The Effect of National Culture and Economic Wealth on Global Software Piracy Rates

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According to a recent survey on global software piracy [9], the Business Software Alliance estimated that the illegal duplication, distribution, or sale of commercial business software cost the U.S. software industry $11.75 billion in lost sales in 2000, and brings to $71.6 billion the losses incurred since the surveys began in 1994.

Software piracy rates are calculated by estimating the demand for software based on the worldwide number of PC shipments and the sale of U.S. business applications. By assuming that for each new personal computer sold there will be a set of accompanying software sales, the difference between expected demand and supply (in the form of sales) is attributed to software piracy.

The global piracy rate—calculated by combining the data for all countries and treating the world as a single market—increased for the first time from 36% in 1999 to 37% in 2000. Averages across individual countries continue to decline, however, from 61% in 1999 to 58% in 2000 (see Figure 1). The highest regional software piracy rates are in Eastern Europe, with rates of more than 60%, suggesting six of every 10 software packages in use are pirated copies. Eleven countries are estimated to have a software piracy rate of 80% and above, with Vietnam (97%), China (94%), the Ukraine/other CIS (89%), Indonesia (89%), and Russia (88%) at the top of the list.

Because of the size of their respective software markets, however, the greatest financial losses occur in the U.S., Japan, China, Germany, the U.K., France, and Italy. These seven countries account for $7.5 billion or 60% of lost sales worldwide in 2000. Although the U.S. has the lowest piracy rate in the world at 24% for 2000, the U.S. software market is four times that of any other country, and so the U.S. alone accounts for more than $2.6 billion in lost sales.

Most countries protect software copyright using copyright and intellectual property rights legislation. In the U.S., such legislation includes the 1997 No Internet Theft (NET) Act, the 1998 Digital Millennium Copyright Act, and the 1999 Digital Theft Deterrence and Copyright Damages Improvement Act, the latter raising the maximum fine to $150,000 for each instance of willful copyright infringement.

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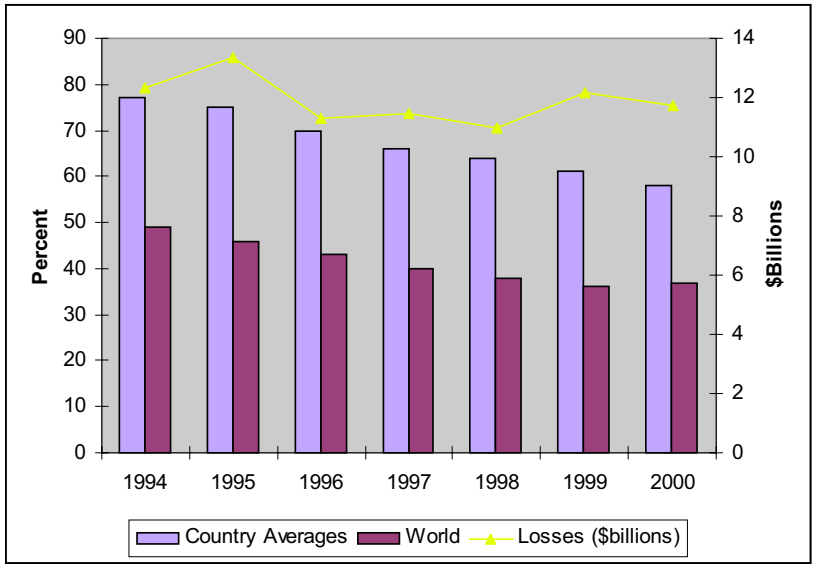

Figure 1. World, and average country, software piracy rates, and retail revenue losses due to software piracy, 1994-2000 (N=87)(cf. [9]).

Common forms of software piracy include counterfeiting, Internet piracy, and softlifting.

Counterfeiting and Internet piracy both involve creating bootlegged copies of licensed software for sale or distribution. Internet piracy makes use of the Internet to distribute the software, and has become a particular concern for vendor organizations. The Software and Information Industry Association (SIIA) reports a rapid rise in the availability of pirated software on Internet auction sites such as eBay, Excite, Amazon and Yahoo!, from 60% of postings in August, 1999, to 91% in March/April 2000.

