Piracy Rates and Software Protection in the Time of 2008 Global Economic Crisis: Empirical Analysis for Greece, Germany and England

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Abstract

2008 global economic crisis were a plague in many sectors of many countries. Many countries were among those which affected the least, such as Germany and England whereas others were among those which were affected the most, such as the famous case of Greece. One sector that rises to the surface more and more as technology progresses is piracy and piracy rates, factor that belongs in those sectors that were affected. That's where software protection policies appear. The purpose of this paper is to analyze the relationship between software security and piracy rates, collecting relevant data for three European countries of utmost significance as regarding the 2008 global economic recession, Greece, Germany and England. The reason this paper was created was to provide those factors as regarding the data selected, that affect the most the piracy rates factor as regarding the global recession. Through thorough research, using Monte Carlo simulation technique and empirical analysis we discover proof that GDP and R&D factors have a negative impact on piracy rates.

Keywords *Piracy rates, Software protection, 2008 global economic crisis, Empirical analysis, software security.*

I. INTRODUCTION

Digital technologies provided room for copyright violations on a much larger scale and raised tremendous concerns on actual intellectual property rights factor. Software developers have expressed serious concerns because thousands of illegal copies have been brought in today's market. Since software piracy influences most of the businesses programming applications, enforcement measures are considered as fundamental for the forthcoming improvement of software industry. For that, crucial factors that affect piracy rates as regarding software violations should be found, thus taking the appropriate measures (G. Mahesh and Rekha Mittal, 2009).

Economic 2008 crisis other known as 2008 recession, were based on widespread failures added by failures of many kinds. This financial crisis affected countries and economies in different levels and extends. Some countries such as Greece were affected the most by this economic sickness, others more powerful in economic extend, such as England and Germany were affected less. One of many factors that were influenced by the 2008 economic crisis was piracy rates as regarding software protection (Daniele Pederzoli and Volker G. Kuppelwieser, 2015).

To date, no paper has inspected the effect of software security on piracy levels and the main factors of utmost importance that influence those piracy rates, in Greece, Germany and England in the 2008 economic crisis. What factors influence software security on piracy levels? That question this paper comes to answer. Observational studies on software piracy have undergone a cross–section estimation technique and by this way this method hasn't got the capacity to represent changes after some time and surreptitiously hasn't got the capacity to represent heterogeneity either.

In a construction project, someone may estimate the time it will take to complete a particular job. Based on some expert knowledge, someone may also estimate the absolute maximum time it might take, in the worst possible case and the absolute minimum time, in the best possible case. If the same model were based on ranges of estimates for each of the three parts, the result would be a range of times, those that may take to complete this task. What Monte Carlo Simulation provides, is giving a range of values as a result, multiplying the existing one's, someone can better estimate a model, thus understand the risk and uncertainty of the same (Ofir Ben-Assuli, Moshe Leshno, 2013; An and Prakash et al., 2012).

In that paper, the 2008 economic crisis effects are firstly presented with IT'S relation with software protection. Then, we conduct a thorough theoretical research to spot four factors that affect

software piracy the most as existing literature suggests. Next, we find supportive data as regarding the four factor, we use the Monte Carlo simulation technique in those data and eventually we estimate a panel data model using data for three nations of utmost importance over a period of time of 16 years: 1994 to 2010. Board information techniques permit control for discarded variables of parameter estimates.

Primary effects of 2008 global economic crisis and software protection

The current 2008 global economic crisis is a worldwide monetary subsidence that stemmed through America and had numerous impacts in all the nations of the world. Every nation is connected to the other in monetary level and extend. Other nations were affected the most, others less. Few negative Measuring software protection

Many national copyright laws are not available in English language, thus measuring software protection is rather difficult but an Index of software protection is composed as regarding statutory law and enforcement in order to measure software protection (Malcolm J. Morgan and Diane J. Ruskell, (1987; BSA, 2011).

As regarding the first and the statutory law, it contains information in worldwide right of first authorization measures. Intellectual Property Rights and WIPO copyright Treaty are the global copyright law surveillances being responsible for copyright violations . The legal measures included are Ex–parte Civil Search Order, directed upon the use of the copyright holder, Edge Measures where the copyright holder may record in an application to the custom powers to suspending the passage of pilfered product and Remedies (Antonio Rodríguez Andrés, 2004; BSA, 2011).

As regarding enforcement and judicial measures, nations whose demonstrations, strategy or practices have the best antagonistic effect are arranged as Need Outside Nations (Antonio Rodríguez Andrés, 2004; BSA, 2011).

