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# Software piracy: A time-series Analysis

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**ABSTRACT**

Software piracy is a global problem that costs businesses billions of dollars each year. This study presents the first time series analysis looking at what influences software piracy. It includes data for 85 countries associating economic, cultural, and temporal variables with national software piracy rates. Some of the variables included coincide with those in previous studies (GDP, collectivism and power indexes) while others are new to this study (time, high tech exports, IT expenditures). The results show that the aforementioned variables are significantly associated with software piracy rates and that more specific influences can be investigated by looking at breakpoints in GDP. This knowledge is important to several areas both within and outside academia such as future policy formation aimed at curbing software piracy, the creation of preventive and deterrent controls for software piracy, and future research of the phenomenon discussed.

**Keywords**

Software Piracy, Time Series, Country Level Analysis

**INTRODUCTION**

Illegal copying and use (piracy) of copyrighted material (movies, music, business and entertainment software, books) constitutes a considerable proportion of the total lost revenue due to intellectual property violations. According to the World Intellectual Property Organization (WIO) (Idris, 2003), the impacts of product counterfeiting (illegally making copies of patented items) and piracy (illegal copying and/or use of copyrighted material) amount to between 5% and 7% of world trade, representing € 200 to 300 billion a year in lost revenue, and the loss of 200,000 jobs worldwide. For the US alone, the International Intellectual Property Alliance (IIPA, 2003) estimates that piracy losses in copyrighted materials in 2002 totaled 10.8 billion USD, with the piracy of software amounting to about 60% of the total, or approximately 6.5 billion USD.

Software producers have attempted to restrain this drain of lost revenue through technological and legal means to little avail. The proportion of pirated software worldwide has remained in excess of 40% over the past decade, according to the Business Software Alliance (BSA, 2003). The reasons for this persistence are that software piracy is a complex phenomenon, making the means for effective control far from clear. Clearly, the phenomenon of software piracy is too complex to be curtailed by simple and direct technological and legal means. Doing so effectively and to a meaningful extent is likely to require a complex combination of legislation, treaty, cooperation, and education, as well as, undoubtedly, enforcement and impediment. The first step toward that end is the understanding of what could be called the ecology of the problem—the fundamental environmental conditions in which it flourishes.

We endeavor in this study to develop clear and sound representations of the factors influencing software piracy in search of that understanding, and in the hope that—even in a small way—it helps to inform and guide the development of policies and agreements which will appropriately balance the rights of holders with the needs and preferences of users. This study intends to discover prominent economic, social, and temporal variables associated with the phenomenon of software piracy using country level data for 85 countries over a ten-year period. This is an important difference from previous studies that utilized cross sectional data for single time periods only.

**THEORETICAL BACKGROUND**

Many authors have researched the influences of software piracy rates see (Gopal and Sanders, 1998; Gopal and Sanders, 2000; Husted, 2000; Marron and Steel, 2000; Shin, Gopal, Sanders and Whinston, 2004). Each of these studies looks at how economic variables influence software piracy. Shin et al. (2004) and Gopal and Sanders (1998) both use GDP per capita as a measure of income. In addition Marron and Steel (2000) looked at how R&D influenced software piracy rates. Each of these studies looked at cross-sectional country level data with a maximum of 77 countries included in the study.

Studies also looked at how cultural and economic variables together influenced software piracy rates. Marron and Steel (2000), Husted (2000), and Shin et al. (2004) have all used the collectivism index with significant results, while Husted also included the power index in his study. These were also cross-sectional country level studies that used software piracy rates as the dependent variable. A study by Ronkainen and Guerreo-Cosumano (2001) that investigated the influences on intellectual property violations also found individualism (the mirror index of collectivism) to explain a significant portion of the variance in that study. This made it clear that any future study would need to look at both types of variables in conjunction with each other. Table 1 summarizes the findings of previous research projects, including both empirical and conceptual studies.

Although quite a few antecedents of software piracy have been studied, no study has comprehensively examined them at a country level. This study hypothesizes that software piracy rates are influenced by economic, cultural, and temporal factors. In addition, a cross-sectional time series database was used to test these hypotheses. This study offers a unique contribution to the software piracy area in that it presents the dynamics of software piracy based on time series analysis with the most complete set of countries compiled so far. Both the economic indicators and the software piracy rates are measured over multiple time periods. This means that if software piracy rates have temporal variation static (single-period) estimates would be biased.

