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The Role of Institutions within the IPR Enforcement Context

The Case of de facto Software Protection in Egypt

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Abstract

The present paper develops a new institutional perspective of intellectual property right (IPR) enforcement dilemmas in developing countries, focusing on the case of software protection in Egypt. Transplanting western made IPR rules and enforcement strategies to developing countries without any additional assistance from right holders did not fulfill the required enforcement standards. Satisfactory results can only be achieved gradually. Game theoretical examinations showed that decisions taken by both parties (right holders and developing countries) under the homo-economicus assumption and in the absence of binding institutions lead to inefficient outcomes, while agreeing on a long-term cooperative second best mindset leads to higher welfare gains. In order to maintain a stable contractual outcome to enforce IPR, one should control for the process of structuring de facto institutions, especially enforcement authorities (prosecutors and judiciary) before signing the agreement and throughout the contractual phase. This hinders sharp fluctuations of transaction cost (TC) and expected value of future payoffs that might occur during the different stages of the contract. Accordingly, the paper provides a new policy tool that can be considered useful when discussing new strategies related to the possibility of establishing binding institutions to enforce IPR.

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1. Introduction

Software piracy tends to be one of the most popular and fastest growing forms of Intellectual Property Right (IPR) violations. In 2007, 60% of software installed on personal computers in the Middle East and Africa was found to be illegal, compared with a world average piracy rate of 38%. Egypt, one of the leading countries in the region, managed successfully to decrease its software-piracy rate from 85% in 1998 to 58%in 2001. This success however didn't last long as it was followed by a drastic increase in software piracy by 11 percentage points to reach 69% in 2003[1] (BSA, 2008). Hence, the Egyptian government tried to implement new strategies and shed the light once again on the existing IPR institutions and enforcement authorities after 2003. However till 2007 Egypt still didn't manage to decrease its piracy rate below 60%. Accordingly, it becomes necessary to ask why countries, especially developing ones lack persistent efficient (*de facto*) IPR protection? Why did Egypt's quick success in reducing software piracy turn into a drastic failure in 2003?

Developing countries with large segments of poor people that rely mainly on access to cheap pirated software face a huge conflict when trying to enforce IPR according to bilateral and multilateral pressure. This is due to the conflicting interests the authorities have to deal with: On one hand, they have to bear the extra fiscal cost of enforcement and deprive their poor citizens from using cheap software products. On the other hand, they cannot stand the increasing sanction threats by the International Organizations and right holders. Accordingly, the conflict of software piracy can be considered an ideal case for the examination of the ability of international obligations to affect existing domestic institutions in a country. A wide range of studies have emerged to analyze the determinants of IPR enforcement and the design of IP piracy models in general. Previous scholars have focused mainly on the economic factors of a country to explain piracy rates. The most common conclusion of previous studies was that national income; usually in combination with other factors is conventionally considered a strong predictor of IPR piracy. In other words, rich nations (Western countries) are more likely to convey with formal IPR laws, rather than poor ones. This finding is supported mainly by Maskus and Penubarti (1995), Ginarte and Park (1997), Maskus (2000), Marron and Steel (2000). Depken and Simmons (2004) moreover added that in addition to GDP per capita, inflation rate also has a significant impact on piracy rates. Bezmen and Depken (2005) showed that higher piracy rates are correlated with lower scores of the Human Devel-

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[1] Piracy rate is measured by the BSA office by first calculating the number of legal software shipped by U.S. firms minus the total number of total software used by PC users inside Egypt. This number is considered the number of pirated software copies. Then to be able to calculate the percentage rate of piracy this number is divided by the total number of software copies used and the results are multiplied by 100.

opment Index (HDI), which tends to be positively correlated with GDP per capita and economic freedom.

Recently, other studies have started analyzing the ability of international relations, like multilateral obligations and bilateral pressures on IPR piracy. Shadlen, Schrank and Kurtz (2005) for example, empirically showed that sanction threats are considered powerful tools to reduce software piracy. However it is worth noting that in light of the weak national incentives to enforce IPR, the ability of international organizations to establish any binding commitments to enforce these obligations, becomes less probable, especially in poor and small developing countries. In light of the growing tendency to test the impact of institutions on economic behavior, some authors like for example Holm (2003) and Fischer and Andrés (2005) agreed upon using one variable (rule of law) as a measure for formal or external institutions in each country. Using a cross country analysis, they found a strong negative relationship between the rule of law and the level of software piracy. However it must be said that the rule of law variable does not represent a single institution but relates to dozens or even hundreds of institutions in a country (Voigt, 2009:17). Other academic researchers chose to illustrate the impact of informal or internal institutions on piracy by measuring the impact of culture on piracy. Husted (2000) for example, has used some elements of the national culture as informal institutions affecting software piracy. His definition of culture is mainly based on Hofstede (1981, 2004), which comprises four main dimensions: power distance, individualism, masculinity and uncertainty avoidance. He found out that, in addition to GNP per capita and income inequality, only individualism tended to have a significant influence on software piracy. This evidence was supported by Fischer and Andrés (2005) who show that in addition to the inverse relationship between individualism and software piracy, the impact of various income classes on piracy rates may depend on the geographic region where a country is located. However, as noted by Shore et al. (2001), it can be said that cross-cultural research that explored the relation between IPR piracy and ethical or moral behavior remains limited. Swinyard et al. (1990) analyze the attitudes towards software copyright laws and the behavioral intentions towards these laws in the US and Singapore and found that both attitudes and behavioral intentions of Americans are more harmonious with copyright laws than those of Singaporeans. Moreover, the authors found that "not only does the Asian culture provide less support for copyright legislation; it provides more support for the human benefits which might come from the piracy".

Accordingly, it can be said that most of the available literature mainly tried to explain why IPR might be better enforced in some countries rather than in others, however none of their de-

terminants of IPR piracy can be used to explain piracy trends within the same region. In other words, what would cause piracy rates to change with different rates or to fluctuate within the same country across a relatively short time period? Looking at figure 1 below, one can notice the fluctuations of piracy rates in the Middle East and Africa between 1994 and 2008. Ever since 1994, the region experienced a smooth decline of software piracy. In 2001 it managed to reach a piracy rate of 50%, however after 2002 piracy rate increased by 6 percentage points to be 56%. This deterioration could be partially explained by referring to the wider sample of data used in calculating global piracy rates since 2003. However this cannot be the sole reason behind this sharp rise on piracy, as piracy rate in the region continued rising in 2004, too. In 2005 piracy declined again by 1% and finally started rising once more in 2006 and then falling after 2007. Hence software piracy is fluctuating around an average of 59%.

Figure 1: Piracy Trends in the Middle East and Africa
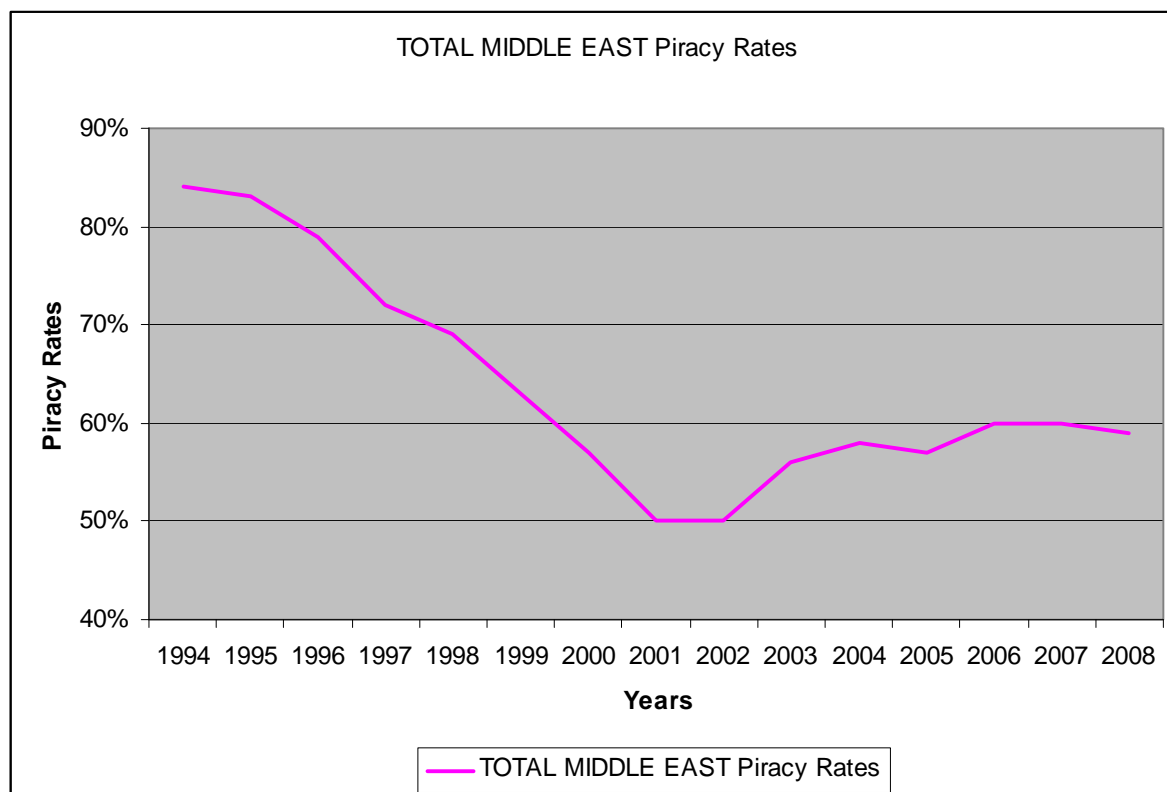
In short, it can be said that the region still needs to stress on certain aspects of the enforcement process to stabilize its piracy trends and achieve more satisfactory results. Previous attempts in the field of IPR enforcement tend to neglect the role of binding institutions and efficient enforcement authorities as main prerequisites to settle IPR related conflicts. The nature of IP laws as being de jure institutions that widely diverge from the prevailing de facto institutions in a country and possible ways to narrow this gap have not been analyzed at all.

