

Emerging Markets Queries in Finance and Business

Econometric modeling of influence on turnover concerning indicators of information society across the European Union

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Abstract

The impact of information society – as a factor of organizational change (Davenport, 2003) on performance of firms is increasingly approached and measured – by means of statistical indicators – in the specialty literature, developing in a fast pace. Across the European Union, indicators that measure information society emphasize many disparities and especially characteristics of this sector, aspects that will be detailed further, in this paper in order to justify the approach of this study. However, the goal of this research is to analyze and suggest, by means of the statistic-econometric methodology, a model through which we emphasize – for member countries of the European Union – as it influences (and practically how „contributes” to them) the formation of turnover on total business sectors, indicators of information society (enterprises with fixed broadband access ,enterprises using the Internet for interaction with public authorities, enterprises having received orders online, enterprises having purchased online)simultaneously with macroeconomic indicators, respectively: average number of employees, EU - 15 country member or EU -27 country member.

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1. Introduction and literature review

The impact of information society – as a factor of organizational change (Dovenport, 2003) on performance of firms is increasingly approached and measured – by means of statistical indicators – in the specialty literature, developing in a fast pace and influencing all business sectors, from industrial, services, either touristic, medical, educational or public administration.

Across the European Union, indicators that measure information society emphasize many disparities and especially, the features of this sector, aspects that will be detailed further in this paragraph in order to justify the approach of this study. If the ITC technologies are mainly used by the major organizations to a large extent, the use of this technology by the firms' type small and medium sized enterprises is in the early stage according to Palvia (1996). Practically, in a global society, in order to be successful, *organizations need high quality information and to provide always added value better than competitors when it is about quality, price and services* (Pollard, 2006). Hit and Brynjolfsson (1996) sustained that while TIC helps increase productivity and excess consumption, they cannot necessarily increase the firm's profitability. Nevertheless a direct and cause relation has been found between performances of organizations and IT investments (Grandon and Pearson 2004).

Practically and theoretically there was a positive relation between information technologies and performance. Many researchers reason that implementation of information technologies provides a higher productivity, a better satisfaction of customers, more value added.

Following the studies carried-out by many researchers, it was emphasized that there is a positive relation between a firm's size and efficiency of using IT within organizations. Lind et al (1989) concluded that the size and structure of an organization have a significant impact on adopting computer. EinDor&Segr (1978) have correlated the size and age of organizations with the use of technological information. The bigger the organization, it will surely extend the use of IT. Another reason for which the firm's size matters is that the firm's resources including financial and human capital are used according to the firm's size (Hong, 1999). Thong and Yap (1995) have emphasized that a firm's size is almost the most discriminatory factor between users that adopt and does not adopt IT within small firms in Singapore. Acar et al (2005), in the study of using IT by firms in Turkey has shown that as the firms becomes bigger, the bigger is impact on performances achieved following the use of IT. Rahim et al (1998) in the study carried-out on firms in Brunei has noticed that there is a positive relation between type of business and use of IT methods.

In most organizations, employees are considered the most significant contribution together with the manager role, the survival of an organization or its success seriously depends on them. (Melville et al., 2004, Nguyen, 2009). Sarosaand Zowghi (2003) and Ghobakhloo et al (2010) have noticed that IT users will have a positive impact concerning IT adoption within organizations. Within the research in the field we remind those of Rateb J. S. Weis wherein he noticed that attitude of managers is important in IT adoption within organizations as well as approach of some strategies to change attitude of employees, and importance of rising investments in training employees in information technologies, having a role in rising labor productivity. Managers together with employees are IT users and have a drastic influence regarding their successful implementation. Therefore, development of these resources could be necessary for the success of organization (Egbu et al., 2005, Ghobakhloo et al., 2011 b).

According to previous studies a positive relation has been found between IT adoption and government support (Tan et al., 2009, Yap et al 1994). Due to the size of firms and their lack of resources, the firms depend more on other companies or external resources or support (Sarosaand Zowghi, 2003). Government initiatives and policies can affect directly and indirectly IT development in infrastructure and can trigger technology proliferation faster (Ghobakhloo et al 2011 a).

However, the aim of this research is to analyze and suggest, by means of the statistic -econometric

methodology, a model through which we emphasize– for the EU member countries – how influences (and practically how these „contribute”) to formation of turnover on total business sectors, *indicators of information society* simultaneously with macroeconomic indicators and with status of the EU – 15 member countries or EU – 27 member countries.