**METHODOLOGY**

The methodology section is divided into two subsections. The first subsection describes the variables and data that were used in the analysis portion of this study. The second subsection describes how the data were analyzed.

**Variables and Data Description**

This study empirically investigates factors influencing national software piracy rates. Country level data for 86 countries were collected for the period 1991-2001 from the annual business software alliance global software piracy study, the World Bank database, and Hoefstede's cultural variables data. The data were analyzed in order to determine which variables are associated with software piracy rates at the country level.

The dependent variable for this study is national software piracy rates. The independent variables used fall into three categories: economic variables, cultural variables, and temporal variables. In total six independent variables were used across the three categories. The following paragraphs will describe the source and meaning of each variable.

The national software piracy rate was collected from the BSA global software piracy study. This variable represents the percentage of pirated software installed out of total software installed. Roughly this is calculated as the difference between total software installed (demand) and total legal software shipped (supply).

In order to determine the economic variables to include in this study we turned to both theoretical and empirical justification. Such a great number of economic variables are available to study from the World Bank database that a refined set needed to be determined for use in this study. Quite a few studies provide us with variables that have significant impact on software piracy. As most country-level studies have developed a base model with economic variables, we test the effects of gross domestic product and information technology expenditures. In addition, we also consider cultural and temporal variables that have been examined with the phenomenon of software piracy based on the previous studies. In order to accomplish this process factor analysis was used to identify a reduced set of variables. This was necessary in order to minimize redundancy (remove multicollinearity) among the variables. Multicollinearity adversely affects regression coefficients and predictions in multiple regression (Neter, Kutner, Nachtsheim and Wasserman, 1996). The reduced set of variables was then entered into a forward stepwise regression (along with the cultural and temporal variables) that further removed some variables from the final model.

The results produced the following set of three economic variables included in the study: gross domestic product (GDP), information technology expenditures, and high-tech exports from the World Bank database (2002). GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States, and these controls for the difference of purchasing

| Study | Level | Sample Size | DV | IVs | Key Findings |
|---|---|---|---|---|---|
| Burton,Raghu,Sinha,&Vinze (2003) | Individual | 75 | Willingness to pay | User interface, Data interchange | Preliminary findings from an experimental design that supports previous findings that preventive controls such as encryption may hurt profits. |
| Cheng,Sims,&Teegen (1997) | Individual | 340 | Consumer decision | Software Price, Pirating cost, Consumer reservation price | Describe a decision-making scheme to determine when people buy vs. pirate software. Individuals will pirate when the cost of pirating is lower than the price of buying and the individuals reservation price. |
| Gopal&Sanders (1997) | Individual | 123 | Pirate Club size measure | Deterrence information, ethical index, gender, age | Creates a model to test the effects of anti-piracy measures on publisher profits. Results suggest that preventive controls have an inverse impact on profits and deterrent controls may have a positive impact on profits. |
| Gopal&Sanders (1998) | Country | 13 | SPR | GDP, software industry | Provides support for the proposition that a government's incentive to enact and enforce copyright protection laws is closely related to the size of the domestic software industry. Also presents a model for ethical intentions based on ethical predisposition and demographics. |
|  | Individual | 242 | Ethical intentions | Demographics, Ethical predisposition |  |
| Gopal&Sanders (2000) | Country | 65 | SPR | GNP | An inverse relationship between software piracy rates and per capita GNP with a break at $6,000 with those below the break being affected more. |
| Husted (2000) | Country | 39 | SPR | GNP, Income, Individualism, Masculinity, Power distance, Uncertainty avoidance | Included cultural variables finding that GNP per capita, income inequality, and individualism are significantly related to software piracy (all relationships are inverse). |
| Marron&Steel (2000) | Country | 77 | SPR | Income, R&D Individualism, Education. | The inverse relationships of individualism, per capita income and strength of economic institutions explain the greatest amount of variance in software piracy rates. |
| Ronkainen&Guerrero-Cosumano (2001) | Country | 50 | IPV | PPP, Corruptions Index, Individualism, Masculinity | All variables have an inverse relationship with IPV (intellectual property violation). Also classified determinants of intellectual property violation into two groups: market factors and involvement factors. |
| Shin,Gopal,Sanders,&Whinston (2004) | Country | 49 | SPR | GDP, Collectivism | Found that there is a break at $6,000 (similar to above study) and collectivism explains a good portion of the variance in software piracy rates. |
| Swinyard,Rinne,& Kau (1990) | Individual | 371 | Moral acceptability | Attitudes, Behavioral intent, Cognition | Presents a cross-cultural study of differences in morality and behavior between individuals in Singapore and the United States. Conclude that Asian attitudes towards piracy are a cultural difference more than a legal difference. |
| Thong&Yap (1998) | Individual | 243 | Moral intention | Deontological evaluations, teleological evaluations | Tested an ethical decision making model on entry level IS workers in the context of softlifting. Find support for the model and suggests that the decision to softlift is determined by ethical judgment. |
| Wagner&Sanders (2001) | Individual | 167 | Piracy Behavior | Religion, moral equity, judgment, intention | Looks at the relationship between religion and a theoretical ethical decision making process. Results suggest there is a relationship between religion and the stages in the decision making process. |