Hence, focusing on the case of software, this paper tries to explain the rationale behind ongoing enforcement problems, focusing on the Egyptian case. The core point is mainly analyzing the role of institutions in the process of fighting software piracy in developing countries. Institutions in the sense of human made constraints that are made to structure human behavior, differentiating between *de jure* (signing an agreement to comply with a certain arrangement) and *de facto* (carrying out the agreement) institutions. The problem of IPR enforcement in general can be simply seen as a supra game, played by two or more interacting agents with conflicting objectives and strategies. Following Watson's example of an infinitely repeated prisoners' dilemma model (Watson, 2002: 216-219), a game theoretical model is constructed that takes into consideration the most important factors which are expected to affect the disputes between the two conflicting parties. Pay-offs representing the expected returns of each party are parameterized in an attempt to understand on what basis the two players are building their decisions along the whole IPR enforcement path (1952-2007)[2]. To solve the game, a backward induction[3] method is implemented in order to determine the optimal decisions for both players. The paper concludes by highlighting the importance of domestic institutional change in the legal enforcement system of software protection.

2. Combating Software Piracy: Towards a New Enforcement Strategy

Software piracy has reached an epidemic level in the Middle East and Africa (Hamade, 2006). Piracy rates of the region have been fluctuating up and down around an average of 59% (BSA, 2008). Software programs are protected in most countries by the copyright law; however in some other countries, and particularly in the US, software-related inventions tend to be often protected by the patent law. Software in general can be easily copied due to their public good nature[4] and their low cost of reproduction (marginal cost of production equals zero). These characteristics form low barriers to entry and makes copying an attractive business for pirates. Moreover, it must be clarified that the protection of readymade software seem to be more problematic than that of tailored applications in developing countries, as the creation and production of these special software products is carried by foreign firms' rather than domestic producers. This fact gives the new laws of enforcing IPR little popularity and hence little local support.

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[2] United States threatens Egypt; therefore Egypt launches a gradual IPR enforcement strategy that heavily relies on de jure protection standards (amending its IPR law) without similar progress in factual enforcement.

[3] Backward induction is an iterative process for solving a sequential game theoretical model.

[4] They are non-excludable and non-rival.

Various software companies enjoy political influence in many of the largest countries. This fact placed IPR protection on the international agenda in the first place[5], as some of these companies started using their power to put continuous pressure on governments of the region to introduce more severe punishments to improve their intellectual property law. This campaign has been mainly led by the United States, which is considered the world's largest software supplier. Schrank (2003: 291-293) states that approximately 80% of the world's ready-made packaged software is produced by American firms, which increases the incentives of US right holders to stress the protection of IPR outside the US. An international comparison by the Deutsche Bank reveals very strong differences between the software market shares of the different countries. The US tends to own 44% of the global software products market, followed by Japan which owns 11.3% of the market (Deutsche Bank, 2005).

Accordingly, the US has launched an anti piracy campaign, putting countries who fail to impose deterrent penalties on a "Watch List" or even on a "Priority Watch List" which were set up by the 1988 US Trade Act.[6] Section 182 of the Omnibus Trade and Competitiveness Act of 1988, 19 U.S.C. § 2242 encompassed the so called "Special 301" provisions. These provisions were issued to form a major US trade tool to control international copyright piracy and are considered a vital tool for the United States Trade Representative (USTR)[7] to stop the increasing losses in US jobs and competitiveness. Special 301 implies continuous coordination between copyright industries, local private sector representatives (for example, the Business Software Alliance (BSA))8, US government representatives and US embassy officials to follow up and resolve copyright problems in counterfeiting countries (Sykes, 1992).

Egypt and other African countries currently participate in the Generalized System of Preferences (GSP) trade program. The program assures the flow of duty-free imports of certain products from developing countries into the US. In order to qualify for and continue benefiting from such unilaterally granted trade preferences program, the board of the USTR must be satisfied that Egypt and other participating countries meet certain discretionary criteria.

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[5] See: Sell 2003, Chapter 5

[6] As it is the prevailing case with China, with 100% tariffs on its trade with the US

[7] USTR is an agency of over 200 people, a highly committed group of professionals who have decades of specialized experience in trade issues and regions of the world. They negotiate directly with foreign governments to create trade agreements, resolve disputes and participate in global trade policy organizations. They also meet with governments, business groups, legislators and public interest groups to gather input on trade issues and explain the president's trade policy positions. The agency was founded in 1962 and has offices in Washington, Geneva and Brussels (www.ustr.gov).

[8] BSA is the largest and most international IT industry group, with policy, legal and/or educational programs in 80 countries. BSA's member companies are some of the most innovative companies in the world, investing billions of dollars a year in local economies and delivering software solutions trusted by billions of people to help them be more productive, connected, and secure (www.bsa.org/country/BSA%20and%20Members.aspx)

These include the adequate and effective protection of intellectual property rights, including copyrights. Hence, US embassies started guiding their host governments towards stricter IPR enforcement, also known as "hands-on diligence" according to the US trade act.[9] They threaten to withdraw the tariff benefits enjoyed under the US GSP if their IPR laws tend to be inefficient. 3.7% of Egypt's total exports to the US in 2007, worth $56.9 entered the country according to the duty-free GSP agreement (IIPA, 2008).[10] The USTR threatens Egypt not to expect such favourable treatment at this level any longer if it fails to meet the required IPR protection standards. They mainly stress the deficiencies of the Egyptian enforcement institutions and organizations, as it continues operating inefficiently, resulting in a lack of satisfactory resolutions of copyright and trademark cases, in addition to the fact of imposing lax sentences.

The World Trade Organization (WTO) can be counted among the different multilateral organizations that try to stress on the importance of legal reforms in developing countries. They guard countries to grant and protect IPRs, given minimum requirement standards that should be fulfilled by each member country. However their strategy is mainly driven by promoting one-fits-all institutions. They seemed to ignore alternative institutional arrangements that might be found to reach more efficient outcomes for the conflicting parties for a long time. Accordingly, it is found that the phenomena of inefficient IPR institutions is more likely to be significant in developing countries, as they may require "appropriate" IPR enforcement strategies and institutions differing from those that prevail in rich countries. Rodrik (2008) calls them second-best institutions.[11] He describes the institutional reform promoted by multilateral organizations such as the World Bank (WB), International Monetary Fund (IMF) or the WTO as being heavily biased towards a best-practice approach. This model assumes the possibility to determine a unique set of appropriate institutional arrangements in advance, and then expects convergence towards those arrangements as inherently desirable. North (1995) makes it clear that countries applying the same formal rules will have very different performance characteristics, due to the fact that they have different informal norms and enforcement characteristics. Thus, it is very hard to determine a unique set of appropriate formal or external institutional arrangements that could be implemented in all countries without taking the already existing informal or internal institutional setup of each country into consideration. This fact can explain the failure of some formal rules from successful Western economies when applied to other developing economies (North, 1996).

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[9] For more details about the special 301, see Sykes, A. (1992): 263-330 and USTR (1997).

[10] http://www.iipa.com/rbc/2008/2008SPEC301EGYPT.pdf.

[11] For more examples and case studies about second-best institutions, see: Rodrik (2008).

