127	0.099	0.048	0.278	0.379	0.108	0.448	0.494	-0.508	LE
			1.000	-0.348	0.136	-0.343	0.356	-0.273	0.334	0.352	-0.393	-0.535	-0.618	-0.164	-0.753	-0.064	0.681	0.539	LR
				1.000	-0.493	-0.067	-0.217	0.453	0.276	-0.715	-0.017	0.320	0.026	0.015	0.124	-0.289	-0.771	-0.153	Piracy
					1.000	-0.097	-0.137	-0.480	0.035	0.051	0.217	0.027	0.318	0.337	0.036	0.314	0.659	-0.243	Finance
						1.000	-0.540	-0.107	-0.141	0.362	0.079	0.178	0.151	0.272	0.437	-0.029	-0.441	-0.246	Popg
							1.000	0.027	-0.140	0.220	-0.191	-0.001	-0.207	-0.677	-0.599	-0.140	0.660	0.688	Demo
								1.000	-0.407	-0.305	-0.216	-0.018	0.106	-0.180	-0.010	-0.590	-0.544	0.067	Aid
									1.000	-0.0005	0.074	-0.294	-0.520	0.124	-0.322	0.302	0.439	-0.093	Savings
										1.000	0.103	-0.273	-0.221	-0.071	-0.171	0.209	0.498	0.270	MIPlaw
											1.000	0.0308	0.443	0.143	0.419	0.350	0.022	-0.136	IPrlaw
												1.000	0.311	-0.052	0.221	-0.157	-0.480	-0.074	Wipo
													1.000	0.261	0.632	0.063	-0.420	-0.299	Multila
														1.000	0.475	0.284	-0.267	-0.661	Bilater
															1.000	0.430	-0.547	-0.633	LMI
																1.000	0.408	-0.430	MI
																	1.000	0.408	Free
																		1.000	English

IHDI : Inequality adjusted Human Development Index. GDPp: GDP per capita growth. LE: Life Expectancy. LR: Literacy Rate. Popg: Population growth. Demo: Democracy. LMI: Lower Middle Income. MI:Middle Income. FreeD: Complete Freedom of the Press. English: English Common Law countries. MIPlaw: Main Intellectual Property law. IPrlaw: Intellectual Property Rights law. Wipo: World Intellectual Property Organization. Multila: Multilateral treaties. Bilater: Bilateral treaties.

Appendix 3: Variable definitions

Variables	Signs	Variable definitions	Sources
Human Development	IHDI	Inequality adjusted Human Development Index	World Bank(WDI)
GDP per capita	GDPpc	Log of GDPpc, PPP(International constant dollar 2005)	World Bank(WDI)
Life Expectancy	LE	Log of Life Expectancy at birth(Total years)	World Bank(WDI)
Literacy Rate	LR	Log Adult literacy rate(annual % of population aged 15+)	GMID
Piracy	Piracy	Piracy rate (annual %)	BSA
Financial Depth	Finance	Financial System Liabilities	World Bank(FDSD)
Population Growth	Popg	Population Growth Rate (annual %)	World Bank(WDI)
Democracy	Demo	Institutionalized Democracy	World Bank(WDI)
Foreign-aid	Aid	Net Official Development Assistance(% of GDP)	World Bank(WDI)
Savings	Savings	Gross Domestic Savings(% of GDP)	World Bank(WDI)
Freedom	Free	Press Freedom Quality	Freedom House
Main IP law	MIPlaw	Main Intellectual Property Law	WIPO
IP rlaw	IPrlaw	Intellectual Property Rights Law	WIPO
Wipo Treaties	Wipo	World Intellectual Property Organization Treaties	WIPO
Mutilateral	Multiter	Multilateral Treaties	WIPO
Bilateral	Bilater	Bilateral Treaties	WIPO
English Common law	English	Countries with English Common Law Tradition (Dummy variable, 1 for English and 0, otherwise)	La Porta (2008, p. 286)
Lower Middle Income	LM. Income	Countries with income group setting: $1,006-$3,975.	Asongu (2014c, p. 365)
Middle Income	M.Income	Countries with income group setting: $1,006-$12,275.	Asongu (2014c, p. 365)

WDI: World Bank Development Indicators. FDSD: Financial Development and Structure Database. BSA: Business Software Alliance. GDP: Gross Domestic Product. Log: Logarithm. PPP: Purchasing Power Parity. WIPO: World Intellectual Property Organization. GMID: Global Market Information Database.