**Table 1 Summary of Empirical Findings From the Literature**

power among countries. GDP was the most commonly included economic variable in previous studies. High tech exports are products with high research and development costs, such as aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. This is in line with a study by Marron and Steel (2000) that looked at how R&D influenced software piracy rates. Information and communications technology expenditures are one variable that include external spending on IT (so called tangible spending such as products purchased), internal spending on IT (intangible spending such as in house customization of software and capital depreciation), and spending on telecommunications equipment.

The cultural variables included in this study were chosen based on results by previous researchers that have been shown to explain some portion of the variance in national software piracy rates. Marron and Steel (2000), Husted (2000), Shin et al. (2004) and Ronkainen et al. (2001) all found some cultural variable to be significant in their studies. From Hofstede's seminal cultural study, we collected the indexes of the two cultural variables; the individualism-collectivism and the power index used in this study. "The power index is a power distance, that is the extent to which members of a society accept that power in institutions and organizations is distributed unequally. A society's Power Distance norm is present in the values of both the leaders and the led, and reflected in the structure and functioning of the society's institutions (Hofstede, 1983)."

"Individualism collectivism index: individualism, which stands for a preference for a loosely knit social framework in which individuals are supposed to take care of themselves and their immediate families only; as opposed to Collectivism, which stands for a preference for a tightly knit social framework in which individuals are emotionally integrated into an extended family, clan, or other in-group which will protect them in exchange for unquestioning loyalty. The word Collectivism in this sense carries no political connotations and does not assume any positions as to the role of the state; it operates at a much smaller scale of social integration (Hofstede, 1983)."

Both the power index and collectivism index are variables that do not contain a time structure, which could potentially create issues in a time series analysis. Statistically the error structure of the two variables is cross-sectional while the error structure of our other variables varies over time and space. Theoretically (Merritt, 2000)has shown that Hofstede's cultural indices are replicable across different time periods and subject groups. In particular collectivism showed to be durable across time and subjects. This provides the current study with the necessary empirical and theoretical foundations to continue using Hofstede's cultural indices.

The temporal variable is year, which is simply the year of the data for the individual country. The data spans ten years from 1991 to 2001. Year was used to look for a time structure in the data. This variable is important for the following reasons: One, aggregate data tend to be serially correlated, because aggregate measures tend to change slowly (serial correlation due to "inertia/momentum"). Two, the existence of serial correlation induces estimation bias and violates the regression (OLS) assumption of independent observations (resulting in serially-correlated residuals). Finally, including a time index like year estimates the effects of "time" not accounted for by other independent variables, and thus corrects the bias and removes the serial correlation from the residuals (this is tested for confirmed later). In addition, the variable year is a trend coefficient that represents the average rate at which the measure of interest is changing independently of other influences. The results of estimation may be caused by the fact that the world average software piracy rates are declining (in both high and low PPP countries) over the period observed. Preliminary analysis (factor analysis discussed above) indicated a substantial amount of redundancy among the original economic candidate variables so subsets of variables with less redundancy were chosen based on that analysis. The economic, cultural, and temporal variables included in the model are: gross domestic product (GDP), a collectivism index (CI), year (YR), IT expenditures (ITE), a power index (PI), and high tech exports (HTE).