2. Information society in European Union

Therefore it can be noticed in figure 1 that for the *enterprises with fixed broadband access* indicator, Romania is – in 2003 -2012 – ranked on the last position, at a significant difference from Bulgaria, ranked on the penultimate position. The first in the top is Spain, followed by Finland, Malta, Sweden, Luxembourg, France, Slovenia etc., according to the EUROSTAT data for this period. Across the OECD countries, Spain is in exchange before France, Germany, Japan and the United States as regards the number of subscriptions to fixed-line internet network and Finland – the second country in Europe with fixed broadband access, compared to the other OECD member countries occupies the last top positions, and so are other European countries such as: Ireland, Slovakia, Slovenia, Estonia, Luxembourg.

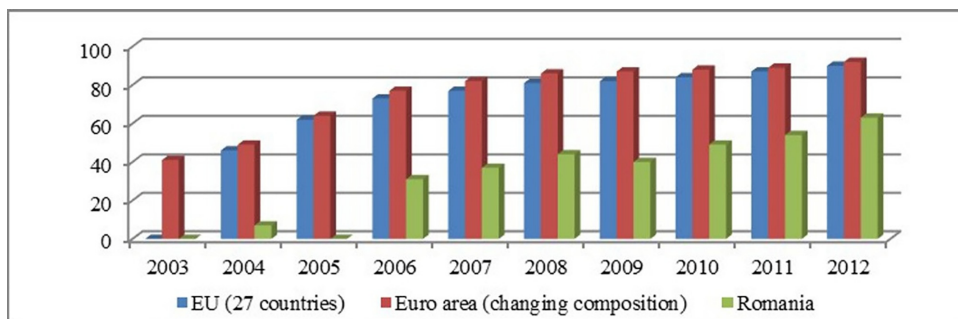
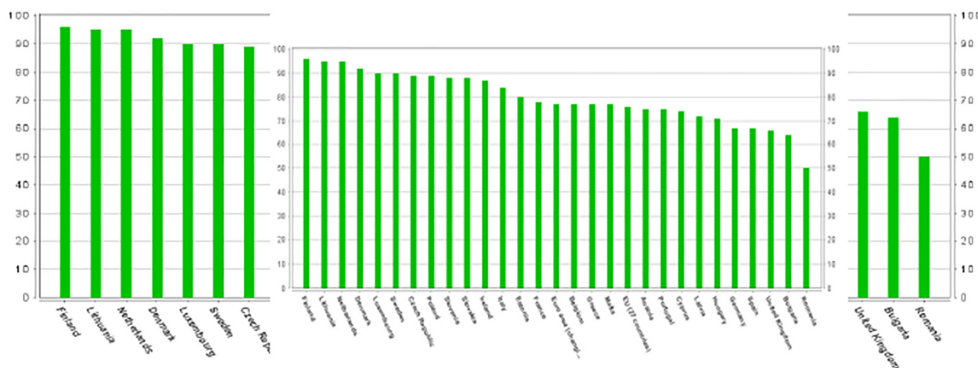


Fig. 1. Enterprises with fixed broadband access for EU 27 countries, Euro area and Romania

Of European countries that are „ranked” best at the *enterprises using the internet for interaction with public authorities* indicator, we mention Finland with 89% of enterprises, Lithuania, Holland, Slovakia, Denmark, the Czech Republic, at the other „end” of the top being Romania (on the last position) that is led by: Bulgaria, United Kingdom, Spain, Germany (figure 2), in 2010.



Across the European Union (figure 3) economic crisis makes its presence felt on the online trade market i.e. beginning with the year 2008 it registers a significant downward trend by 5% from 16% of total firms that received online orders to 11%, starting with the year 2010, experienced a recovery of this market. A feature is noticed in Romania, namely the percentage slackness of firms that received online orders is 3% during the economic recession in 2007 – 2009, and in 2010, a spectacular increase, a doubling of this percentage from 3% to 6%, respectively followed by a decline to 4% in 2011. In the top of European countries with a high percentage of enterprise that have received online orders (figure 3) in 2012 is Sweden, followed by Denmark, the Czech Republic, Belgium, Ireland, namely countries both from Western and Northern Europe as well as former communist countries. The top 'bottom' is again occupied by Romania and this time is followed by Bulgaria and Italy and before it are: Latvia, Greece (aspect that is explained due to the current economic situation of these countries), Cyprus, Poland, and Hungary etc.