Softlifting involves installing software with a single-user license on multiple machines, and is the most common example of software piracy within businesses. After its international "Sweeps Week" in May 2001, the Business Software Alliance (BSA) reported settlements of $6.2 million from 159 software infringement cases around the world. Typically, a lack of management control over how employees load, download, and share software is blamed for the copyright infringements, with anonymous tip-offs to the SIIA anti-piracy hotline sparking the investigation.

The motivation to pirate software on an individual level is often framed in terms of cost, in particular, the high cost of legal software [1, 2, 7]. This article, however, will investigate the problem at a national level and determine the extent to which Hofstede's cultural dimensions of power distance (PDI), individualism (IDV), masculinity (MAS), and uncertainty avoidance (UAI) are related to national software piracy rates. The connection between software piracy and national culture is that software piracy involves engaging in an illegal act. To pirate or not to pirate thus raises a moral issue [5], and many studies have noted cultural differences in perceptions of software piracy [10, 11].

While a few studies have related Hofstede's culture dimensions to software piracy rates [4, 6, 8], they have tended to either relate software piracy to a particular year, or

use reduced sample sets because of a lack of available data. This study will use a sample of 45 countries and data stretching from 1994 to 1999. It will be shown that although there is clearly a cultural component to software piracy, by including a measure of economic wealth into the model it will be shown that the dominant factor still appears to be economic. The development of online auctions, however, has the potential to dismantle these relationships and ignite soaring global software piracy rates over the next few years.

Hofstede's Four Cultural Dimensions

Hofstede's [3] four cultural dimensions are power distance (PDI), individualism (IDV), masculinity (MAS), and uncertainty avoidance (UAI). The dimensions were derived from an initial survey of over 72,000 IBM employees in 40 countries between 1967 and 1973. All four dimensions are based on questions involving to work-related values. Later studies added further countries with a current sample of 50 countries and three regions. The dimensions were normalized to a 100-point scale, although countries added later often exceeded this score. The dimensions are briefly outlined here:

Power Distance Index (PDI). The power distance index is related to society's acceptance of social inequality, with the inverse being an expectation of relative equality in organizations and institutions. In other words, PDI is a measure of the type of dependence relationship between manager and subordinate based on the extent to which employees are afraid to disagree with their managers, subordinates' perception of the actual decision-making style of their manager (autocratic or paternalistic), and the subordinates' preference for a particular decision-making style.

Countries with low PDI scores, such as Austria (11), Israel (13), and Denmark (18), prefer a more consultative style of leadership suggesting a greater interdependence between manager and subordinate in making decisions. The ideal boss is a resourceful democrat. Countries with high PDI scores, such as Malaysia (104), Guatemala (95), Panama (95), and The Philippines (94), prefer more autocratic styles of leadership. The ideal boss is a benevolent autocrat or "good father" [3].

Individualism (IDV). The individualism-collectivism dimension relates to the tendency of individuals to look after themselves and their immediate family, with the inverse being the integration of people into cohesive groups. Those at the individualistic end of the pole attach more importance to personal or family time away from work, freedom to adopt their own approach to the job, and a challenging work environment that allows for a personal sense of achievement. Those at the collectivist end of the pole attach more importance to training opportunities that allow them to improve or learn new skills, physical working conditions such as lighting and workspace, and fully using skills or abilities on the job.

In countries with low IDV scores, such as Guatemala (6), Ecuador (8), and Panama (11), the interests of the in-group outweigh those of the individual. Hiring decisions are based on whether the individual is a member of the in-group, with a preference for hiring relatives. In countries with high IDV scores, such as the U.S. (91), Australia (90), and the U.K. (89), employees act according to their own interests, and organizations must define work patterns in such a way that self interests and those of the organization coincide. Nepotism is seen as a bad thing, and hiring of relatives would be seen as a conflict of interest.

Masculinity (MAS). The masculinity-femininity dimension relates to an assertive or competitive orientation at the masculine end, with the inverse being a more modest and caring attitude toward others. This is the only dimension in which males and females score consistently differently, although the differences are more pronounced in high MAS countries. In masculine cultures, social gender roles are clearly distinct, with males being assertive, tough, and focused on material success, and females being modest, tender, and concerned with the quality of life. In feminine cultures, social gender roles overlap, with little difference in views expressed by males and females.