### Analysis

The data structure for this model (including cultural, economic, and temporal variables) is a "cross-sectional time-series," which means that it includes observations over both space and time. Forward stepwise regression was used to create a model showing the significant set of variables chosen from all available data. In addition, two models based on GDP were found which investigate the differences between more and less developed countries. This was completed because previous studies found these breaks in GDP to help clarify differences in software piracy rates. For these two models a shift occurs at a GDP of $12,000, which differs from the previous studies conducted by Gopal and Sanders (2000) and Shin et al. (2004) that found GDP shifts at $6,000.

### RESULTS

Table 2 present the results of the three regression analyses for this study. The estimation (i) includes all variables and gives overall macro level results for this study. Overall, the result shows that software piracy rates are significantly related to cultural, economic, and temporal factors. Specifically GDP, YR, ITE, and HTE are inversely related to software piracy rates. This indicates that as income raises software piracy rates decline; as time progresses software piracy rates are decreasing at

an average of 2.5% per year; and that increased spending in IT and high tech exports will have small impacts in lowering software piracy rates. YR indicates that there are temporal variations in software piracy rates, indicating that cross-sectional studies do not fully explain the phenomenon. The cultural variables collectivism and power are positively related to software piracy rates. This implies that in cultures that are highly collective software piracy rates are higher. This is also true for cultures where the people feel that power is distributed unequally between the organizations and institutions.

The overall model explains 76% percent of the variance in software piracy rates between countries, is significant at the .001 level (F (6, 209) = 113.49), has a standard error of the estimate of 8.784 and includes the following variables: GDP, CI, YR, ITE, PI, and HTE. It is worth noting that the correlation between YR and economic variables such as GDP, ITE, and HTE ranges between 0.10 and 0.15.

| Variable | (i) | | (ii) | | (iii) | |
|---|---|---|---|---|---|---|
| | B | Tolerance | B | Tolerance | B | Tolerance |
| Intercept | 5101.229 *** | | 5055.795 ** | | 4468.456 *** | |
| CI | 0.2118 *** | 0.385 | 0.199 * | 0.957 | 0.254 *** | |
| YR | -2.53 *** | 0.963 | -2.498 *** | 0.922 | -2.217 *** | |
| ITE | -0.004 * | 0.162 | -0.089 *** | 0.905 | -0.006 *** | 0.678 |
| HTE | -0.00005 * | 0.650 | 0.00020 * | 0.975 | -0.00006 * | 0.743 |
| GDP | -0.417 * | 0.127 | | | | |
| PI | 0.142 ** | 0.347 | | | 0.124 * | 0.574 |

Note: Significance at the .05, .01, and .001 levels are represented by *, **, and *** respectively. Model (ii) and (iii) include GDP shift.

**Table 2 Summary of Regression Results**

**Analysis of Income Subsets**

Our result indicates that a country's income level has a strong effect on the software piracy rates. Further we conducted an empirical estimation with an income breakpoint with those nations who's GDP is above 12,000 and those where GDP is below 12,000. This breakpoint was empirically determined by looking at subsets of data where GDP was 6, 7, 8, 9, 10, 11, 12, and 13 thousand respectively and choosing those with the highest correlations between piracy rates and GDP.

We estimate our model without PI because PI turns out to be insignificant with the breakpoint (Column (ii) of Table 2). Overall, the model is significant at the .05 level (F (4,65) = 34.39), explains 66% of the variance in software piracy rates, and has a standard error of the estimate of 7.9120. Even though this model explains less variance than the overall model, we gain precision in the coefficient estimates and more valid specification (both overall standard error of estimates (SEE) are smaller as well as the standard error of the coefficients). This gives the ability to see more precisely how the variables influence software piracy rates at the given income level. GDP is not included because it is already taken into account when the data was grouped by GDP <> 12.

The coefficient of ITE for countries with GDP less than $12,000 is ten times as influential on software piracy rates as it is at the overall or higher GDP levels. A possible explanation is that those few poorer countries that do spend significant money on IT products may try to protect those investments through stricter legislation in areas such as intellectual property as compared to poor countries that don't spend much on IT.