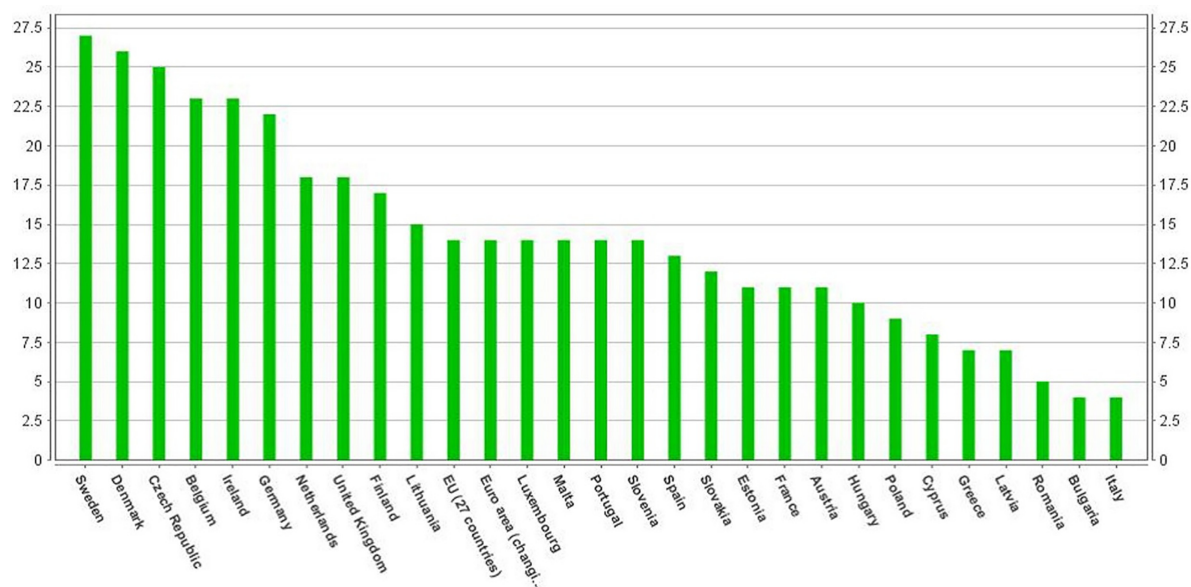


Fig.3. - Enterprises having received orders online (at least 1%) in 2012

Therefore it is noticed that, for the *enterprises having purchased online* indicator (figure 4), the first positions are occupied by the following countries: Norway and Ireland, followed at a significant gap by Austria, Sweden and Finland. The last positions are occupied this time by Greece and Bulgaria, Romania being on the antepenultimate position, Italy, Poland and Portugal being in front of it.

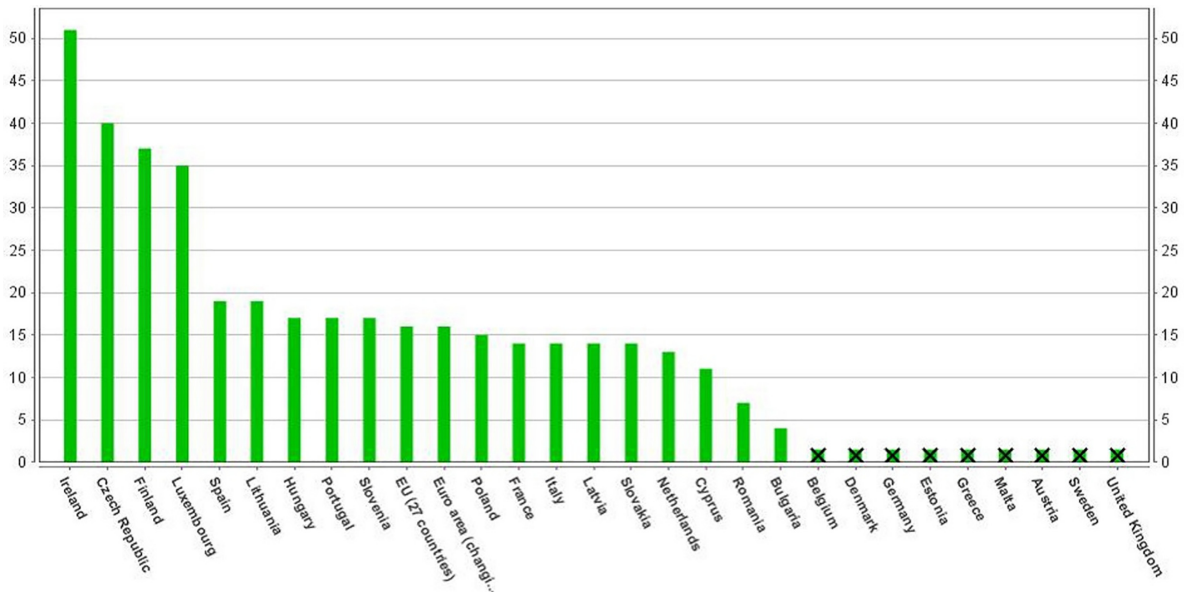


Fig.4. - Enterprises having purchased online (at least 1%)