Four main variables affect piracy rates as regarding the 2008 economic crisis

Both a measurement of national income and a strong predictor of intellectual property rights and software protection (Poonam and Archna Chaudhry, 2016). Real GDP per capital depicts the level of economic expansion in a country Ginarte and Park (1997) proved that high income nations equals stronger patent protection whereas intellectual property protection and software protection in less developed countries is less comprehensive with less patent protection. Shadlen, Schrank, and Kurtz (2005) showed the relationship between income and software protection. As nations enrich, its producers innovate more and thus are more likely to demand. Software protection also depends on financial empowerment.

effects of that crisis were dumping of merchandise, stock qualities significant decreasing and unemployment rate expansion (Dr. R.Narayanasamy and Ms. R.Thirugnanasoundari, 2016). Those are parts of the 2008 global monetary crisis (Raj and J. Mohan, 2012). Firms confronted difficulties and many forced to close (JOHN HLIAS PLIKAS, 2015). Except those financial 2008 global crisis continued in other scale factors (Muhamed Zulkhibri, 2015), among which is software protection. It has been spotted that 2008 global economic recession supported the florescence of software piracy in countries with lesser economic power that others (Antonio Rodríguez Andrés, 2004; Traphagan and Griffith, 1998; Marron and Steel, 2000).

That means that nations with higher GDP per capital can stronger protect software rights simply because they can economically afford it (Carl Shapiro and Hal R Varian, 1998; Ostergard, 2000) as implied in the introduction, whereas countries with lesser financial sustainability cannot afford to protect software rights, because they can't afford to. All those lead to a negative correlation between GDP and piracy rates (Gopal and Sanders, 2003; BSA, 2011).

Education level measured in years

The education level measured in years, is used to measure the countries potential to adopt a new technology (Marron and Steel, 2000; BSA, 2011). Moreover, educational level may evolve with institutional quality (Dr. V. Selvarani and Prof. A. Zeenath Amman). Based on this and past literature, a negative correlation between education level and piracy rates as regarding software protection is anticipated. Conversely, Shadlen, Schrank, and Kurtz (2005) found a negative effect of a country's education level measured in years of schooling on software piracy rates.

Research and development

Countries with a high R&D activity, can provide relatively stronger protection for intellectual property (Ginarte and Park, 1997). Past research have shown a negative effect of R&D on piracy rates (Marron and Steel, 2000; Shadlen, Schrank, and Kurtz, 2005; BSA, 2011; Sameer Sinha and Prof. Sunil Mishra).

Software protection index

This software protection information index other known as software trademark index or simpler software trademark application index is a derivative of the Civil and Criminal Codes and the national copyright law. Past literature proven that this trademark application shows a positive effect on piracy rates (Marron and Steel, 2000; Schrank, and Kurtz, 2005; Sophie Louveaux, 1999; BSA, 2011).

II. DATA SOURCES AS REGARDING THE FOUR LEADING FACTORS

Dependent variable

Piracy rate is the dependent variable. The Business Software Alliance holds national software piracy rates in yearly measurement for eight countries since 1994 (BSA, 2011).

Independent variables

Software protection index equals trademark application variable in this model. Information about software protection index comes from the other known as WIPO, UNESCO which stands for United Nations Educational, Scientific, and Cultural Organization and the WTO, the World Trade Organization (WIPO, 2016; UNESCO, 2016; WTO, 2016).

GDP per capital in purchasing power are collected from the World Bank's World Development data indicators (World Bank, 2016).

R&D expenditures are taken from the same data as GDP per capital and are calculated and measured by the real GPD per capital share (World Bank, 2016).

Data for education level in education years were obtained from the World Bank's World Development database as well (World Bank, 2016).

The variables

The data that were searched and collected in the databases as explained before. In TABLE 1, we can see those variables as regarding the three nations that will be analyzed, Greece, Germany and England in time window of 1994 to 2010. Piracy rates is the dependent variable as explained before, Research and development expenditure (% of GDP), GDP per capita (current US$), Trademark applications, total and years of schooling are the independent ones. Is obvious that some values as regarding Research and development expenditure (% of GDP) and piracy rates are missing. And this is where Monte Carlo simulation technique comes to surface.

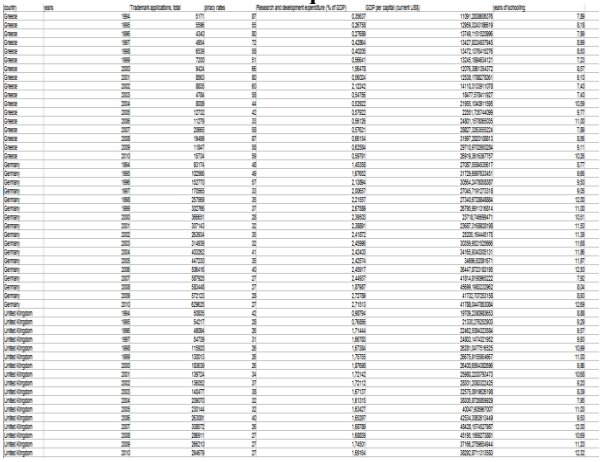
Table 1. Dependent and independent variables and Greece, Germany and England for the years 1994 to 2010.