HTE for GDP less than 12 is five times more influential on software piracy rates than it is in the other models, and affects rates in the opposite direction. This could be because those countries have a less competitive software industry and poorer markets. It is also likely that at least a couple of those countries are also exporting pirated software. PI is not significant for poorer countries. This coincides with what Husted (2000) found in his study that power is not a significantly associated with software piracy rates. CI has roughly the same impact on poorer countries as it does for the overall results.

The regression analysis of model (iii) explains 67 % of the variance in software piracy rates, is significant at the .05 level (F (5, 140) = 59.54), and has a standard error of the estimate of 7.8172. GDP is not included in this estimation because it is already taken into account when the data was grouped by the GDP breakpoint. HTE is statistically significant with countries of GDP over $12,000. It is probably because high-GDP countries have developed substantial volume of software industries,

and therefore actively try to protect their intellectual capital so that their software industry can continue to develop and profit from it. ITE are inversely related to software piracy rates with about the same impact as they had in the overall results. CI and YR have roughly the same influence on richer countries as they did on poorer countries and in the overall results. The PI also has about the same influence on richer countries as it did on the overall results. The intercept in the overall model implies that the software piracy rate would be 51% for values of the independent variables of zero. This is not a reasonable conclusion so it implies nonlinearity at lower levels of software piracy rates. An adequate linear fit is achieved because we are observing a limited range of values for piracy rates (no observations below .24).

A tolerance score is considered with all three models to avoid a possible problem of multivariate interdependence of each variable. A tolerance score of zero indicates total dependence (redundancy) and a score of one indicates the variables are orthogonal. There are several variables in each model that are highly dependent: in the overall model GDP has a score of .13 and ITE = .16; in the GDP < 12 model ITE = .17. The subset models have larger tolerance statistics suggesting that the relatively high interdependence of the variables largely rests with GDP. In addition, tests of residuals (Kolmogorov-Smirnov and first-order autocorrelation) indicate that the hypotheses of normality and independence of the residuals cannot be rejected at the .05 level for any of the three models.

The data structure for this model is a cross-sectional time-series, meaning that it includes observations both over space and time. Thus, the error structure of the model (estimated by the residuals) may have separate and independent space and time components. This is difficult to analyze, but may not be a problem. Analyses of the residuals do not indicate any patterns that would be present if there were persistent cross sectional effects not present in the other variables. Note that the residual (AND standard residual) has a 0.00 correlation with YR and all of the other regressors. Furthermore, the variable YR has high tolerances in all estimated models. Also, the standardized residuals and predictions are not correlated, as should be for an adequately specified model (independence between prediction and error).

## DISCUSSION AND CONCLUDING REMARK

By using a combination of economic and cultural variables over three quarters of the variance in piracy rates can be explained. The inclusion of times series is significant because ignoring the time-dependent nature of the data means that those influences will be either incorrectly accounted for by other dynamic factors such as population or GDP, or lumped into the residuals (in which case the residuals would not be independent). The results show that time (YR) is strongly and independently associated with software piracy rates, and that software rates decreased at an average rate of approximately 2 percentage points over the time period represented.

Cultural, economic and temporal factors all significantly influence software piracy rates. Collectivism has been found significant in several previous studies and shows that a country's tendency to pirate software is based not only on the economic conditions within that country but also on how collective a society is. The more collective the greater the tendency to pirate software, since the greater good of the whole supercedes the rights of an individual. In the future it may be possible to create better deterrent controls by taking the collective nature of the society into account.

This study again confirms the role that culture plays in software piracy. Replicating previous studies regarding ethical and moral judgment concerning consumer decision-making with the inclusion of cultural variables may provide clues as to how to help prevent piracy in the future. If these studies could perhaps be repeated or analyzed in the context of the culture they were conducted in it may provide clues as to how to help prevent piracy in the future.

The inclusion of the power index as a significant variable differs from previous studies such as Husted (2000) that found power to not be a significant variable. This could be due to the cross sectional nature of Husted's study or perhaps due to collinearity in Husted's variables. Either way it adds some more depth to a complicated issue and presents a possible path for future research to explore the differences in more detail.