During the end of the 20s century, the world has begun moving towards new IPR strategies, stressing on cooperative policies to reduce software piracy. Governments, together with software companies, the International Intellectual Property Alliance (IIPA) and the BSA started doing lots of cooperative efforts to fight software piracy in the MENA region. After the year 2000, the BSA started publishing an annual study to provide a detailed and diverse picture of global software piracy to analyze piracy trends by region and by country. It started looking at alternative solutions to fight piracy in which they have to work aside and guide the host governments. Collusive agreements between the BSA and the governments of different countries to provide price cut-offs of original software products were signed, in addition to conducting huge awareness campaigns to the public. Great achievements were observed and piracy trends started to decline in the whole MENA region. However after certain time (2003-2006), they realized that this was only the start or the necessary condition of efficient enforcement, as it just has formed the starting point of the process, especially after noting the fluctuations of software piracy rates of a number of countries. Accordingly, they tried to search for the reasons behind the sharp deteriorations of software piracy rates after reaching satisfactory results. During the last few years tendency towards reforming the judicial and prosecution system of IPR protection within a country started gaining great attention. The efficiency of the enforcement authorities, in other words the process of factual (de facto) enforcement is now considered an important target of modern IPR policies.

3. Software Protection in Egypt

The Egyptian Information and Communication Technology (ICT) sector managed in the last few years to gain the attention of domestic as well as foreign investors due to its tremendous success. A number of international companies have joined the market and establish projects in various fields, including value-added services and some call centers. In 2008, the total revenues of these companies also increased by 15% to reach EGP[12] 10.48 billion compared to EGP 9.11 billion in 2007. There are almost 175.1 thousand employees working in the ICT sector in 2008 compared to 162.5 thousand employees in 2007, hence employment grew by 7.77%. The Egyptian software industry, part of the larger Information and Telecommunication (ICT) sector, is now one of the fastest-growing and most vibrant segments of the region. In 2008, the total number of ICT companies in Egypt experienced an annual growth rate of 25.5% to reach a number of 2938 companies, of which 79% are IT companies including software firms, 12.8% IT enabled services companies and 8.1% telecommunications companies. It can be said that the total number of ICT operating companies in 2008 was 25.5%

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[12] 1EGP= 0.18522$

higher than in 2007. Hence it can be said that the ICT sector is considered an important source for stimulating economic growth and prosperity, especially in light of the ongoing transnationality trend of the Egyptian economy. Egypt ranks among the largest recipients of FDI in the region, its FDI inflows in 2007 are measured to be $12 billion (WIR, 2009[13]).

However the problem of software piracy, though lots of effort and trials done by the government remains a critical issue. The losses due to software piracy in Egypt estimated by the Business Software Alliance (BSA) are $131 million (BSA, 2008). Relying on previous growth trends of the industry, it is found that a ten percentage point reduction in software piracy over the next four years in Egypt would create more than 1,700 jobs, $153 million in local industry revenues and $8 million in additional tax revenues for federal, regional and local governments (IDC, 2007). Accordingly the problem of software piracy in Egypt can be considered a key issue, due to its importance among the other factors that would affect stimulating growth of the ICT industry as a whole, in addition to attracting foreign direct investment.

The first Egyptian copyright law number 354 of 1954 did not include innovative technology, such as software, databases or any other computer related applications. Hence and after continuous pressure from the International intellectual Property Alliance (IIPA), Law 38 of 1992 emerged as an extension of the first law and its several amendments to include for the first time innovative technology. Few enforcement actions were taken against large and medium-sized resellers and end-users, which resulted in non-deterrent remedies such as a warnings and threats without the any further attempts to take the required legal actions against software pirates, mainly companies. Thus, it can be said that these amendments were ineffective and fell short of internationally-accepted standards. Police activity has targeted small resellers engaged mostly in selling CDs, and there has been little effort to stop resellers engaged in hard-disk loading. Hence, in spring 1994, Egypt began a new enforcement campaign on resellers, who are engaged in software piracy through hard disk loading of computers. During 1995 and the first half of 1996, the IIPA members were satisfied with Egypt's progress. However, enforcement activity and particularly the failure to impose deterrent penalties (fines imposed are totally inadequate to deter piracy, between 1000 and 5000 Egyptian Pounds) have prompted IIPA to again focus on piracy issues in Egypt in 1997. During the second half of October 1997, Egypt reactivated raids on resellers and in 1998; they also started raids on business end-users. Finally, in June 2002, the Egyptian government issued its new IPR law. Law 82 of 2002 provides a firm basis for protecting copyright materials

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[13] Available at: http://www.unctad.org/en/docs/wir2009_en.pdf

and authors' rights. The new law clearly extends the protection of copyright to the digital environment, including protection of temporary copies, broad exclusive rights of exploitation that appear to encompass digital communications and transmissions over digital networks and attempted implementation of other key provisions of the World Intellectual Property Organization (WIPO) internet treaty and the WIPO copyright treaty.[14] The increased activity of the software industry throughout Egypt, in addition to the assistance of the BSA has encouraged the authorities to take more actions against pirates, not only in major cities and towns, but also in remote areas. However the penalties remained non deterrent ranging from a value of EGP 5000 to a maximum of EGP 10. 000 or / and one year prison term.

The new enforcement campaign launched by the Egyptian authorities to protect the software industry was activated by several actions. In addition to Law 82 of 2002, the government also established new enforcement units, such as: the new Anti-Piracy Police Department affiliated to the Ministry of Interior (1996-1997) and the Registration and Information Office (2003) that was established to combat any violations using computer systems in Egypt. Different entities have collaborated with the Egyptian government to combat piracy; these are various organs of the Egyptian government as the Ministry of Culture and the Information and Decision Support Center, which reports to the Prime Minister's office. The Department of Anti-piracy Police affiliated to the Ministry of Interior and the Censorship Unit, affiliated to the Ministry of Culture formed together the main copyright enforcement pool of the Egyptian government. Officers belonging to these main authorities are obliged according to the new copyright law[15] to raid suspected sites, confiscate the pirated products and have the right to arrest the offending individuals. Afterwards, the cases are handed to the executives who decide whether the individual case should be transferred to court.

Furthermore, the sharp decline in Egypt's piracy rate happened immediately during enacting its new IPR law and because of signing several agreements with Microsoft to bring the prices of legitimate products closer to those of the pirated ones for specific target groups. The first agreement was signed by the Egyptian Ministry of Higher Education and Microsoft. It involved the provision of cheaper legal software programs to university students. The second one is the agreement signed by the Ministry of Communication and Information Technology and Microsoft. It involves the utilization of cheaper legal software programs by public ministries and organizations since the beginning of the 21st century (Microsoft Egypt, Ministry if In-

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[14] For further details about these two treaties, see IIPA, 2004 SPECIAL 301 REPORT, Egypt.

[15] Law number 82, 1992

formation and Telecommunication Egypt, 2005[16]). A study by Sims, Cheng & Teegen (1996) shows that software price and household income are main causes of software piracy. Hence, these measures managed to tackle some of the most important causes of piracy. In addition the government and BSA have worked together on launching comprehensive educational campaigns to reduce piracy. The BSA has carried a comprehensive awareness campaign using several media and continuously tries to build new strong relations with public officials and police authorities to influence the enforcement process. The government appealed to the public and business owners to adopt proper guidelines for using legal products and remind them of the legal liabilities and potentially high cost of piracy. These factors helped increasing public awareness concerning pirated software. Software users are now aware of the true danger of pirated software on the micro- (as the user might lose any information when implementing pirated software) and macro-level (as it will have negative effects on the level of investment, employment rate and the sector as a whole).

Thus, attempts of collusive arrangements between right holders and the government in Egypt succeeded to improve the situation during 2000-2002, hence reaching a socially preferred outcome. As a result the BSA has expected Egyptian authorities to be encouraged to establish more efficient enforcement techniques to accelerate their own enforcement activities. However, the prevailing enforcement institutions were still inefficient, as they proved to be instable. The rapid increase of cheap internet facilities and the high profits gained by pirates since the beginning of the 21st century in Egypt due to the wide spread of cheap copying techniques, in addition to the lax punishment and the weak probability of getting caught have encouraged many people to enter the market of pirated products. Pirates realized that the expected revenue obtained from pirating exceeds its costs in the light of the prevailing enforcement institutions in Egypt. The inspection unit has registered a case were 500 CDs were caught and the pirate was accused and had to pay more than one million Egyptian pounds according to the Egyptian copyright law. However by one way or the other, the pirate managed to reduce the fine to the minimum according to law 82 of 2002 which is EGP 5000 (Censorship Unit, October 2003). Hence, it becomes even unclear whether the penalty stated by the new law is to be imposed per pirated copy or per infringement action (per case). Such wide spread examples, not just in the field of software but also in the field of music sound and film recording encourages pirates to continue their successful business Accordingly, the enforcement cooperation experienced some imbalances in the following years, leading to dissatisfactory actions from both parties: after 2002, Egypt couldn't achieve more

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[16] Also available at http://www.microsoft.com/middleeast/egypt/english/press/casestudy/Agreement.aspx

improvements in its enforcement plan, as the process become more difficult and costly to be carried out through time. On the other hand, BSA and IDC started using a larger sample size in estimating piracy rates. They reported that piracy rates in Egypt have increased once again and reached 69% in 2003, 64% in 2005 and 60% in 2007 (BSA, 2007). Some Egyptian officials and experts consider the new piracy methodology nothing more than a new way to put more pressure on the authorities to maintain their enforcement efforts.[17] Ever since, the Egyptian government recommended negotiations with the BSA and other international organizations to look for further possible reforms in their enforcement process. As a result the Information and Decision Support Center (IDSC) and the ministry of Communication and Information Technology took full responsibility of monitoring the software protection process. The IDSC created a specialized Agency, namely the Information Technology Industry Development Agency (ITIDA) to whom they delegated the whole software protection responsibility. ITIDA is now working closely with some NGOs, the USTR and a number local and international software companies to curb software piracy rates by mainly giving training programs to enforcement authorities and reviewing the path of the different software piracy cases caught by the police. In addition efforts were done to establish separately specialized economic courts to handle IPR related trials. Accordingly, law 120 of 2008 emerged to announce the establishment of economic courts in Egypt which started working October, 2008.