(country)	years	Trademark applications, total	(piracy rates	Research and development expenditure (% of GDP)	GDP per capital (current US$)	years of schooling
Greece	1994	5171	87		11091.2038063767	8.89
Greece	1995	5596			12959.3243186619	9.18
Greece	1996	4340			13749.1151520996	9
Greece	1997	4954	72	0.42984	13427.8324937945	9
Greece	1998	6539			13472.1376415276	9
Greece	1999	7200		0.99641	13245.1894534121	9
Greece	2000	9424	66		12076.3961354372[8.57	
Greece	2001	8663		0.98024	12536.1780710061	9
Greece	2002	9835			14110.3133911078	9
Greece	2003	4784		0.94786	18477.3784119027	9
Greece	2004	8009		0.52922	21955.1040911595	9
Greece	2005	12732		0.57922	22551.7357440999[9.77	
Greece	2006	11279		0.96126	24801.1578093035	9
Greece	2007	20665	58	0.97621	28927.3283555224	9
Greece	2008	19499	57	0.98154	31997.2892010881	9
Greece	2009	11947	58	0.62584	29710.9720950284	9
Greece	2010	15734	59	0.59791	26919.3616367757[10.26	
Germany	1994	93174	48		27087.5594535817[9.77	
Germany	1995	102586			31759.6987631451[9.66	
Germany	1996	152770		2.13894	30864.2478283387	9
Germany	1997	170665	33	2.1815	27045.7191273318	9
Germany	1998	257569		2.21557	27340.6733849884	9
Germany	1999	302766		2.3373	26795.9911316814	9
Germany	2000	366661	28	2.39503	2371[9.74669947110.51	
Germany	2001	307143		2.39891	20687.3169929196	9
Germany	2002	263634		2.41872	25205.164443175	9
Germany	2003	314839		2.45996	30359.9521525666	9
Germany	2004	402682		2.42402	34165.8340353131	9
Germany	2005	447230		2.45214	34696.8209167[11.97	
Germany	2006	506416		2.45917	36447.8723183195	9
Germany	2007	597925	27	2.44937	41814.8190963222	9
Germany	2008	583448	27	2.5009	45699.1983333962	9
Germany	2009	572123	28	2.72789	41732.707263158	9
Germany	2010	629625	27	2.71513	41780.0447853084[12.69	
United Kingdom	1994	50835	42		19709.2380936538.88	
United Kingdom	1995	54217			21330.2762528039.29	
United Kingdom	1996	49094		1.71444	22462.5084323584	
United Kingdom	1997	54739	31	1.68783	24803.1474321952	
United Kingdom	1998	115200		1.67394	26291.0477516525	
United Kingdom	1999	130013		1.75755	28679.8159549657	
United Kingdom	2000	163639	26	1.7311	29400.6564382659[9.86	
United Kingdom	2001	138724		1.72142	25980.2203793473	
United Kingdom	2002	136052		1.72112	28301.2083323425	
United Kingdom	2003	140477		1.67137	32575.0919626198	
United Kingdom	2004	209070		1.61315	38305.8726599629	
United Kingdom	2005	230144		1.63427	40047.9059670071[11.03	
United Kingdom	2006	263081		1.65257	42534.3082610449	
United Kingdom	2007	308072	26	1.68788	48405.1514378971	
United Kingdom	2008	289911	27	1.69038	45195.1856073881	
United Kingdom	2009	266210	27	1.74501	37166.2759654944	
United Kingdom	2010	294679	27	1.69164	38292.8711315831[12.32	

Monte Carlo simulation technique gives a range of values by multiplying the existing one's in order to better estimate the model and understand the risk and uncertainty. The range of values is between the minimum and the maximum value of the variable to be multiplied, Research and development expenditure (% of GDP) and piracy rates as it is indicated, according to Monte Carlo theory.

The equation that is used to multiply the values between minimum and maximum value of the two variables is the RANDBETWEEN(''Here bottom value'', ''Here top value''). TABLE 2 depicts the result values after the Monte Carlo simulation technique use.

Table 2. Values multiplies with Monte Carlo RANDBETWEEN("Bottom value", "Top value") technique.



Econometric model specification and analysis steps

The econometric model of the variables explained is the following:

PIRACY_RATES=C(1)+C(2)8GDP_PER_CAPITAL_CURRENT+C(3)*RESEARCH_AND_DEVELOPMENT+C(4)*TRADEMARK_APPLICATIONS_+C(5)*YEARS_OF_SCHOOLING, according to the theoretical background.

Panel data econometric analysis is used and that explains the chronological perspective of the three nations as shown in TABLES 1 and 2. The first step that is carried out for the empirical econometric analysis is to run a simple panel fixed effects regression with the variables selected using the famous Least squares method. The second step examines the results and tests the robustness of these results to potential endogeneity.