3. Methodology

Data used in this study are statistical data according to EUROSTAT for the 27 EU member countries and the average for these indicators, respectively:

- enterprises with fixed broadband access - % of enterprises with at least 10 persons employed in the given NACE sectors for 2005 – 2012 period
- enterprises using the Internet for interaction with public authorities - % of enterprises with at least 10 persons employed in the given NACE sectors for 2005 – 2010 period
- enterprises having received orders online (at least 1%) - % of enterprises with at least 10 persons employed in the given NACE sectors, by size class
- enterprises having purchased online (at least 1%) - % of enterprises with at least 10 persons employed in the given NACE sectors, by size class
- average number of employees– all sector for the period 2007 - 2012
- average turnover – all sector for the period 2007 – 2012, in million euro

In order to establish a model up to the entire surveyed population, up to the 27 EU member countries respectively, we have applied the linear multiple regression method that has the following equation:

$$Y = a + b_1x_1 + b_2x_2 + \dots + b_mx_m(I)$$

Where $\begin{cases} a = \text{coefficient expressing influence of factors not included in model, considered with steady action} \\ b_i = \text{multiple regression coefficients with which they influence every X factor feature on Y result feature} \end{cases}$

4. Main findings

Within the regression model, the *dependent variable* is provided by *average of turnover*, the other variables representing *independent variables*. The data base contains data of the EU 27 member countries in 2007 – 2012. Data have been processed by means of the SPSS 17.0 software.

Table 1 illustrates the results related to descriptive statistics of variables in the study, the method used being the *Enter* method with option *in the case of missing data we used the LISTWISE method* (for the advantage it provides, simultaneous consideration of independent variables, respectively, and because there is a high number of statistical comments) according to results supplied by the SPSS software and shown in table

Table 1- Descriptive Statistics

	Mean	Std. Deviation	N
average turnover	1.2045	.89185	102
EU 27 country or EU – 15 country	.58	.496	102
enterprises with fixed broadband access	78.50	12.527	102
enterprises using the internet for interaction with public authorities	74.76	13.535	102
enterprises having received orders online	12.91	7.666	102
enterprises having purchased online	23.71	14.369	102
average number of employees	7.0527	2.93554	102

Table 2 - Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	average number of employees, enterprises using the internet for interaction with public authorities, EU 27 country or EU – 15 country, enterprises having received orders online, enterprises with fixed broadband access, enterprises having purchased online	.	Enter

a. All requested variables entered.

The value of R^2 statistic (table 3) shows us goodness of fit, the value of 0.740 shows us that 77.4 % of total variance of the dependent variable *average turnover* is explained by independent variables, respectively *average number of employees, enterprises using the Internet for interaction with public authorities, country being in EU 15 or EU 27, enterprises having received orders online, enterprises with fixed broadband access, enterprises having purchased online*.

Table 3 – Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.860 ^a	0.740	0.723	0.468	0.740	45.137	6	95	0.000

a. Predictors: (Constant), average number of employees, enterprises using the internet for interaction with public authorities, EU 15 country or EU 27 country, enterprises having received orders online, enterprises with fixed broadband access, enterprises having purchased online

b. Dependent Variable: average turnover

Table 4 shows the ANOVA and F test results indicating that the model is significant statistically as $p <$

0.05.

Table 4 – ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	59.472	6	9.912	45.137	0.000 ^a
	Residual	20.861	95	0.219		
	Total	80.330	101			

a. Predictors: (Constant), average employees, enterprises using the internet for interaction with public authorities, WU 15 country or EU 27 country, enterprises having received orders online, enterprises with fixed broadband access, enterprises having purchased online

b. Dependent Variable: average turnover

Table 5 illustrates the regression coefficients calculated (including the standardized Beta coefficient), as well as the results of their significance tests (if they are significantly different than zero or not).