References

Agbor, J. A., (2011). "How Does Colonial Origin Matter for Economic Performance in Sub-Saharan Africa", *World Institute for Development Economics Research, Working Paper* No. 2011/27.

Andrés, A. R. (2006a). "The relationship between copyright software protection and piracy: Evidence from Europe", *European Journal of Law and Economics*, *21*, pp. 29–51.

Andrés, A. R., (2006a). "Software piracy and income inequality", *Applied Economic Letters*, 13, (2), pp. 101-105.

Andrés, A. R., & Goel, R. K., (2012). "Does software piracy affect economic growth? Evidence across countries", *Journal of Policy Modeling*, 34, pp. 284-295.

Andrés, A. R., & Asongu, S. A., (2013a). "Fighting software piracy: which governance tools matter in Africa?" *Journal of Business Ethics*, 118(3), pp. 667-682.

Andrés, A. R., & Asongu, S. A., (2013b). "Global dynamic timelines for IPRs harmonization against software piracy", *Economics Bulletin*, 33(1), pp. 874-880.

Asongu S. A., (2013a). "Harmonizing IPRs on Software Piracy: Empirics of Trajectories in Africa", *Journal of Business Ethics*, 118(1), pp. 45-60.

Asongu, S. A., (2013b). "Globalization and human development: implications for Africa", *International Journal of Development Issues*. 12(3), pp. 213-238.

Asongu, S. A., (2013c). "Consult your gods: the questionable economics of development assistance in Africa", *African Governance and Development Institute Working Paper* No. 13/002.

Asongu, S. A., (2013d). "How has mobile banking stimulated financial development in Africa?", *Journal of African Business*, 14(1), pp. 7-18.

Asongu, S. A, (2015). "Fighting software piracy in Africa: how do Legal origins and IPRs protection channels matter?", *Journal of the Knowledge Economy*, http://link.springer.com/article/10.1007/s13132-012-0137-0 (accessed: 15/01/2014)

Asongu, S. A., (2014a). "Software piracy, inequality and the poor: evidence from Africa", *Journal of Economic Studies*, 41(4), pp. 526-553.

Asongu, S. A., (2014b). "Software piracy and scientific publications: knowledge economy evidence from Africa", *African Development Review*: Forthcoming.

Asongu, S. A., (2014c). "Globalization (fighting) corruption and development. How are these phenomena linearly and nonlinearly related in wealth effects?", *Journal of Economic Studies*, 41(3), pp. 346-369.

Asongu, S. A., & Aminkeng, G. A. A., (2013). "The economic consequences of China-Africa relations: debunking myths in the debate", *Journal of Chinese Economic and Business Studies*, 11(4), pp. 261-277.

Banerjee, D., Khalid, A. M., & Sturm, J.-E. (2005). "Socio-economic development and software piracy. An empirical assessment", *Applied Economics, 37*(18), pp. 2091–2097.

Baumol, W.T. (1993). *Entrepreneurship, Management and the Structure of Payoff,* MIT Press, Cambridge, MA.

Beck, T., Demirguc-Kunt, A., & Levine, R., (1999). "A New Data base on Financial Development and Structure", *Financial Sector Discussion Paper* No. 2.

Beck, T., Demirgüç-Kunt, A., & Levine, R., (2003). "Law and finance: why does legal origin matter?", *Journal of Comparative Economics*, 31, pp. 653-675.

Bezmen, T. L., & Depken, C. A., (2004). "The impact of software piracy on economic development", *Working Paper*. Francis Marion University., pp. 1-20.

Bezmen, T. L., & Depken II, C. A. (2006). "Influences on software piracy: Evidence from the various United States". *Economics Letters, 90*, pp. 356–361.

Business Software Alliance, (2007). 2006 Piracy study. BSA, New York.

Business Software Alliance: BSA, (2009). What is Software Piracy? http://www.bsa.org/Piracy%20Portal.aspx, accessed May 2012.

Carla, M., & Ramello, G. B., (2011). "In the Beginning Was the Word. Now is the Copyright", *Review of Law and Economics*, 7(1), pp. 271-289.

Charoensukmongkol, P., & Elkassabgi, A. (2011a). "The inverse U curve relationship between software piracy and technological outputs in developed nations". *Management Research Review, 34*(9), pp. 968–979.

Chen, C.-C., Chen, C.-P., & Yeh, C.-Y. (2010). "Determinants of software piracy: Evidence from Far East countries". *Journal of International and Global Economic Studies, 3*(2), pp. 53–62.