III. EMPIRICAL ANALYSIS OF SIMPLE PANEL FIXED EFFECTS LEAST SQUARES REGRESSION

Dependent Variable: PIRACY_RATES
Method: Panel Least Squares
Date: 05/13/16 Time: 16:13
Sample: 1994 2010
Periods included: 17
Cross-sections included: 3
Total panel (balanced) observations: 51
PIRACY_RATES=C(1)+C(2)*GDP_PER_CAPITAL__CURRENT+C(3)*RESEARCH_AND_DEVELOPMENT+C(4)*TRADEMARK_APPLICATIONS__+C(5)*YEARS_OF_SCHOOLING

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	84.30559	12.78404	6.594599	0.0000
C(2)	-0.000583	0.000268	-2.172696	0.0350
C(3)	-13.36137	3.957176	-3.376491	0.0015
C(4)	9.20E-06	2.00E-05	0.461358	0.6467
C(5)	-0.617765	1.369085	-0.451225	0.6539

R-squared	0.562268	Mean dependent var	43.43137
Adjusted R-squared	0.524205	S.D. dependent var	17.89106
S.E. of regression	12.34089	Akaike info criterion	7.956607
Sum squared resid	7005.683	Schwarz criterion	8.146001
Log likelihood	-197.8935	Hannan-Quinn criter.	8.028980
Durbin-Watson stat	1.450809		

Fig. 1. Panel data analysis using Least squares estimation method.

Fig. 1, depicts the first step of the analysis and its results. R-squared is 0.56 above 0.50, which means that our regression analysis and its results reflect reality according to the economic theory.

Let's check Coefficient numbers. C(1) is the constant value. All the other values except C(4), are with negative signed which means a negative relation exist between GDP per capital current, R&D, and education in years of schooling and piracy rates whereas Trademark applications C(4) sign affects positively piracy rates but with very little extend.

In Prob. section and the probabilities for each variable coefficient, we can see that only C(2) and C(3) of the Coefficient results have Probabilities less than a=0.5. This reflects econometric theory where numbers with probabilities less than a=0.5 have statistical significance and impact in the dependent variable. In other words GDP per capital current and Research and Development are the two variables that affect piracy rates. Which of the two affect piracy rates the most? R&D factor, because of less prob. number, thus bigger statistical significance and with bigger coefficient number, 13.36137. In Fig. 2, we can see the substituted Coefficients attached to the econometric model equation.

Substituted Coefficients:
==========
PIRACY_RATES=84.3055878017-0.000582949259209
*GDP_PER_CAPITAL__CURRENT-13.361368485
*RESEARCH_AND_DEVELOPMENT+9.2048892282e-06
*TRADEMARK_APPLICATIONS__-0.61776537724*YEARS_OF_SCHOOLING

Fig. 2. Substituted Coefficients.

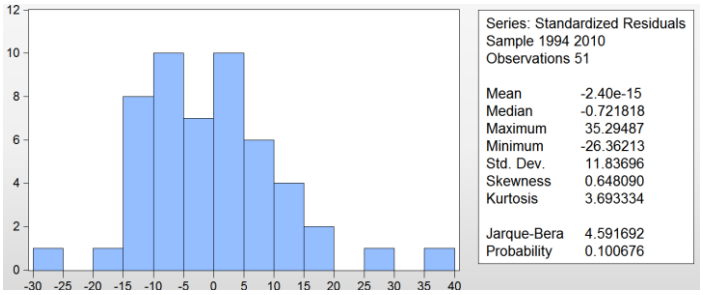
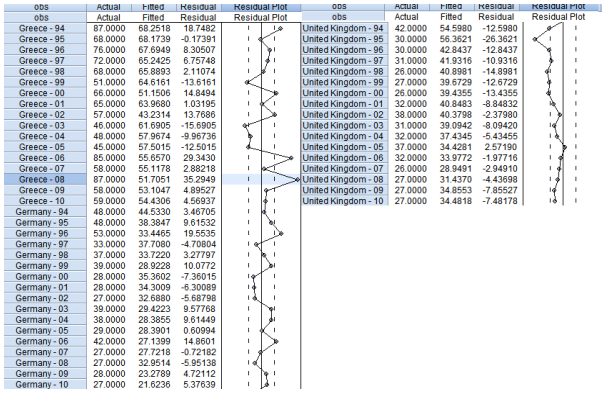


Fig. 3. Standardized Residuals

Fig. 3, shows us the standardized residuals, of the model. We can see that the model's graphical allocation almost follows the standardized normal distribution, a very good sign, with maximum value 35.29487 and minimum value -26.36213. We can accept that the residuals are close to a normal distribution because the standard deviation, seen as Std. Dev is slight and Jarque-Bera statistic in 4.591692 with P-Value seen as Probability 0.100676 non zero, thus it is indicated that the null hypothesis that the distribution follows the normal distribution is accepted. As regarding Skewness and Kurtosis, both of them are in normal levels with Skewness in 0.648090 and Kurtosis in 3.693334. The second explains the slight Kurtosis of the model to the left.