Against the above mentioned theoretical background, one can conclude that there have been a multi round game going on between the Egyptian government on the one hand and the right holders on the other hand. Each of the players tries to use different strategies taking the reactions of the other player into consideration. Hence game theoretical analysis is needed to understand the economic rationale behind this ongoing enforcement conflict in Egypt. In doing so one should keep in mind that the whole enforcement process till 2007 mainly experienced three main phases: The first one includes pressure from right holders without any attempts to contribute or assist Egypt to start enforcing IPR in the field of software (prevailing high piracy rates before mid 1990s), while the second one includes signing agreements to start a mutual cooperation in fighting software piracy (achieving lower piracy rates during the late 1990s till 2002). The third stage however illustrates the situation after the contractual agreement has been made. This stage is important in order to examine the efficiency of resulting institutions after signing the agreements, hence being able to identify the reasons behind the fluctuating trend of piracy rates. In the third phase discounted payoffs of the players

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[17] This statement is confirmed by many officials at the IDSC in Egypt, 2004.

are used to be able to understand what could have changed after 2002, such that Egypt couldn't maintain its enforcement status.

4. The Game

There are two players in the game: the Egyptian government (G) and the BSA. Both are bargaining over the prevailing degree of software protection within Egypt. The BSA can be seen as the main representative of software firms or US software firms in specific within the country. It is mainly established to protect the interest of foreign software firms within different host countries using different tools. For simplicity the paper mainly focuses on the most widely used strategies used by the BSA in Egypt up till now. These are either practicing sanction threats or supporting the host government to achieve a cooperative enforcement strategy. A complete laissez-faire strategy or imposing real sanctions did not occur in the case of Egypt till now; however they are also included in the game as optional strategies. A simple sequential game is used to simplify the ongoing bargaining situation between both parties and reflect their pay-offs at a certain point throughout the bargaining process. In comparison to the complexity of real world's IPR conflicts this game setting may be considered kind of simplistic; however it is adequate to understand the rationale of software protection problems in Egypt.

4.1 Identifying the Strategies of Each Player

Egypt has the possibility to choose among the following strategies:

a. To comply with the IPR law and improve software protection:
Convey to the requests of right holders and international organizations, in other words try to factually enforce IPR bearing the resulting enforcement costs. This strategy could be implemented early at stage one before any cooperative offers from the right holder or at stage two taking the reaction of the right holder into consideration.

Not to comply with the IPR law:

The government might choose not to enforce software protection due to its strategic role in the economy as a source of knowledge, growth and prosperity to the whole country. Hence the government might simply choose to reduce the imports of foreign protected software, on the one hand to provide incentives for domestic software firms to produce their national software and on the other hand they could shift towards using open-source software as it is cheaper than the protected software. Thus they may decide not to enforce IPR, saving en-

forcement costs. Again this strategy could be implemented at stage one or as a reaction strategy in stage two of the game.

The BSA, on the other hand is able to choose among the following three strategies:

c. To cooperate with Egypt in order to achieve efficient software protection:

Cooperation in the sense of signing agreements with the government to help constructing an efficient enforcement system through providing the required financial resources, in addition to the required know how. Price cut offs of original software products to students and government ministries is also considered among the most important processes of such a cooperation as it provides an incentive to the government to undertake such a step. This strategy involves bearing additional costs from the side of the right holders, however it is expected that these costs are offset by the resulting fall in software piracy and hence the increase in profits.

d. No reaction strategy (Laissez-Faire):

Such kind of "laissez-faire" strategy makes sense only if the losses due to piracy are not worth the effort of bargaining over stricter enforcement in the host country. This could be the case of host countries with a small market share or a tolerable level of software piracy.

e. Practicing sanction threats on Egypt to improve software protection:

Sanction threats are a widely common strategy used in international conflicts, like IPR violations. However threats lose their effectiveness after a certain period of time as they become non credible. Glachant and Brosseau (2008) consider this strategy also a sort of laissez-faire strategy, with minor effect on the contractual relation if the second party is sure about the incredibility of these threats. Practicing continuous threats and warnings in order to achieve their target in the future avoiding any contracting costs appears to be the cheapest strategy. Moreover, it must be said that a pure laissez faire strategy is omitted in this model as the damages caused by copyright violations, especially with the rapid growth of computer usage form a serious loss that cannot be easily neglected by right holders.

f. Imposing sanctions in case Egypt did not enforce its copyright law:

This strategy might be very costly as it requires a significant amount of money and effort from the right holders to convince international organizations that the Egyptian case has crossed its limits to an extent that should be punished with imposing a trade sanction. In this case a standard piracy level must be set as an international criterion for sanction imposition. How-

ever the disadvantage of such a strategy to the right holder is that he won't be reaping any benefits from sanctioning Egypt. This strategy will reduce the payoffs of both players, leaving both of them worth off. This can explain the reason behind not implementing it through the whole bargaining process of the BSA in Egypt till now.

4.2 Determining the Payoffs of the Players

In order to construct the game, facts must be converted into a simple abstract language of mathematics; hence preferences or expected utilities must be given ordinal values. Payoff numbers describe the players' preferences over outcomes. Watson (2002) indicates that any numbers can be used as long as they preserve the preference order of the players over the different outcomes. Thus larger numbers indicate higher levels of utility.

Stage 1: It is expected that the players will rank their preferences as follows, in order to minimize his losses:
Given that Egypt had decided at an early stage to comply with the IPR law at the beginning of phase one of the game, this would be the most preferred scenario to the right holder, as it doesn't require any financial resources nor additional effort and hence observing the highest payoff of $(P_2^L = 8)$. On the other hand it leaves Egypt in a very critical condition as it doesn't have any incentives to protect software, in addition to the fact that it doesn't have the needed financial nor qualified human resources to launch such an enforcement program. Egypt's resulting pay offs of this strategy will yield a value of $(P_1^E = 2)$.

However assuming that Egypt decides not comply with the IPR law at phase one of the bargaining process, then the BSA decides whether to impose sanction threats as a kind of pressure on Egypt to develop adequate software protection or just do nothing and let them continue pirating. This latter strategy might form a great danger for the right holders as Egypt is a leading country in the Middle East and Africa with a rising ICT industry, hence the disadvantages of piracy can not just be neglected. Payoffs of adopting a laissez-faire strategy are then $P_2^{LF} = 2$ for the BSA, while being $P_1^{LF} = 6$ for the Egyptian government as they may continue pirating benefiting from the cheap pirated software for the poor segments of the society. In addition to not being bothered by international obligations or threats to increase enforcement. Assuming however that the BSA chooses to impose sanction threats on the government, than the government would again have the option to comply or not. Complying at this stage yields a payoff of $P_2^T = 7$ for the BSA and $P_1^T = 3$ for the government.

<u>Stage 2:</u> Given that Egypt decides once again not to comply, the BSA in turn responds and chooses among three strategies, where the resulting pay offs depend once again on the expected reaction of the other player (Egypt). This is the start of phase two:

At this stage, the BSA will rank its preferences as follows:

Assuming that Egypt will comply at the next phase of the game, the BSA prefers to continue using stricter threats as an enforcement strategy to make lax enforcement less attractive to the government. This strategy is considered the easiest and cheapest tool that might fulfill the required target and does not require any contractual arrangements. Thus there will be neither contractual efforts nor costs incurred by the BSA. In other words it might seem attractive compared to the remaining two, as it might lead to some quick benefits at least during the first rounds of threats, as credibility might still be present. Hence, having a high payoff of ($P_2^{ET} = 6$). Achieving factual enforcement through contractual arrangements that require self contributions and facilities given to Egypt, in other words creating institutions that should support Egypt's existing IPR enforcement institutions can be considered a second best option at this stage. This strategy satisfies the original goal of the right holders but incurs additional contracting costs. Thus, the strategy is assigned a payoff of ($P_2^{EC} = 5$).