Depken, C.A., & Simmons, L., (2004) "Social Construct and the Propensity for Software Piracy," *Applied Economics Letters*, 11, pp. 97-100.

Ding, C. G., & Liu, N.-T. (2009). "Productivity changes of Asian economies by taking into account software piracy". *Economic Inquiry, 47*(1), pp. 135–145.

Diwan, I., & Rodrik, D., (1991) "Patents, Appropriate Technology and North-South Trade", *Journal of International Economics,* 30, pp. 27-48.

El Harbi, S., Grolleau, G., & Bekir, I. (2012). "Is There A Piracy Kuznets Curve?" *Review of Law and Economics, 8*(2), pp. 433-456.

Ginarte, J. C., & Park, W. G., (1997) "Determinants of Patent Rights: A Cross-National Study," *Research Policy,* pp. 283-301.

Goel, R. K., & Nelson, M. A. (2009). "Determinants of software piracy: Economics, institutions, and technology", *Journal of Technology Transfer, 34,* pp. 637-658.

Goel, R. K., & Nelson, M. A. (2012). "Shadow economy and international software piracy". *Applied Financial Economics, 22*(23), pp. 1951–1959.

Gomes, N. D., Cerqueira, P. A., & Almeida, L. A. (2013). "Determinants of worldwide software piracy losses". GEMF-Faculdade de Economia, Universidade de Coimbra.

Gomes, N. D., Cerqueira, P. A., & Almeida, L. A. (2014a). " Effects of taxation on software piracy across the European Union" (GEMF Working Paper No. 2014-03). GEMF - Faculdade de Economia, Universidade de Coimbra.

Gomes, N. D., Cerqueira, P. A., & Almeida, L. A. (2014b). "Software piracy: A critical survey of the theoretical and empirical literature" (GEMF Working Paper No. 2014-05). GEMF - Faculdade de Economia, Universidade de Coimbra.

Goode, S., & Kartas, A. (2012). "Exploring software piracy as a factor of video game console adoption". *Behaviour & Information Technology*, 31(6), pp. 547–563.

Gould, D. M., & Gruben, W. C., (1996) "The Role of Intellectual Property Rights in Economic Growth," *Journal of Development Economics,* 48, pp. 323-350.

Grossman, G. M. & Helpman, E., (1991). *Innovation and Growth in the Global Economy*, MIT Press, Cambridge, MA.

Fleury, J-B., & Marciano, A., (2013). "Becker and Posner: Freedom of Speech and Public Intellectualship", *Review of Law and Economics*, 45(5), pp. 254-278.

Hamister, J., & Braunscheidel, M. (2013). "Software piracy and intellectual property rights protection". *Academy of Information & Management Sciences Journal, 16*(1), pp. 15–35.

Husted, B. W., (2000). "The Impact of National Culture on Software Piracy," *Journal of Business Ethics*, 26, pp.197-211.

Jamil, D., & Zaki, H. (2011). "Software piracy does not hurt anyone?" *International Journal of Engineering Science and Technology, 3*(4), pp. 3467–3471.

Kariithi, N. K. (2011). "Is the devil in the data? A literature review of piracy around the world". *Journal of World Intellectual Property, 14*(2), pp. 133–154.

Kim, L., (2004). "The Multifaceted Evolution of Korean Technological Capabilities and its Implications for Contemporary Policy," *Oxford Development Studies,* 32(3), pp. 341-63.

Kranenburg, H. L., & Hogenbirk, A. E., (2005). "Determinants of Multimedia, Entertainment, and Business Software Copyright Piracy: A Cross-national Study," *Journal of Media Economics*, 2, pp. 109-129.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W., (1998). "Law and finance", *Journal of Political Economy*, 106, pp. 1113-1155.

Lee, J., & Mansfield, E., (1996) "Intellectual Property Protection and U.S. Foreign Direct Investment," *The Review of Economics and Statistics,* 78(2), pp. 181-86.

Mansfield, E., (1994). *Intellectual Property Protection, Foreign Direct Investment, and Technology Transfer,* (Washington D.C.: International Finance Corporation).

Marron, D. B., & Steel, D. G., (2000). "Which Countries Protect Intellectual Property? The Case of Software Piracy," *Economic Inquiry,* 38(2), pp. 147-74.

Maskus, E. K., (2000). "Intellectual Property Rights and Economic Development", University of Colorado, Boulder.

Maskus, K. E. & Penubarti, M., (1995) "How Trade Related are Intellectual Property Rights?"*Journal of International Economics,* 39, pp. 227-248.