obs	Actual	Fitted	Residual	Residual Plot
Greece - 94	87.0000	68.2518	18.7482	
Greece - 95	68.0000	68.1739	-0.17391	
Greece - 96	76.0000	67.6949	8.30507	
Greece - 97	72.0000	65.2425	6.75748	
Greece - 98	68.0000	65.8893	2.11074	
Greece - 99	51.0000	64.6161	-13.6161	
Greece - 00	66.0000	51.1506	14.8494	
Greece - 01	65.0000	63.9680	1.03195	
Greece - 02	57.0000	43.2314	13.7686	
Greece - 03	46.0000	61.6905	-15.6905	
Greece - 04	48.0000	57.9674	-9.96736	
Greece - 05	45.0000	57.5015	-12.5015	
Greece - 06	85.0000	55.6570	29.3430	
Greece - 07	58.0000	55.1178	2.88218	
Greece - 08	87.0000	51.7051	35.2949	
Greece - 09	58.0000	53.1047	4.89527	
Greece - 10	59.0000	54.4306	4.56937	
Germany - 94	48.0000	44.5330	3.46705	
Germany - 95	48.0000	38.3847	9.61532	
Germany - 96	53.0000	33.4465	19.5535	
Germany - 97	33.0000	37.7080	-4.70804	
Germany - 98	37.0000	33.7220	3.27797	
Germany - 99	39.0000	28.9228	10.0772	
Germany - 00	28.0000	35.3602	-7.36015	
Germany - 01	28.0000	34.3009	-6.30089	
Germany - 02	27.0000	32.6880	-5.68798	
Germany - 03	39.0000	29.4223	9.57768	
Germany - 04	38.0000	28.3855	9.61449	
Germany - 05	29.0000	28.3901	0.60994	
Germany - 06	42.0000	27.1399	14.8601	
Germany - 07	27.0000	27.7218	-0.72182	
Germany - 08	27.0000	32.9514	-5.95138	
Germany - 09	28.0000	23.2789	4.72112	
Germany - 10	27.0000	21.6236	5.37639	

obs	Actual	Fitted	Residual	Residual Plot
United Kingdom - 94	42.0000	54.5980	-12.5980	
United Kingdom - 95	30.0000	56.3621	-26.3621	
United Kingdom - 96	30.0000	42.8437	-12.8437	
United Kingdom - 97	31.0000	41.9316	-10.9316	
United Kingdom - 98	26.0000	40.8981	-14.8981	
United Kingdom - 99	27.0000	39.6729	-12.6729	
United Kingdom - 00	26.0000	39.4355	-13.4355	
United Kingdom - 01	32.0000	40.8483	-8.84832	
United Kingdom - 02	38.0000	40.3798	-2.37980	
United Kingdom - 03	31.0000	39.0942	-8.09420	
United Kingdom - 04	32.0000	37.4345	-5.43455	
United Kingdom - 05	37.0000	34.4281	2.57190	
United Kingdom - 06	32.0000	33.9772	-1.97716	
United Kingdom - 07	26.0000	28.9491	-2.94910	
United Kingdom - 08	27.0000	31.4370	-4.43698	
United Kingdom - 09	27.0000	34.8553	-7.85527	
United Kingdom - 10	27.0000	34.4818	-7.48178	

Fig. 4. Actual, Fitted, Residual Plot.

In Fig. 4 and the Actual, Fitted, Residual Plot, we want the residuals of the econometric model to be as less as it could be, with Fitted to close as near as actual numbers as possible. In other words the residual line needs to be as close as possible to the middle and inside the dashed lines. What is emphasized is that that biggest residual range belongs in Greece in year 2008. That is a first sign that Greece were affected the most as regarding piracy rates. From those three countries England were affected the least as regarding piracy rates with Germany being affected in natural level.

	1994	1995	1996	1997	1998
piracy rates	87.00000	68.00000	76.00000	72.00000	68.00000
GDP per capital (current US$)	11,091.3	12,959.3	13,749.1	13,427.8	13,472.1
Research and development expenditure (% of GDP)	0.36	0.27	0.28	0.43	0.40
Trademark applications, total	5,171.00	5,596.00	4,340.00	4,954.00	6,539.00
Years of schooling	7.9	8.2	8.0	9.0	8.5
	1999	2000	2001	2002	2003
piracy rates	51.00000	66.00000	65.00000	57.00000	46.00000
GDP per capital (current US$)	13,245.2	12,076.4	12,538.2	14,110.3	18,477.6
Research and development expenditure (% of GDP)	0.57	1.56	0.56	2.12	0.55
Trademark applications, total	7,200.00	9,424.00	8,563.00	8,835.00	4,784.00
Years of schooling	7.2	8.6	9.1	7.4	7.4
	2004	2005	2006	2007	2008
piracy rates	48.00000	45.00000	85.00000	58.00000	87.00000
GDP per capital (current US$)	21,955.1	22,551.7	24,801.2	28,827.3	31,997.3
Research and development expenditure (% of GDP)	0.53	0.58	0.56	0.58	0.66
Trademark applications, total	8,009.00	12,732.0	11,279.0	20,665.0	19,499.0
Years of schooling	10.6	9.8	11.0	7.9	8.6
	2009	2010			
piracy rates	58.00000	59.00000			
GDP per capital (current US$)	29,711.0	26,919.4			
Research and development expenditure (% of GDP)	0.63	0.60			
Trademark applications, total	11,847.0	15,734.0			
Years of schooling	9.1	10.3			