However assuming that Egypt does not attempt to enforce IPR anyways at this stage, then continuing with sanction threats might once again appear to be preferred by the BSA at the beginning, as it does not incur extra costs. Hence having a payoff of ($P_2^{NT} = 4$). However as these threats are not to be realized in practice (meaning that they are considered as empty threats) the piracy problem will slightly be affected. The following preferred strategy according to this scenario would be to cooperate and yield a payoff of ($P_2^{NC} = 3$). This can also be called a combined loss: Losses due to piracy and additional losses due to the efforts done and resources consumed in the process of establishing firm-made enforcement institutions.

Sanction imposition, in other words if threats are to be realized can be considered the least preferred strategy, hence it yields the least payoffs in this scenario. This is due to the fact that it would require additional resources and might not result in any additional benefits to the right holder concerning piracy reduction as explained before. Hence it is assigned a payoff of ($P_2^S = 1$). Moreover, as a consequence Egypt might decide to reduce their consumption of protected software and the right holder might suffer from resulting losses caused by the decrease in brand loyalty and network externalities.

Egypt on the other hand will rank its preferences as follows:

Assuming that the BSA will cooperate and help Egypt to reduce Software piracy, Egypt will on the one hand prefer to benefit from the facilities and benefits provided by the generous agreements of right holders to provide cheap legal software, providing minimum enforcement effort. This is due to the high costs it has to bear when it comes to the de facto enforcement part of the contract, in addition to the fact that tolerating a certain level of piracy would maximize social welfare. Thus choosing not to enforce is assigned a maximum payoff of (P_1^{NC} = 8). On the other hand, choosing the alternative strategy, hence cooperating with the BSA to reach satisficing results that would be good enough for both parties, would imply bearing additional contracting costs by the government. Choosing this strategy would have a payoff of (P_1^{EC} = 7).

However, assuming that the BSA will not cooperate and would rather use continues sanction threats might on the one hand encourage Egypt to start searching for alternative products, rather than making additional effort to reduce prevailing software piracy. This however requires additional knowledge acquisition and training of open source software, thus it also inquires an opportunity cost. This scenario is assigned a payoff of (P_1^{NT} = 5). On the other hand the government might choose the scenario in which it decides to cooperate and factually enforce IPR without any mutual cooperation from the BSA. This choice forms a great burden to the Egyptian government, as they will be the sole responsible body for the whole enforcement program, in addition to the high cost of enforcement they have to bear. This would imply a payoff of (P_1^{ET} = 4).

Finally, given that the BSA imposes real sanctions on the Egyptian economy, the government would rather choose not to comply with IPR enforcement in order to avoid a double damage and hence obtaining a payoff of (P_1^{S} = 1). It can be said that the impact of such a sanction would have a twofold effect on the Egyptian government: first, loosing trade benefits enjoyed according to the GLS program and second bearing the whole costs of the enforcement process on their own if they decide to comply in the future.

4.3 Running the Game

The analysis of the game can be divided into two main parts. The first part aims to analyze the current situation of the game (phase one and two). In other words, it explains the economic rationale behind the enforcement conflict in Egypt, given the preferences of each

player at a certain point in time. The second part treats IPR enforcement process as an infinitely repeated game that should be analyzed throughout different rounds (phase three) in order to explain why contractual agreements or mutual cooperation to protect IPR might get weaker or even break over time. This game shall provide an insight of fluctuating piracy rates in Egypt to be able to draw policy implications.

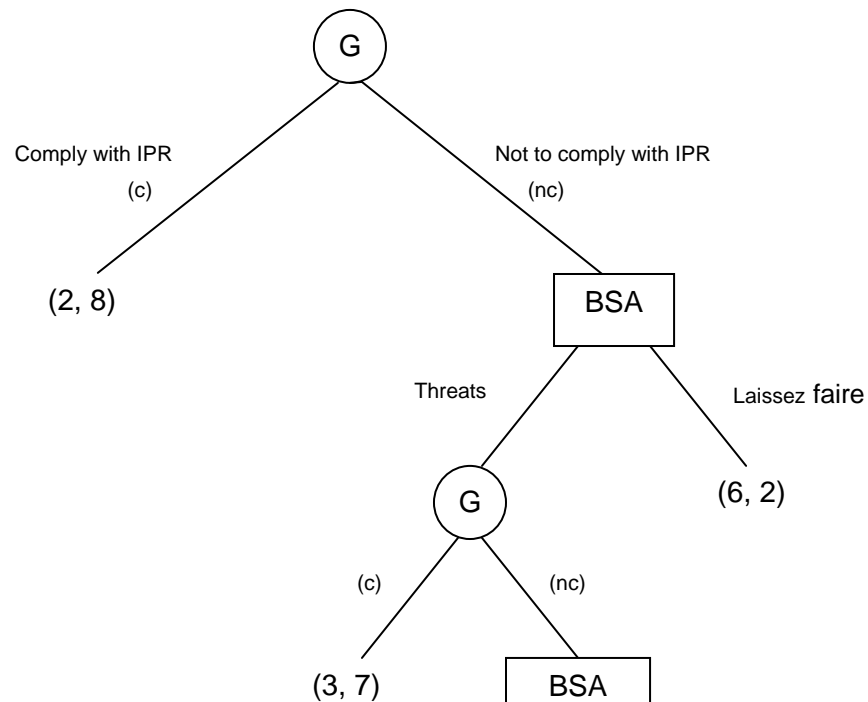Part 1: A Contractual Relationship in a Static Setting (phase one and two)

Combining the different strategies together to run the game using backward induction method, we can identify that the game would end if Egypt decides to comply at the first round of the game in phase 1, however it is most likely that Egyptian authorities will always prefer to choose not to comply with the IPR laws, as it is accompanied by relatively higher payoffs than complying with the laws, independently from the decision of the right holder. Thus, (b) is obviously the dominant strategy over (a) concerning the Egyptian point of view.

As a response action of the BSA, it is obvious that they will choose to continue threatening Egypt (e) rather than cooperating (c) to save costs. Imposing a sanction (f) would be considered the worst choice as it is accompanied by the least payoff, while a laissez-faire strategy might be not suitable to handle the Egyptian case. Hence, threats (e) seem to form the dominant strategy concerning the preferences of the right holder.

Accordingly, the equilibrium status of this game includes on the one hand, the BSA office that prefers using sanction threats to put pressure on Egypt to enforce IPR and on the other hand the Egyptian government that prefers not to do any effort to enforce IPR. This scenario can be mainly linked to the fact that most sanction threats by right holders were not realized in practice. In other words, they have proven to be ineffective, leading to a type of laissez-faire situation. To provide a better understanding about the behaviour of both players, figure (2) illustrates the corresponding extensive form of the game:

Figure 2: The Conflict of Software Protection in Egypt: An Extensive Game Tree

Phase 1:

```
                              ( G )
              Comply with IPR /    \ Not to comply with IPR
                     (c)     /      \      (nc)
                            /        \
                       (2, 8)      [ BSA ]
                              Threats /    \ Laissez faire
                                     /      \
                                  ( G )    (6, 2)
                              (c) /   \ (nc)
```

Phase 2:

```
                        (3, 7)     [ BSA ]
                    Sanction / Continue Threats \ Support: cooperation
                           /         |           \
                        (1,1)      ( G )         ( G )
                              (c) /   \ (nc)  (c) /   \ (nc)
                                 /     \         /     \
                             (4,6)   (5, 4)  (7, 5)   (8, 3)
```
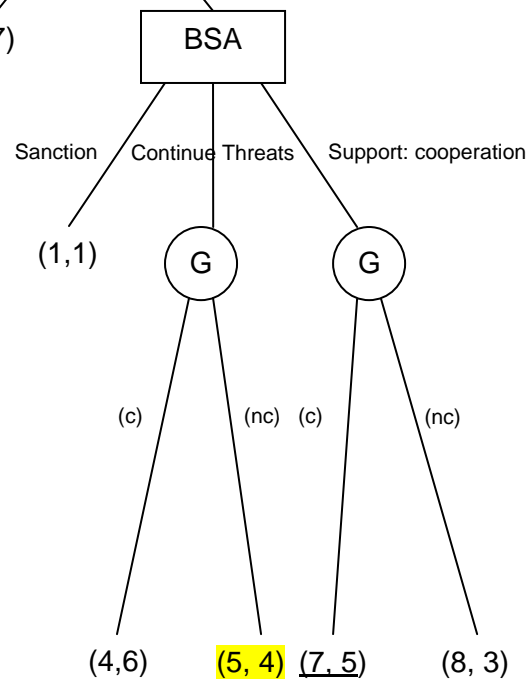
Figure 2 shows that each player would maximize his utility according to the homo economicus principle, choosing a non-cooperative strategy which results in payoffs (5, 4). This is called the Nash equilibrium. A Nash equilibrium position exists when no player would like to change his position, given the position of the other player. This model is considered a typical case of a prisoners' dilemma, in which both players will choose not to cooperate (player "2" continues practicing sanctions threats and player "1" is not interested in enforcement), while if they both decided to cooperate, they could both be better off at (7, 5).