In countries with low MAS scores, such as Sweden (5), Norway (8), The Netherlands (14), and Denmark (16), the view expressed is that one works in order to live. The concerns are over the quality of working relationships, job security, and living in a desirable area. In countries with high MAS scores, such as Japan (95), Austria (79), and Venezuela (73), the view expressed is that one lives in order to work. The concerns here are for opportunities for high earnings and advancement, as well as challenging work that gives a personal sense of achievement, and recognition for a job well done.

Uncertainty avoidance index (UAI). The uncertainty avoidance index relates to the discomfort experienced in unstructured or unusual circumstances, with the inverse being tolerance of new or ambiguous circumstances. The index is a measure of how often people feel nervous or tense at work, the degree to which they believe company rules should not be broken (even if it's in the company's best interests), and the degree to which they seek a long-term career with their employer. As anxiety increases, there is a need for predictability, formal structure, and rules (both written and unwritten). Uncertainty avoidance does not mean risk avoidance, since anxious cultures tend to be more expressive, which has been related to speeding on highways.

In countries with low UAI, such as Singapore (8), Jamaica (13), Denmark (23), Sweden (29), and Hong Kong (29), people can appear to be quiet, easy-going, controlled, and even lazy. There is an emotional horror of formal rules, which are only established in cases of absolute necessity, such as which side of the road to drive on. In countries with high UAI, such as Greece (112), Portugal (104), Guatemala (101), and Uruguay (100), people can appear to be busy, fidgety, emotional, and even aggressive.

Method

A sample of 45 countries is derived for which software piracy rates, cultural dimensions scores, and economic wealth data is available. The BSA software piracy study [9] lists 80 countries and seven regions, while the Hofstede sample [3] consists of 50 countries and five regions, with 46 countries in common. The regional data is dismissed since it would be difficult to determine how to combine the data to match one region to another. Finally, the economic data is derived from the World Bank's World Development Indicators 2001 CD-ROM database [12]. Data is available for all the countries except Taiwan, thus producing a sample of 45.

Economic wealth is defined in terms of gross domestic product (GDP) per capita converted to international dollars using purchasing power parity (PPP) rates. PPP rates were developed by the World Bank to adjust GDP by taking into account the relative cost of a basket of local goods and services. Countries A and B may have the same GDP, but if goods and services are cheaper in country A, its PPP rate will be higher. As such, PPP is a better indicator of standard of living in a particular country.

Country	SPR(%)	GNI($)	PDI	IDV	MAS	UAI
Argentina	72	9872	49	46	56	86
Australia	34	20120	36	90	61	51
Austria	43	21837	11	55	79	70
Brazil	68	6276	69	38	49	76
Canada	42	22699	39	80	52	48
Chile	62	12419	63	23	28	86
Colombia	67	6396	67	13	64	80
Costa Rica	81	6515	35	15	21	86
Denmark	39	22849	18	74	16	23
Ecuador	81	4823	78	8	63	67
El Salvador	92	2832	66	19	40	94
Finland	43	19182	33	63	26	59
France	47	21502	68	71	43	86
Germany	37	20887	35	67	66	65
Greece	80	12360	60	35	57	112
Guatemala	90	4021	95	6	37	101
Hong Kong	63	23094	68	25	57	29
India	74	1519	77	48	56	40
Indonesia	95	3179	78	14	46	48
Ireland	67	18917	28	70	68	35
Israel	65	17699	13	54	47	81
Italy	55	19887	50	76	70	75
Japan	45	23048	54	46	95	92
Korea	70	12503	60	18	39	85
Malaysia	76	7479	104	26	50	36
Mexico	68	8168	81	30	69	82
Netherlands	55	20424	38	80	14	53
New Zealand	37	17150	22	79	58	49
Norway	49	23323	31	69	8	50
Pakistan	91	1560	55	14	50	70
Panama	74	7023	95	11	44	86
Peru	75	4418	64	16	42	87
Philippines	87	3350	94	32	64	44
Portugal	55	13645	63	27	31	104
Singapore	56	26416	74	20	48	8
South Africa	54	7241	49	65	63	49
Spain	66	15420	57	51	42	86
Sweden	47	19458	31	71	5	29
Switzerland	40	24885	34	68	70	58
Thailand	83	6460	64	20	34	64
Turkey	87	5840	66	37	45	85
UK	35	19871	35	89	66	35
Uruguay	79	8865	61	36	38	100
US	27	28055	40	91	62	46
Venezuela	68	8551	81	12	73	76

NOTE:
SPR = Average software piracy rate (1994-1998)
GNI = Average gross national income, PPP (1994-1998)
PDI = Power distance index
IDV = Individualism-collectivism
MAS = Masculinity-femininity
UAI = Uncertainty avoidance index

Table 1. Data sample (N=45).