Fig. 5. Piracy rates value and chronological advancement in numbers.

In Fig. 5 we can see piracy rates value and chronological advancement in numbers. What we see and emphasize is that in the beginning of 2008 global economic crisis, where GDP and R&D were less, piracy rates climbed the top.

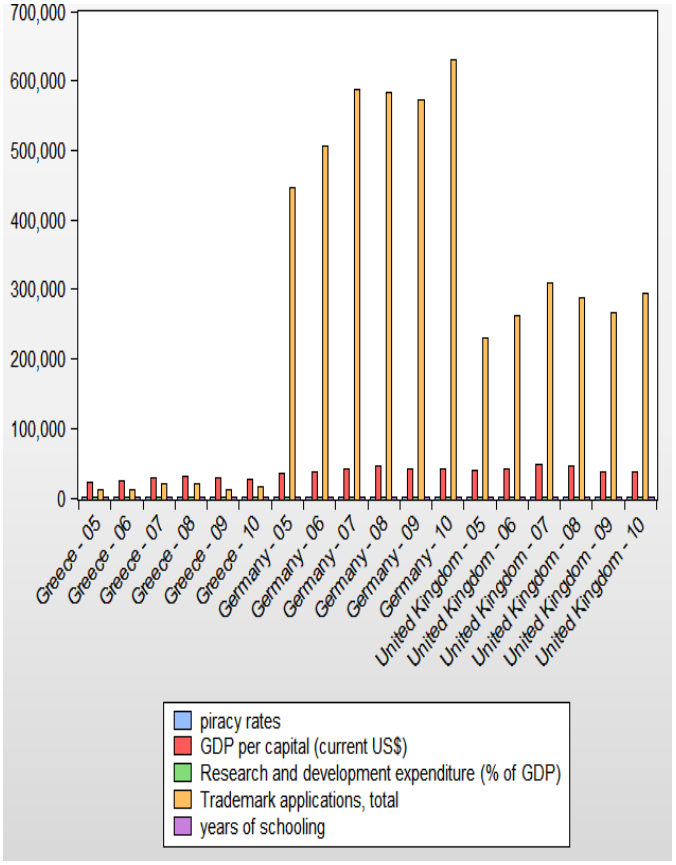


Fig. 6. Bar chart as regarding the three nations.

In Fig. 6 and the bar chart as regarding the three nations in the years 2005 to 2010. What is emphasized in that kind of chart is the different levels of Trademark applications and GDP per capital factors among the three countries.

As regarding the Trademark applications factors among Germany, England and Greece, we see that this factor dominates in Germany. England follows and Greece comes last. This means that Germany identifies products or in a much bigger scale than the other two countries. As regarding the second factor and the GDP per capital we can see that England holds the reigns of the most stable economy, comparing with Greece which comes last and Germany holding the second comparing position.

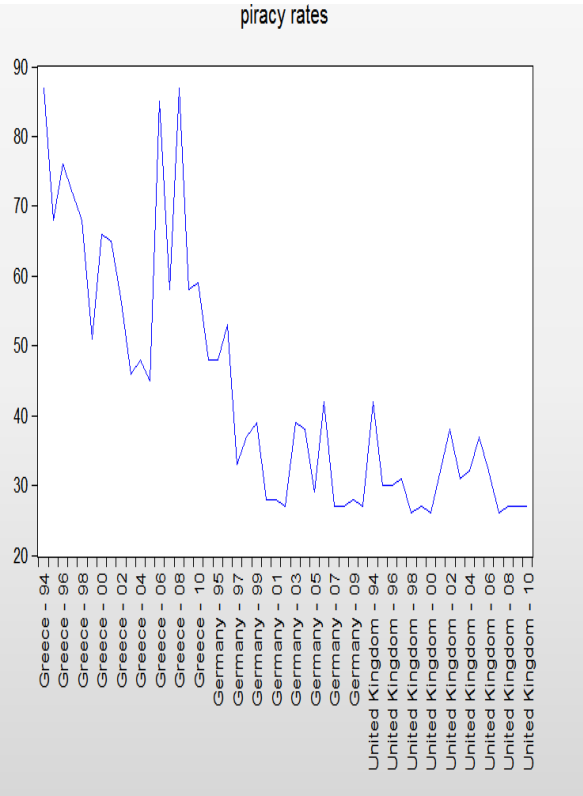


Fig. 7. Piracy rates and chronological perspective (time chart diagram).