However, as soon as the game is repeated infinitely, the whole set up changes dramatically. There is a multitude of possible equilibria and game theorists are still having difficulties predicting a particular one as the most likely outcome of the game. Among the expected great number of possible equilibria, mutual cooperation tends in this case to be an attractive one. In a repeated prisoner's dilemma model, both players could be made better by choosing a cooperative profile in future rounds, hence reaching a Pareto-efficient outcome[18]. To sum up, it can be said that creating contractual relationships in the light of choosing a second best mindset is necessary to make all participating parties better off, leading to more efficient outcomes.

Referring to the sanction strategy of the BSA, we notice that it can be completely ignored at this stage of the contractual setting as it implies fewer payoffs for each player. The greatest risk associated with practicing a threat is to carry it out, as it might involve uncontrollable costs. "A successful threat is one that is not carried out" (Schelling, 19960: 177). A better understanding can be provided through assuming a relation between the maximum total utility of this non cooperative game and the product of each players net pay offs, as follows: U max $= (U1) (U2) = (u_1 - c_1) (u_2 - c_2)$, where U is total welfare gain of the game; $U1$, $U2$ are the net utilities of players one and two respectively; u_1, u_2 are the current payoffs of the respective players involved in a bargaining game and c_1, c_2 are their respective costs due to launching a certain strategy. A graphical illustration (figure 3) of this relation shows the resulting welfare loss from imposing a sanction.

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[18] An outcome is said to be Pareto-efficient or Pareto-optimal when no further Pareto improvements are possible.

Figure 3: Welfare loss under Sanction Imposition
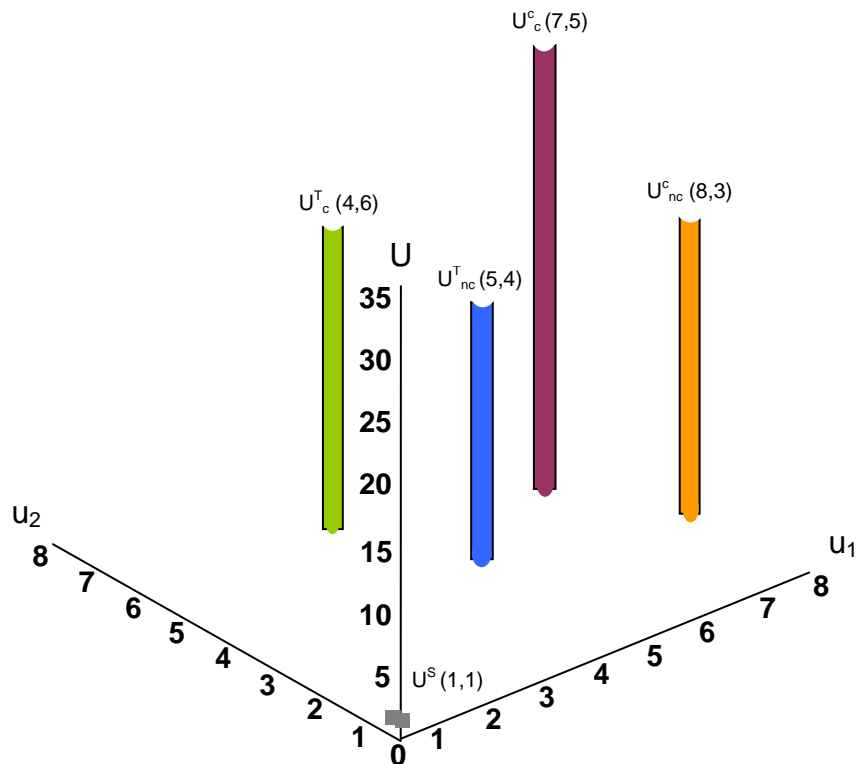
Where, the U_1-axsis represents the net payoffs of player one (government) and the U_2-axsis represents the net payoffs of player two (BSA). U_{max} is the product of the net payoffs of both players. The plotted points represent the different payoff combinations of both players resulting from using different strategies. U^S is the observed total utility of both players under sanction, U^T: under threats and finally U^C: under cooperation. The subscript denotes the accompanied reaction of the government with each of the right holder strategies: either (c) to denote cooperation or (nc) to denote no cooperation. It is obvious that imposing a sanction is associated with the greatest welfare loss for both players and that is why it enjoys a very high opportunity cost. Accordingly, the BSA prefers to avoid implementing it as a tool in the near future as long as there appears to be certain progress in the enforcement program, even with the presence of some fluctuations in Egypt's enforcement performance.

Referring to the path of the software protection process in Egypt, it is found to be in line with the outcome of the game. As before in phase one, the outcome of the utility maximizing IPR strategy chosen by both players leads to mutual welfare losses (b, e). Realizing the existence of possible situations in which both of them gain to some degree (a, c), rational actors tend to agree on mutual cooperation. This can explain why contractual relations between both players started taking place in the late 1990s. However, reaching a contractual agreement at a certain stage of the ongoing conflict does not necessary imply a stable equilibrium

in the future. In a typical prisoners' dilemma situation and in the absence of binding institu-tions, each of the parties may still have an incentive to provide less effort than the other would expect, which leads to a prompt response from the other party. In other words, as time passes, each player has an incentive to break the cooperation to save the additional efforts and costs along the whole enforcement process, such that the other player bears more. However, it must be said that if one player breaks the contract, the other player will not stick to his commitments either and they will return to the original suboptimal Nash equilibrium. Thus, the conflict will start again. This kind of strategy is called the "trigger strategy" and usually requires an analysis through time, hence considering an infinitely repeated form of the game.

Part 2: A Contractual Relationship in an Infinitely Repeated Game (phase three)

A trigger strategy scenario usually requires the identification of two action profiles: The first one is the "cooperative profile" (a, c) and the second one, is the "punishment profile" (b, e). The trigger strategy usually requires that both players play the cooperative profile in each pe-riod unless one of them decides to deviate. If this is the case, then the player's reputation will be destroyed and the punishment profile is triggered for the rest of the game. Our game in-cludes only one Nash equilibrium, (b,e), which consists of a suboptimal equilibrium and also represents the punishment scenario of the game. Our goal is to understand whether the players have an incentive to play (a,c) each period under the threat that they will revert to (b,e) forever if one of them or both cheat or not. To be precise, the trigger strategy states that the players will select (a,c) each period as long as this profile was always played in the past; otherwise they are to play (b,e).

To simplify, we should rather use a reduced form of the game to focus on the relevant strate-gies that illustrates the two existing action profiles of the players. Hence, a (2 * 2) payoff ma-trix can be used to provide a closer insight about the part of the game that is relevant to this analysis.

Figure 4: The action profile versus the cooperative profile in a payoff matrix

		Right Holder (BSA)	
		Cooperate (c)	Impose Sanction Threats (e)
Government	Enforcement (a)	P_1^{EC} (7) $\quad$ P_2^{EC} (5)	P_1^{ET} (4) $\quad$ P_2^{ET} (6)
	No Enforcement (b)	P_1^{NC} (8) $\quad$ P_2^{NC} (3)	P_1^{NT} (5) $\quad$ P_2^{NT} (4)

To evaluate whether the trigger strategy is a subgame perfect equilibrium of our original prisoners' dilemma game, we consider the incentive of player i (i=1,2) from the perspective of period 1. Suppose the other player j (j=1, 2 and j≠i) behaves according to the trigger strategy, then the payoffs of the stage game are to be discounted over time, for a repeated game. Thus, it is necessary to consider the sum of discounted payoffs (s), in order to take time preferences into consideration. Let δ denote the discount factor. In this case, the sum of stream of discounted payoffs will be:

$s \equiv 1 + 1\delta + 1\delta^2 + 1\delta^3 + ...$ $\quad \therefore \delta$ represents a discount-factor, $\delta \in (0,1)$

$\delta = \dfrac{1}{1+r}$ $\quad \therefore$ r represents the discount-rate which indicates future preferences.