Table 5 - Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	-1.689	0.381		-4.431	0.000			
	EU 27 country or EU 15 country	0.633	0.127	0.352	4.994	0.000	0.545	0.456	0.261
	enterprises with fixed broadband access	0.005	0.005	0.064	0.899	0.371	0.347	0.092	0.047
	enterprises using the internet for interaction with public authorities	0.009	0.004	0.137	2.220	0.029	0.335	0.222	0.116
	enterprises having received orders online	-0.023	0.013	-0.199	-1.776	0.079	0.479	-0.17	-0.09
	enterprises having purchased online	0.026	0.008	0.421	3.437	0.001	0.617	0.333	0.180
	average number of employees	0.167	0.017	0.549	9.926	0.000	0.576	0.714	0.519

a. Dependent Variable: average turnover

It is therefore noticed that, independent variables having a significant effect (at a significance level of 95 %) on turnover of a European Union member country are: status as developed country (for EU15 countries) or not (EU27countries), enterprises using the Internet for interaction with public authorities, enterprises having purchased online and the average number of employees.

The positive coefficient of the dichotomy independent variable EU – 27or EU - 15 (EU 27-0 value, EU 15-1 value) means that at the same level of the other independent variables a company being in the developed UE15 country has a bigger turnover. This variable could be interpreted as a factor including all the competitiveness advantages of a developed economy. The possibility of enterprises using the internet for interaction with public authorities' cuts down the time and effort spent on administrative issues and increases performance. This is proved by the positive coefficient of this variable in the model. It is an interesting result that online selling has no significant effect on turnover at 95% level but the other internet usage indicator has.

This result could be in concordance with the statement that online B2B segment is more important for the companies than the B2C segment. The independent variable of the average number of employees represents the company size. Its positive effect indicates that bigger companies can apply more efficient the internet in the business processes. The equation of the multi-linear regression model is the following:

Average turnover = - 1689 + 0.633EU 27 or EU 15 + 0.009enterprises using the internet for interaction with public authorities + 0.026enterprises having purchased online + 0.147 average number of employment

The aforementioned model reveals us the following aspects:

- Companies from the EU15 have on average a turnover higher with Euro 633,000, than in the EU 27.
- At an increase with a percentage of the number of firms using internet in relation with public authorities' turnover increases on average with Euro 9,000.
- At an increase with a percentage of number of firms using internet for shopping turnover increases on average with Euro 26,000.
- At an increase with a percentage of average number of employees, turnover increases on average with Euro 147,000.

The rank of the effects of predictive variables based on the standardized coefficients (Beta) in descending order: *average number of employees* (0.549), *enterprises having purchased online* (0.421), *developed country (EU15) or not (EU27)* (0.352), *enterprises using the Internet for interaction with public authorities* (0.137).

5. Conclusions and discussions

In conclusion this model proves the results of Palvia (1996) according to which the ITC technologies are used intensively by the large organizations, aspect proved by the fact that, the order of independent variables in making the model reveals *average number of employees* in the first position, with direct effects on creation of added value according to Pollard (2006). The significant contribution to model formation as regards the *status of developed country (EU15) or not (EU27)* and online shopping by organizations in the EU member countries, hence the degree of development and investments in the ITC technologies according to research carried-out by London and Pearson (2004) that emphasizes the direct and causal relation between organization performances (measured through turnover) and investments in ITC. The model also proves the research carried-out worldwide regarding these aspects, for European Union, respectively the research of Thong and Yap for Singapore in 1995, Acar for Turkey, in 2005 and Rahim for Brunei in 1998 and proved that, the larger the firm is, the higher is impact on performances achieved as a result of using ITC, positively. Another aspect proved by this model is related to the fact that there is a positive relation between IT adoption and sustainment of governments in the EU member countries, aspect researched by Tan et al. (2009) and Yap (1994).

The results of this study should be interpreted and considered taking into consideration that, though statistical units comprised in the study have a common „denominator”, are member countries of the European Union respectively, we should take into consideration the major disparities existing among them, both as regards macroeconomic indicators and those related to information society, aspects emphasized in the first part of the paper. In using the suggested model, we should also take into account that each of the 27 member countries have experienced and are in various stages of economic crisis. Considerable disparities are also those related to the different economic past of the EU member countries, the former communist countries and countries with an operational market economy respectively, developed countries and developing countries, politically unstable countries for example Romania, Greece. All these aspects can represent independent variables and thus the model suggested for this paper can be completed with qualitative variables that

commensurate these aspects, by means of the logit or probit models that enable inclusion of such variables in the regression based modeling. The model suggested through this study can be also detailed and extended according with the size of firms, type of business, management characteristics, resources that organizations have.

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