In Fig. 7, we can see piracy rates in chronological order in time chart diagram from 1994 to 2010. As we can distinguish, Greece has the higher levels in piracy, followed by Germany which comes second and the United Kingdom which comes last in piracy rates. Let's focus in the 2008 economic crisis and the year 2008. We can see the Greece's piracy levels have a peek in this year. Germany has its peek almost in 2008. The same way is for England. The 2008 economic crisis affected Greece the most as regarding piracy rates. Let's have another focus. After the start of the 2008 until 2010, economic crisis piracy levels for the three countries began to lower. For England those rates lowered faster, Germany comes second in line and Greece comes last. Let's emphasize that Greece's piracy levels descended in very little levels. That is explained with the relation of GDP per capital and piracy levels and with R&D extend as explained before. England has the most stable economic level as regarding the 2008 economic crisis and high R&D extend. After the 2008 breakdown, England's GDP begun to rise fast again, following with piracy levels to descend. After the 2008 crisis, Germany's GDP begun to raise again with lower levels but with high extend as well, following with piracy levels to descend quickly too. For the case of Greece though this rule doesn't apply. We can see that Greece's piracy rates peek at 2009 too. It is known that Greece suffered from severe economic crisis ever since 2008 and that is why this anomaly relation exists. Let's emphasize that research and development in Greece is low. Greece's economy started to fall from 2008 to 2010 and then on. We can assume an anomaly in piracy rates line from 2010 and then on. Furthermore, with the passing of years the technology progresses, thus countries have further means of fighting piracy (Irena Vida et al., 2012). Moreover, the more technologically progressed a country is, the better the antipiracy techniques (Norazah Mohd Suki et al., 2011).

IV. CONCLUSIONS

In this paper, the Relationship between Copyright Software Protection and Piracy where tested as regarding the 2008 economic crisis, centering in three countries of ultimate importance: Greece which was severed the most from this economic crisis, Germany and England, which were least severed comparing those three. Evidence from Europe and data with extend from 1994 to 2010, were searched and collected in order to test this relation. Through empirical and statistical panel analysis, two main factors were found that affect piracy rates in the time of the 2008 crisis the most. One the GDP per capital and the other the research and development factor with the second having more statistical significance than the first, thus affecting piracy rates the most. Among the three countries, Greece's levels are the lowest as regarding this GDP and R&D factor. Greece should focus in research in development along to Fig.ht piracy rates. England has the most stable economy and Germany the second stable in the middle of the 2008 crisis terms. Another conclusion of the paper is the negative relation between piracy rates, GDP per capital and R&D factor. It is emphasized, that in the year 2008, piracy levels were higher. Last but not least, during the 2008 recession Greece's piracy levels were higher comparing with the other two nations with United kingdom having the best economic stability. Further research could focus in this empirical research, adding more important variables and with greater yearly data extend testing their robustness as regarding piracy level.

REFERENCES

[1] Andrés, A. R. (2006). The relationship between copyright software protection and piracy: Evidence from Europe. European Journal of Law and Economics,21(1), 29-51.

[2] Assuli, O. B., Leshno, M.(2013) "Implementing a Monte-Carlo simulation on admission decisions", Journal of Enterprise Information Management, Vol. 26 Iss: 1/2, pp.154 – 164

[3] Austin, J. H. (1998). Zen and the brain: Toward an understanding of meditation and consciousness. Cambridge, MA: MIT Press.

[4] Bhattacharjee, S., Gopal, R. D., & Sanders, G. L. (2003). Digital music and online sharing: Software piracy 2.0?. Communications of the ACM, 46(7), 107-111

[5] BSA global software piracy study, (2011). SHADOW MARKET. Retrieved from http://globalstudy.bsa.org/2011/downloads/study_pdf/2011_BSA_Piracy_Study-Standard.pdf

[6] Calarco, M., & Atterton, P. (2009). Animal philosophy: Essential readings in continental thought. New York, NY: Continuum.

[7] Chen, J. Q. (2003). Intelligence: Multiple intelligences. In J. Guthrie (Ed.), Encyclopedia of education (pp. 1198-1201). New York, NY: Macmillan.