For simplicity: $\delta + \delta^2 + \delta^3 + ... = \delta\left[1 + \delta + \delta^2 + \delta^3 + ...\right] = \delta s$

Therefore: $s \equiv 1 + \delta s$ ➜ $s = 1/(1-\delta)$

To sum up, $1 + 1\delta + 1\delta^2 + 1\delta^3 + ... = 1/(1-\delta).$

To generalize, $a + a\delta + a\delta^2 + a\delta^3 + ... = a/(1-\delta).$

Referring back to our game to analyze the Egyptian relation after signing a mutual cooperation agreement to protect software and fight software piracy in phase two, the Egyptian government basically has two options. First, it can follow the prescription of the trigger strategy,

which means cooperating as the BSA does. In this case, it obtains a payoff of P_1^E=7 each period, which will yield the following expected value of cooperation, given the other player is cooperating, too:

Equation 1:

$$F^c = \sum_{t=0}^{\infty} \delta^t P_1^{EC} = \frac{P_1^{EC}}{(1-\delta)}$$

The other option would be choosing to defect, and hence gaining a payoff of P_1^{NC}= 8, given that the BSA is still maintaining its position. However, as the BSA is assumed to cooperate only in the consecutive period according to the trigger strategy, the following payoffs of the government will be reduced to P_1^{NT}=5. In general, one player's defection induces the other player to defect in each period thereafter as well. Hence, the best that the government can do after defecting in one period is to keep defecting in future periods, too. This leads , hence to a reduced payoff of P_1^{NT} starting from the second period. Accordingly, by defecting in period 1, the government obtains the following expected value:

Equation 2:

$$F^{nc} = P_1^{NC} + \sum_{t=1}^{\infty} \delta^t P_1^{NT} = P_1^{NC} + \left(\frac{\delta}{(1-\delta)}\right) * P_1^{NT}.$$

Thus discounting the payoffs to period t, it is obvious that cooperating yields a payoff of $(\frac{P_1^{EC}}{(1-\delta)})$, while defecting against the grim trigger leads to a payoff of $(P_1^{NC} + \left(\frac{\delta}{(1-\delta)}\right) * P_i^{NT})$.

A rational player is supposed to cooperate if cooperation yields more benefits than defecting over the long term. Thus it can be said if $F^{nc} \leq F^c$, then there is an incentive to cooperate.

To reach general criteria[19] we subtract P_1^{EC}[20] from both hand sides of the inequality. The new incentive condition can be rewritten as follows:

Equation 3:

$$P_1^{NC} - P_1^{EC} \leq \left(\frac{\delta}{(1-\delta)}\right)\left(P_1^{EC} - P_{i\,1}^{NT}\right)$$

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[19] For details about the rationale behind the incentive equation, see Brousseau and Glachant, 2008: 169-174
[20] For detailed steps, see appendix.

The net benefit of cheating ($P_1^{NC} - P_1^{EC}$) must be less than the opportunity cost of being

punished $\left(\dfrac{\delta}{(1-\delta)}\right)\left(P_1^{EC} - P_{i1}^{NT}\right)$. Thus it can be said that there exists a trade off between the

expected gain from defecting and the expected cost of reprisal, depending on the value of δ.
Large values of δ, are accompanied with higher probability of contractual success and institutional efficiency. Using the ordinal values of our model we find, that the Egyptian government has the incentive to defect in period t if the discount factor exceeds 0.33. In this case
$\delta^* = 0.33$ is called the "cutoff" or "threshold discount factor". It represents the minimum value
below which the government cannot sustain a stable cooperative outcome.

Reformulating equation 3, to be in terms of the cutoff discount factor, we would get the following relation:

Equation 4:

$$\delta \geq \frac{\left(P_1^{NC} - P_1^{EC}\right)}{\left(P_1^{EC} - P_1^{NT}\right)}$$

When deciding on whether to break the agreement or not, each player considers the possible future loss that would result due to the associated trigger nature of the game. Patient players that have high discount factors, care a lot about payoffs in future periods and therefore do not want to ruin their reputations for some short-term gain. In this case the cooperative outcome is likely to constitute the new Nash equilibrium of the repeated game. Moreover, it must be said that future payoffs are found to be directly influenced by the duration and complexities of the different procedures involved in a contractual agreement. A study by Wernerfelt (2003) showed that the efficiency and sustainability of contracting regimes depend on the nature of the different tasks carried and on how often these tasks change along the execution of the contract. Hence, to be able to understand why piracy rates might rise again shortly after successfully achieving satisfactory results in a country, we shall refer to the Egyptian case. The explanation shows that maintaining a status is more about the future than the past.

4.4 Linking Empirical with Theoretical Results

The Egyptian enforcement program passed through different phases and included several procedures ever since signing the agreement with the BSA. At the early stages of the agreement, enforcement involved more legislative and organizational tasks which can be done at moderate costs, in addition to the benefit of acquiring cheap legal software for university students and public ministries (positive net benefit of contracting), thus resulting in $\delta \geq = \delta^*$.

Moreover, software pirates became more careful, fearing the possibility of getting caught in light of the new IPR law. Accordingly, it can be said that at this stage of the contractual agreement both parties were better off jointly achieving lower rates of software piracy.

However when it was turn for the more intense de facto tasks, δ started to decrease to reach a value below δ^*. This can be explained by referring to the nature of the IPR enforcement process. IPR enforcement in general and combating software piracy in specific, involves a great number of delegations and a great number of tasks till it reaches the hands of last resort enforcers (could be the judges). Hence it involves high monitoring and controlling costs, in addition to staffing and training prosecutors and judiciary, which impose high costs on the government. Furthermore, it must be said that weak incentives and low experience of last resort enforcers in general concerning IPR related issues might form the main obstacle of factual enforcement. Finger and Schuler (1999), reviewed case studies of a selected number of countries who started their IPR reform programs and found out that a substantial amount of reforms, legislations, enhancing administrative structures, computerization of work procedures, in addition to extensive staff training are required to observe efficient IPR enforcement. These facts might be the main reason behind the sharp rising costs of de facto enforcement.

It must be clarified that the quality of decisions by enforcement authorities (judges and prosecutors) directly depends on their skills and incentives, which are influenced by their qualifications and the mechanisms overseeing their decisions. Accordingly, and in light of lax sanctions of IPR piracy on the one hand and ineffective sanction threats by the BSA on the other hand, the government found it more beneficial to lax the conditions agreed upon as their expected benefit seemed to be greater than the opportunity cost of not fulfilling the terms of the agreement. Hence fluctuations in δ led to corresponding fluctuations in the enforcement progress and hence piracy trends.

5. Conclusion and Policy Implications

In general it can be said that the contribution of right holders in the IPR enforcement process is a crucial fact, as most developing countries are not ready yet to accept this concept. However signing agreements and providing price cutoffs can only considered a necessary condition for efficient enforcement, as it just forms the starting point of the process. A suffi-

cient condition is rather monitoring the process of factual (de facto) enforcement, which forms a turning point in the enforcement path during the time of executing the agreement.

Part 1 of the game explains how both players: Egypt and the BSA managed to move from the suboptimal Nash equilibrium to a socially preferred Pareto outcome, yielding higher gains for both players. But as the game enjoys the typical form of a prisoners' dilemma and in the absence of binding institutions, there was an incentive to breach the contract in future rounds. Part 2, on the other hand, show exactly that a credible commitment to hold a promise ex post signing the contract may directly depend on the value and relative stability of the discount factor (δ). The nature of practicing de facto enforcement tasks is associated with higher costs, as it involves complex hierarchical legal and prosecution organs. This makes them more difficult to be realized than the prior de jure tasks. Hence, after 2002 when it was time to carry on efficient de facto enforcement procedures, Egypt relaxed its enforcement efforts. The government tried to benefit from the advantages of the contractual agreement without having to bear the additional cost of de facto enforcement. Accordingly, the US launched its threats once again keeping Egypt on the priority watch list, thus starting a new round of the game. This game will tend to iterate as long as de facto and de jure legal enforcement of software and other IPR related products diverge.

As an attempt to contribute in the de facto enforcement process, the BSA organization has offered to contribute in raiding the suspected sites together with the Egyptian police. However, the Egyptian ministry of interior has totally refused this offer, considering it a foreign invasion and interference in Egypt's domestic policies, which has worsened the situation between both parties. Weak incentives and low experience of the prosecution authorities and last resort enforcers concerning IPR related issues in Egypt can be considered the main reasons behind the sharp rising costs of de facto enforcement. Accordingly, it is necessary for the Egyptian government to focus on the organization of the judiciary and prosecution authorities, benefiting from the willingness of the BSA to provide more efforts. Hence in order to effectively enforce IPR disputes in Egypt, extensive mutual efforts must be done to improve de facto institutions of IPR.

It can be said that Egypt should work on different aspects of its enforcement program to increase its estimated value of δ. Future research is required to support the evidence provided by this study by analyzing how legal institutions can affect the cost of de facto enforcement within the Egyptian legal IPR framework, hence treating institutions as an exoge-

nous factor. This requires the introduction of the concept of credible punishment, which is supposed to be carried out by the Egyptian enforcement authorities. An upstream analysis of the Egyptian enforcement institutions (judiciary and prosecution authorities) governing IPR related issues needs to be carefully analyzed, to determine why IPR prosecutors are likely to perform inefficiently. The impact of the quality of human capital involved in dispute settlements of IPR related issues, and their incentives behind taking certain decisions must be tested. A study by Wiliamson (1975) to analyze the impact of poor performances of courts on contractual performances, showed that litigation by courts are time consuming and might result in errors or absence of choice. This can be the case when judges dismiss a case due to wrong litigation procedure or the lack of sufficient evidence, as it is typical for most copyright suits in Egypt. For this purpose, studies analyzing the impact of skills on the quality of decisions can be reviewed, to construct a similar analysis with respect to software piracy suits.