While several economic variables have long been associated with software piracy studies, high tech exports are not found in any of the studies mentioned so far. They are found to affect countries differently according to their GDP, and thus, provide greater detail to a complicated issue. For countries with GDP less then 12 high tech exports are positively related to software piracy rates and are five times as influential. For wealthier nations high tech exports are inversely related but do not affect piracy rates a great deal. IT expenditures are also more influential for poorer countries, but is inversely related to both high and low GDPs. There is also room to explore the differences in GDP shifts found in this study vs. those found in Gopal and Sanders (2000). This study found a shift in GDP at $12,000, while Gopal and Sanders found the shift at $6,000. The time series nature of this study enabled it to more accurately capture the affects of income on national software piracy rates.

To our knowledge, this study is the first to use time series data in the analysis of national software piracy rates. It is the authors' hope that the results of this study offer a guideline to effective software piracy prevention treaties and legislation. As

our empirical results indicate, software piracy is a problem that is not going away. Because of this, it is important to learn all we can about what causes and influences national software piracy rates so that they can hopefully be controlled and possibly lowered in the future. For future work, it would be worthwhile to consider other factors explaining software piracy beyond this study.

## REFERENCES

1. BSA. (2003). *Expanding global economies: The benefits of reducing software privacy*. Business Software Alliance. Retrieved, from the World Wide Web: http://global.bsa.org/idcstudy/pdfs/White_Paper.pdf
2. Burton, O., Raghu, T. S., Sinha, R. and Vinze, A. (2003) Software piracy: An empirical examination of the impact of network externalities and open source alternatives on willingness to pay, *Proceedings of the Ninth Americas Conference on Information Systems*, Tampa, FL.
3. Cheng, H. K., Sims, R. R. and Teegen, H. (1997) To purchase or to pirate software: An empirical study, *Journal of Management Information Systems,* 13, 49-60.
4. Conner, K. R. and Rumlet, R. P. (1991) Software piracy: An analysis of protection strategies, *Management Science,* 37, 125-139.
5. Gopal, R. D. and Sanders, G. L. (1997) Preventive and deterrent controls for software piracy, *Journal of Management Information Systems,* 13, 29-47.
6. Gopal, R. D. and Sanders, G. L. (1998) International software piracy: Analysis of key issues and impacts, *Information Systems Research,* 9, 380-397.
7. Gopal, R. D. and Sanders, G. L. (2000) Global software piracy: You can't get blood out of a turnip, *Communications of the ACM,* 43, 82-89.
8. Hofstede, G. (1983) National cultures revisited, *Behavior Science Research,* 18, 285-305.
9. Husted, B. W. (2000) The impact of national culture on software piracy, *Journal of Business Ethics,* 26, 197-211.
10. Idris, K. (2003). *Intellectual property: A power tool for economic growth*. World Intellectual Property Organization (WIPO). Retrieved, from the World Wide Web: http://www.wipo.org/about-wipo/en/
11. IIPA. (2003). *Losses in US copyrighted materials*. International Intellectual Property Alliance. Retrieved, from the World Wide Web: http://www.iipa.com/statistics.html
12. Marron, D. B. and Steel, D. G. (2000) Which countries protect intellectual property? The case of software piracy, *Economic Inquiry,* 38, 159-174.
13. Merritt, A. (2000) Culture in the cockpit: Do Hofstede's dimensions replicate?, *Journal of Cross-Cultural Psychology,* 31, 283-301.
14. Neter, J., Kutner, M. H., Nachtsheim, C. J. and Wasserman, W. (1996) *Applied linear statistical models fourth edition,* Irwin, Chicago.
15. Ronkainen, I. A. and Guerrero-Cosumano, J.-L. (2001) Correlates of intellectual property violation, *Multinational Business Review*, 59-65.
16. Shin, S. K., Gopal, R. D., Sanders, G. L. and Whinston, A. B. (2004) Global software piracy revisited: Beyond economics, *Communications of the ACM,* 47, 103-107.
17. Swinyard, W. R., Rinne, H. and Kau, A. K. (1990) The morality of software piracy: A cross-cultural analysis, *Journal of Business Ethics,* 9, 655-664.
18. Thong, J. Y. L. and Yap, C.-S. (1998) Testing an ethical decision-making theory: The case of softlifting, *Journal of Management Information Systems,* 15, 213-237.
19. Wagner, S. C. and Sanders, G. L. (2001) Considerations in ethical cecision-making and software piracy, *Journal of Business Ethics,* 29, 161-167.
20. World Bank (2002) *The 2002 World Development Indicators*. International Bank for Reconstruction and Development.