Moores, T. T. (2008). "An analysis of the impact of economic wealth and national culture on the rise and fall of software piracy rates". *Journal of Business Ethics, 81*(1), pp. 39–51.

Moores, T. T. (2010). "Untangling the web of relationships between wealth, culture, and global software piracy rates: A path model". *Journal of Global Information Management (JGIM), 18*(1), pp. 1–14.

Mostafa, M. M. (2011). "A neuro-computational intelligence analysis of the global consumer software piracy rates". *Expert Systems with Applications, 38*(7), pp. 8782–8803.

Nelson, R. R., & Pack, H., (1999). "The Asian Miracle and Modern Growth Theory," *Economic Journal,* 109, pp. 416-36.

Nicita, A., & Ramello, G. B., (2007). "Property, Liability and Market Power: The Antitrust Side of Copyright", *Review of Law and Economics*, 3(3), pp. 767-791.

Panas, E.&, Ninni, V. (2011). "Is there a software Kuznets curve?" *Applied Economics Letters, 18*(18), pp. 1723–1728.

Park, W., & Ginarte, J., (1997). "Intellectual Property Rights and Economic Growth," *Contemporary Economic Policy,* 15, pp. 51-61.

Peitz, M., & Waelbroeck, P. (2006). "Piracy of digital products: A critical review of the theoretical literature", *Information Economics and Policy, 18*, pp. 449–476.

Png, I. P. L., (2010). "On the reliability of software piracy statistics", *Electronic Commerce Research and Applications,* 9(5), pp. 365-373.

Ramello, G. B., (2011). "Property rights and externalities: the uneasy case of knowledge", *European Journal of Law and Economics*, 31(1), pp. 123-141.

Ramello, G. B., (2005). "Intellectual Property and the Markets of Ideas", *Review of Network Economics,* 4(2), pp. 1-20.

Reinig, B. A., & Plice, R. K. (2011). "Toward an understanding of software piracy in developed and emerging economies". *International Journal of Social and Organizational Dynamics in IT, 1*(1), pp. 1–12.

Robertson, C., Gilley, K. M., & Crittenden, W. F. (2008). "Trade liberalization, corruption, and software piracy". *Journal of Business Ethics, 78*(4), pp. 623–634.

Romer, P. M., (1990). "Endogenous Growth and Technical Change," *Journal of Political Economy,* 98, pp. 71-102.

Rushing, F., W., & Thompson, M .A., (1996). "An Empirical Analysis of the Impact of Patent Protection on Economic Growth," *Journal of Economic Development,* 21(2), pp. 61-79.

Rushing, F., W., & Thompson, M.A., (1999). "An Empirical Analysis of the Impact of Patent Protection on Economic Growth: An Extension," *Journal of Economic Development,* 24(1), pp. 67-76.

Seyoum, B., (1996). "The Impact of Intellectual Property Rights on Foreign Direct Investment," *Columbia Journal of World Business* 31(1), pp. 50-59.

SIIA. (2000). *SIIA report on global software piracy 2000*. Washington, DC: Software and Information Industry Association.

Sonmez, M., Yang, D., & Andrés, A. R. (2010). "Investigating the determinants of business software piracy: A longitudinal study of European countries". *Recent Patents on Computer Science, 3*(3), pp. 195–202.

Stulz, R., M., & Williamson, R., (2003). "Culture, Openness and Finance", *Journal of Financial Economics,* 70, pp. 313-349.

Theng, Y.-L., Tan, W. T., Lwin, M. O., & Shou-Boon, S. F. (2010). "An exploratory study of determinants and corrective measures for software piracy and counterfeiting in the digital age". *Computer and Information Science, 3*(3), pp. 30–49.

Todaro, M. P., & Smith, S. C., (2003). *Economic Development*, 8th ed. Addison Wesley.

Traphagan, M., & Griffith, A. (1998). "Software piracy and global competitiveness: Report on global software piracy". *International Review of Law, Computers & Technology*, *12*,pp. 431–451.

Yang, G. & Maskus, K. E., (2001). "Intellectual Property Rights, Licensing, and Innovation in an Endogenous Product-Cycle Model," *Journal of International Economics,*53, pp. 169-187.

Yang, Z., Zhou, J., Qin, H., & Koong, K. S. (2013, January 1). "Quantitative analysis of global software piracy: 2003 through 2010". *International Journal of Business and Systems Research, 7*(1), pp. 81–100.