A final implication would be that Egypt should reconsider its status, as it cannot risk losing the support it acquires from the BSA, as well as the benefits acquired due to the GLS program, if the sanction threats are to be realized. This fact would even cause more severe damages in light of the ongoing Egyptian transnationality policy. A violation of joined bilateral or multilateral agreements like IPR protection would yield negative impacts on Egypt's new FDI strategy, especially in the field of ICT. Egypt has reached a transnationality score of about 12% (WIR, 2007) and it can not risk losing the trust of foreign investors at this stage of its economic development. Accordingly, measuring the impact of transnationality levels of host economies on IPR piracy would also be considered a valuable contribution to this study.

References

Andrés, A. 2006. Software piracy and income inequality. Applied Economics Letters 13(2):101-105. Retrieved December 15, 2009 from http://www.informaworld.com/10.1080/ 13504850500390374

Bezman, T. and Depken, C. 2005. The impact of software piracy on economic development. The University of Texas at Arlington, Department of Economics, Working Paper 05-002. Retrieved January 15, 2008 from http://www.uta.edu/depken/P/statepiracy.pdf

Brousseau, E. and Glachant,J. 2008. New Institutional Economics: A Guidebook. Cambridge University Press. United Kingdom, 2008.

BSA. 2003. Eighth Annual BSA Global Software Piracy Study. June. Washington: Business Software Alliance. Retrieved August 8, 2009 from http://www.rockitg.com/ documents/white-paper-bsa.pdf

BSA. 2008. Fifth Annual BSA and ICD Global Software Piracy Study: Business Software Alliance. Retrieved August 8, 2009 from http://global.bsa.org/idcglobalstudy2007/ studies/2007_global_piracy_study.pdf

BSA. 2009. Sixth Annual BSA-IDC Global Software Piracy Study. Retrieved August 8, 2009 from http://global.bsa.org/ globalpiracy2008/index.html

Depken, C. and Simmons, L. 2004. Social construct and the propensity for software piracy. Applied Economics Letters 11(2): 97-100.

Fischer, J. and Andrés, A. 2005. Is Software Piracy a Middle Class Crime? Investigating the Inequality-Piracy Channel. University of St. Gallen Economics Discussion Paper No. 2005-18. Available at SSRN. Retrieved January 5, 2009 from http://ssrn.com/abstract=803244

Ginarte, J. and Park, W. 1997. Determinants of patent rights: a cross-national study. Research Policy 26: 283-301.

Hamade, S. 2006. The Legal and Political Aspects of Software Piracy in the Arab World. Third International Conference on Information Technology: New Generations: 137-142.

Deutsche Bank Research. 2005. Digital Economy and Structural Change. Deutsche Bank Research. Retrieved November 18, 2009 from http://www.dbresearch.com/PROD/ DBR_INTERNET_EN-PROD/PROD0000 000000186720.pdf

Hofstede, G. 1981. Culture and Organizations. International Studies of Management and Organization, 10(4): 15-41.

Hofstede, G. 2004. Geert Hofstede Cultural Dimensions. Retrieved November 22, 2009 from http://www.geert-hofstede.com/hofstede_dimensions.php

Holm, H. 2003. Can economic theory explain piracy behaviour? Topics in Economic Analysis & Policy, 3 (5): 1–15.

Husted, B. 2000. The Impact of National Culture on Software Piracy. Journal of Business Ethics 26(August): 197–211.

International Intellectual Property Alliance (IIPA) 2008 Special 301 Report. Retrieved August 8, 2009 from http://www.iipa.com/rbc/2008/ 2008SPEC301EGYPT.pdf

Marron, D and Steel, D. 2000 Which Countries Protect Intellectual Property? The Case of Software Piracy. Economic Inquiry 38: 159-74.

Maskus, K. 2000. Intellectual Property Rights in the Global Economy. Institute for International Economics, Washington.

Maskus, K. and Penubarti, M. 1995. How Trade Related Are Intellectual Property Rights? Journal of International Economics 39: 227-48.

North, D. 1995. Five Propositions about Institutional Change. In: Knight, J., & Sened, I. (Eds.), Explaining Social Institutions, Ann Arbor MI, The University of Michigan Press: 15-26.

North, D. (1996). Where Have We Been and Where Are We Going? Economic History 9612001, Economics Working Paper Archive, EconWpa 1996. Retrieved January 16, 2008, from http://129.3.20.41/eps/eh/papers/9612/9612001.html

Rodrik, D. 2008. Second-Best Institutions. Mimeo. Retrieved October 30, 2009 from http://www.ksghome.harvard.edu/ ~drodrik/Second-best%20institutions%20paper.pdf

Schelling, T. 1960. The Strategy of Conflict. Harvard University Press, Cambridge, Massachusetts and London, England: 173-187.

Schrank, A. 2003. The Software Industry in North America: Human Capital, International Migration, and Foreign Trade. In Industrial Agglomeration: Facts and Lessons for Developing Countries. Chiba: IDE.

Shadlen, K. , Schrank, A. and Kurtz M. 2005. The Political Economy Of Intellectual Property Protection: The Case of Software, in: International Studies Quarterly 49: 45–71.

Sell, S. 2003. Private Power, Public Law: The Globalization of Intellectual Property Rights. London. Cambridge University Press.

Shore, B., Venkatachalam, A., Solorzano, E., Burn, J., Hassan, S. and Janczewski, L. (2001). Softlifting and piracy: Behaviour across cultures. Technology in Society 23: 563-581.

Sims, R, Cheng, H. and Teegen, H. 1996. Toward a Profile of Student Software Piraters. Journal of Business Ethics 15: 839–849.

Sykes, A. 1992. Constructive Unilateral Threats in International Commercial Relations: TheLimited Case for Section 301. Law and Policy in International Business 23: 263-330.

Swinyard, W., Rinne, H. and Kou, A. (1990). The morality of software piracy: A cross-cultural analysis. Journal of Business Ethics 9: 655-664.

The Office of The United States Trade Representatives (USTR). 2002. The Work of USTR: Intellectual Property. Retrieved December 27, 2006 from http://www.ustr.gov/sectors/ustrwork.shtml

United Nation Conference on Trade And Development (UNCTAD). 2007. World Investment Report (WIR). Retrieved March 30, 2008 from http://www.unctad.org/ en/docs/ wir2007p1_en.pdf

Voigt, S. 2009.How (Not) to Measure Institutions? Retrieved January 30, 2010 from http://ssrn.com/ abstract=1336272

Watson, J. 2002. Strategy: An Introduction to Game Theory. W.W. Norton & Co., New York.

Wernerfelt, B. 2003. Robust Incentive Contracts. MIT Sloan Working Paper No. 4448-03, June 27, 2003. Retrieved December 5, 2008, from http://ssrn.com/abstract=470802 or DOI: 10.2139/ssrn.470802

Williamson, O. 1975. Markets and hierarchies, analysis and antitrust implications: A study in the economics of internal organization. New York: Free Press.

World Investment Report (WIR). 2007. Transnational Corporations, Extractive Industries and Development. UN Publication. New York and Geneva, 2007. Retrieved January 30, 2009 from http://www.unctad.org/en/ docs/wir2007_en.pdf

Appendix

Mathematical Derivation: From Equation 2 to Equation 3:

$$F^c = (\frac{P_1^{EC}}{(1-\delta)})$$

$$F^{nc} = P_1^{NC} + \left(\frac{\delta}{(1-\delta)}\right) * P_i^{NT} .$$

$$P_1^{NC} + \left(\frac{\delta}{(1-\delta)}\right) * P_1^{NT} \leq (\frac{P_1^{EC}}{(1-\delta)})$$

$$P_1^{NC} \leq \frac{P_1^{ECc}}{(1-\delta)} - \frac{\delta P_1^{NT}}{(1-\delta)}$$

$$P_1^{NC} \leq \frac{P_1^{EC} - \delta P_1^{NT}}{(1-\delta)} \qquad \cdot P_1^{EC}$$

$$P_1^{NC} - P_1^{EC} \leq \frac{P_1^{EC} - \delta P_1^{NT} - (1-\delta) P_1^{EC}}{(1-\delta)}$$

$$P_1^{NC} - P_1^{EC} \leq \frac{-\delta P_1^{NT} + \delta P_1^{EC}}{(1-\delta)}$$

$$P_1^{NC} - P_1^{EC} \leq \left(\frac{\delta}{(1-\delta)}\right)\left(P_1^{EC} - P_1^{NT}\right)$$