Variable	Mean	SD	1	2	3	4	5
1. SPR	62.7	18.44					
2. GNI	13600.9	7945.53	-0.85**				
3. PDI	55.3	22.90	0.65**	-0.63**			
4. IDV	44.4	26.42	-0.81**	0.71**	-0.71**		
5. MAS	49.2	19.16	-0.12	0.04	0.10	0.05	
6. UAI	66.0	24.44	0.38**	-0.40**	0.22	-0.41**	0.04

N = 45 * $p < 0.05$ ** $p < 0.01$

Table 2. Descriptive statistics and correlations of variables.

Because it is unclear whether the independent variables (culture and economic wealth) of a particular year are directly responsible for the software piracy rate (SPR) of that year, it seems preferable to smooth the data by taking an average. Given the data available, the SPR will be defined in terms of the average rate from 1994 to 1999, while GDP will be defined as the average in PPP terms over the same period.

The analysis will involve three steps. First, there will be a correlation analysis of the variables to determine relationships between the independent variables. Second, forward stepwise regression will be used to determine which of the variables explain most of the variance in SPRs. The advantage of forward stepwise regression is that variables are added depending on their ability to sufficiently increase the explanatory power of the model. Finally, a search will be made for outliers using Cook's Distance, D.

Given that the Hofstede data, which dates back to the late-1960s, is being used to explain data from the mid-1990s, it is possible that some countries do not fit their cultural scores as well in the 1990s as they did in the 1960s and 1970s. Hofstede suggests that even if cultures do shift, the relative positions of countries are likely to remain the same. So, countries may shift in their IDV scores, say, but high IDV countries are likely to remain relatively high compared to those scoring at the lower end of the scale. The search for outliers will determine whether the sample continues to behave robustly.

Results

An analysis of the correlation between the variables shows that all are significantly correlated, except for MAS. The highest correlations are between SPR and GDP (-0.87), and SPR and IDV (-0.81). The negative sign for both GDP and IDV suggests that becoming richer and more individualistic is associated with a decline in the software piracy rate. The strong correlations seen here are expected. The relationship between GDP and SPR has been noted before [1, 2], while Hofstede [3] has previously noted the close relationship between the other variables.

The inverse relationship between PDI and IDV makes sense, since it would be difficult to have an autocratic manager (high PDI) in an environment where workers value their own initiative (high IDV). It also makes sense to suggest that increasing GDP promotes IDV, since as cultures become wealthier they have the means to look after themselves and thus become less dependent on the in-group. As such, the negative relationship between GDP and PDI is more likely to be a by-product of the neg-

Variable	Coefficient	Standard error	t-statistic (df=41)	P
Intercept	96.5966	4.0047	24.1208	0.0000
GNI	-0.0013	0.0002	-5.8607	0.0000
IDV	-0.2830	0.0668	-4.2365	0.0001
MAS	-0.0740	0.0646	-1.1448	0.2589

N = 45 Regression characteristics: Adjusted $R^2 = 0.802$; $F(3, 41) = 60.467$ ($p<0.0000$); DW = 1.595

Table 3. Results of forward stepwise regression analysis (F=1.0 to enter).

ative relationship between PDI and IDV, rather than from the suggestion that cultures with high PDI must necessarily be poorer.

The result of the stepwise regression analysis is given in Table 3. As can be seen, GDP and IDV dominate the regression model. This is to be expected, given the high correlation seen in Table 1 between SPR and these two variables. None of the other cultural dimensions were significant. Although MAS sneaked into the model, the parameter value is not significant. The adjusted R^2 suggests that the model explains 78.5% of the variance in SPR for the sample.

Although a Cook's Distance of D>1.0 is often given as a rule of thumb to identify outliers, the mean D of the regression model derived is D=0.020, and so, a D>1.0 would require a data point to be 50 times the mean. In fact, only one data point exceeded D=0.090 (over four times the mean), that of Ireland (D=0.094). Removing Ireland from the sample improved the adjusted R^2 to 81.4% (DW=1.831).