[8] Clancy, T., Stiner, C., & Koltz, T. (2002). Shadow warriors: Inside the special forces. New York, NY: Putnam

[9] Dr. R.Narayanasamy, Ms. R.Thirugnanasoundari "Risk and Return Analysis of Equity Shares with Special Reference it Companies (NSE) Stock Index", SSRG International Journal of Economics and Management Studies (SSRG - IJEMS), V3(2),1-4 March to April 2016. ISSN:2393 - 9125. www.internationaljournalssrg.org/IJEMS/index.html. Published by : Seventh Sense Research Group

[10] Dr. V. Selvarani, Prof. A. Zeenath Amman "A Study on Consumer Behaviour of Instant Food Products with Special Reference to Tiruchirappalli City", SSRG International Journal of Economics and Management Studies (SSRG - IJEMS), V3(1),1-7 January to February 2016. ISSN:2393 - 9125. www.internationaljournalssrg.org/IJEMS/index.html. Published by : Seventh Sense Research Group.

[11] Ginarte, J. C., & Park, W. G. (1997). Determinants of patent rights: A cross-national study. Research policy, 26(3), 283-301.

[12] Vida, I., Koklič, M. K., Kinney, M. K., Penz, E. (2012) "Predicting consumer digital piracy behavior: The role of rationalization and perceived consequences", Journal of Research in Interactive Marketing, Vol. 6 Iss: 4, pp.298 - 313

[13] Louveaux, S., Poulett, Y., Salaün, A.(1999) "User protection in cyberspace: some recommendations", info, Vol. 1 Iss: 6, pp.521 – 537

[14] Mahesh, G., Mittal, R.(2009) "Digital content creation and copyright issues", The Electronic Library, Vol. 27 Iss: 4, pp.676 – 683

[15] Marron, D. B., & Steel, D. G. (2000). Which countries protect intellectual property? The case of software piracy. Economic inquiry, 38(2), 159-174.

[16] Mohan, S. R., Singh, M. P., & Joshi, M. P. (2012). On the use of empirical equation in extracting disorder parameters in inhomogeneous organic thin films.The Journal of Physical Chemistry C, 116(3), 2555-2562.

[17] Morgan, M. J., Ruskell, D. J.(1987) "Software Piracy — The Problems", Industrial Management & Data Systems, Vol. 87 Iss: 3/4, pp.8 – 12

[18] Suki, N. M., Ramayah, T., Suki, N. M. (2011) "Understanding consumer intention with respect to purchase and use of pirated software", Information Management & Computer Security, Vol. 19 Iss: 3, pp.195 - 210

[19] Ostergard, R. (2000). The measurement of intellectual property rights protection. Journal of International Business Studies, 31(2), 349-360.

[20] Pederzoli , D., Volker G. Kuppelwieser, V. G.(2015) "Retail companies' internationalization behavior and the 2008 crisis", International Journal of Retail & Distribution Management, Vol. 43 Iss: 9, pp.870 – 894

[21] PLIKAS, J. H.(2015). Social Media and Small Businesses: A Combinational Strategic Approach under the Current Economic Crisis. IOSR Journal of Business and Management (IOSR-JBM), Volume 17, Issue 12 .Ver. I (Dec. 2015), PP 105-115

[22] Poonam, Archna Chaudhry "Financial Inclusion in India: A State Level Study", SSRG International Journal of Economics and Management Studies (SSRG - IJEMS), V3(3),1-4 May to June 2016. ISSN:2393 - 9125. www.internationaljournalssrg.org/IJEMS/index.html. Published by : Seventh Sense Research Group

[23] Prakash, A., Jha, S. K., Mohanty, R. P.(2012) "Scenario planning for service quality: a Monte Carlo simulation study", Journal of Strategy and Management, Vol. 5 Iss: 3, pp.331 – 352

[24] Prof. (Dr.) Sameer Sinha, Prof. Sunil Mishra "A Study on Consumers Perception towards Mobile Handset", SSRG International Journal of Economics and Management Studies (SSRG - IJEMS), V3(3),1-4 May to June 2016. ISSN:2393 - 9125. www.internationaljournalssrg.org/IJEMS/index.html. Published by : Seventh Sense Research Group.

[25] Rojo-Álvarez, J. L., Martínez-Ramón, M., Prado-Cumplido, D., Artés-Rodríguez, A., & Fig.ueiras-Vidal, A. R. (2004). Support vector method for robust ARMA system identification. Signal Processing, IEEE Transactions on,52(1), 155-164.

[26] Shadlen, K. C., Schrank, A., & Kurtz, M. J. (2005). The political economy of intellectual property protection: the case of software. International Studies Quarterly, 49(1), 45-71.

[27] Shapiro, C., & Varian, H. R. (2013). Information rules: a strategic guide to the network economy. Harvard Business Press.

[28] UNESCO - United Nations Educational, Scientific and Cultural Organization, (2016). Retrieved from http://www.uis.unesco.org/Pages/default.aspx

[29] World Bank, (2016). Retrieved from http://data.worldbank.org/indicator

[30] WIPO - World Intellectual Property Organization, (2016). Retrieved from http://www.wipo.int/portal/en/index.html

[31] WTO–World Trade Organization, (2016). Retrieved from https://www.wto.org/english/res_e/res_e.htm