What is so different about Ireland? Ireland is notable for having the highest increase in GDP within the entire sample. In 1994, Ireland was one of the poorest countries in Western Europe with a GDP of $15,676. By 1999, however, Ireland had become one of the richest, with a GDP of $25,918 exceeding those of Denmark, Germany, and the U.K. While the SPR in Ireland has also dropped significantly, from 74% in 1994 to 51% in 1999, this rate is still relatively high, given that Denmark, Germany, and the U.K. had a SPR of less than 30% in 1999.

Discussion

It would appear that increased personal wealth has resulted in a natural decline in software piracy rates throughout the world. The model developed here suggests that as people become richer, they become more individualistic, and the combination of these two effects result in the tendency to buy legal, rather than pirated copies of software, even in countries that traditionally have high software piracy rates.

Ireland did not fit this pattern only to the extent that it has had a prodigious increase in economic wealth (some 65% from 1994 to 1999), but still had a relatively high software piracy rate. Clearly, old habits die hard, and the existence of a flourishing software piracy market may be hard for some to resist, even if they now have the money to buy legal copies.

Furthermore, while vendor organizations such as the BSA and SIIA have a role to play in highlighting and attempting to combat software piracy, the model produced here accounts for more than 80% of the variance, and so, there seems little variance left over to attribute to the efforts of these organizations.

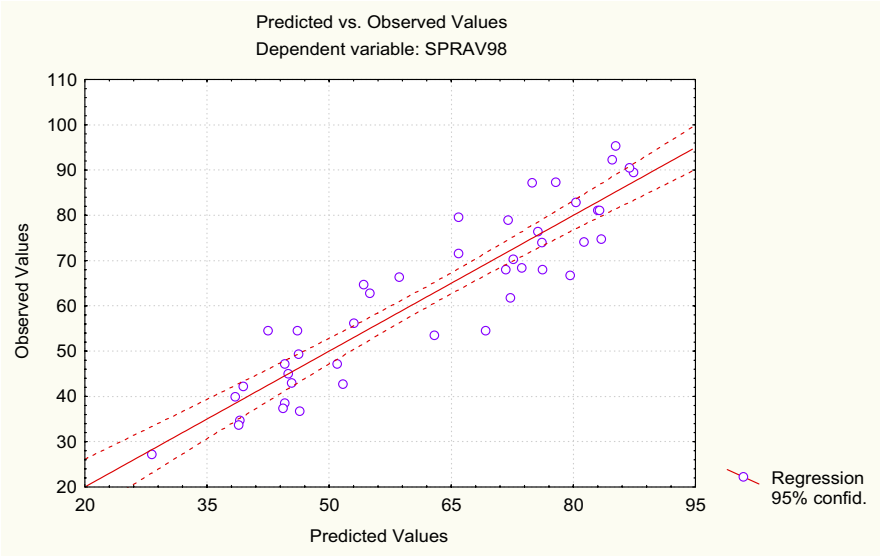

Figure 2. The regression model (with Ireland removed, N=44).

One reason for this could be that the efforts of BSA and SIIA have tended to focus on the U.S. market, an area that already has a relatively low software piracy rate. While the BSA Web site (www.bsa.org/) carries software piracy news from around the world and hotline numbers for reporting software piracy in more than 60 countries, the SIIA site is heavily U.S.-based, and only has a U.S. toll-free number to report cases of software piracy. But software piracy is an international issue.

Future predictions depend on the underlying relationships of the regression model remaining the same. While the slight increase in the 2000 global piracy rate (again, see Figure 1) could be a "blip," there are reasons to believe that software pirates are changing their face, from small arcades in furtive local malls, to global players in the Internet marketplace.

As with all businesses, the means of distribution is one obstacle to trade. In cyberspace, distribution crosses national boundaries, the pirates become anonymous accounts on Internet auctions sites, and thus the people involved become more difficult to catch. Without a global treaty to contain the problem, national culture will be set aside as individuals with the propensity to engage in software piracy will be able to make contact, wherever they are in the world.

The use of online auctions to distribute pirated software has already been identified as a rapidly growing problem. While GDP and IDV may have facilitated a decline in SPR over the last few years, it has done so within the context of national markets. The Internet, on the other hand, can overcome the obstacle of supply across national boundaries and thus has the potential to ignite a soaring piracy rate over the next few years. Time will tell.

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