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Διαδικτυακή έναντι Παραδοσιακής Οικονομίας στην Ελλάδα, 2003-2006**

**New Economic Structure:
Internet versus Traditional Economy in Greece, 2003-2006**

Ζωή Γεωργαντά⁽¹⁾ και Κωνσταντίνος Σφακιανάκης⁽²⁾

Zoe Georganta⁽¹⁾ and Konstantinos Sfakianakis⁽²⁾

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(1) University of Macedonia - Economic and Social Sciences, Department of Applied Informatics (UMAI), zoe@uom.gr

(2) UMAI, ksfak@uom.gr

ABSTRACT

This paper investigates the structure of the Greek economy in the internet age, as well as its evolution during the period of 2003 - 2006. Economic activity is distinguished between the traditional economy and seven sectors of the new internet economy. The data used come from the databases of HELLASTAT which include 65500 business firms operating in Greece covering all industries classified under NACE and its corresponding Greek classification, STAKOD. It is found that the share of the internet economy was 7% in 2003 and 8% in 2006. It is also found that the aggregate internet economic activity has grown by more than 47% during the above period, while the traditional economy grew by less than 42%. The corresponding growth of workforce in the two economic sub-structures were 44% and 12%, respectively, so challenging the common belief that electronic economic activity increases unemployment. Among the sectors of the internet economy, the applications achieved the highest growth rate, an astonishing 1229%, whereas the number of companies in the sector have tripled during the examined period.

Keywords: New economic structure, Digital economy, Measurement of internet economy, Greece

1. Introduction

The ever increasing use of internet technology intensifies the network character of societal organization and leads to continuous colossal changes in the functioning of markets. The emergence of new ways of economic exchanges has led to new business models and practices which require the differentiation of strategic and tactical planning, as well as the formation of new governmental policies. These new developments trigger a new economic age which has not yet been recognized by the official economic statistics. Due to its novel character, the new economic reality, which came to be known as digital, internet, or new economy, cannot be analyzed on the basis of the traditional economic classifications and methods, but it demands the redefinition of national economies through a thorough statistical analysis of economic structure. This will lead us to the construction of new statistical measures and indices in order to accurately describe the digital economy.

We could generally define digital economy as the value created by all economic agents through or due to internet. The question is how to measure this value so that we could describe the new economic structure. The first step would be careful observation and this is done by this paper. Thus, this work is the result, first, of rigorous examination of the new economic framework unfolding in Greece since the

beginning of the new millennium, and, second, of efforts to contribute to the establishment of accurate terminology and definitions of the digital economy in Greece. Main sources of this paper are Georganta (2004, 2006) and Sfakianakis (2009). The purpose of this article is to first identify the contributors of internet economic value and get from them a satisfactory measure of that value for two time periods at least three years apart.

On the basis of such information, this paper aims at classifying the Greek economic activity, first, into the two main aggregate sectoral divisions, namely the traditional and the digital economy, and second, into the seven economic categories implicitly identified in the work of Sfakianakis (2009). The paper will also examine the growth of these sectors during 2003 - 2006. To achieve its purpose, the paper uses the databases of HELLASTAT. The population of 65,500 units from these databases is “cleaned” and balanced, resulting in a “populational” sample of 27,498 companies out of which a stratified random sample of 379 units is selected to be used for the fulfillment of the paper’s purposes.

Among the findings are the following: the share of the internet economy was 7% in 2003 and 8% in 2006. Although its share has grown by 1% during the period 2003-2006, the growth rate of the internet economy in Greece is impressive. Thus, as measured by its turnover, the sector of internet infrastructure grew by more than 110% during 2003 and 2006. The sector of internet applications grew by an astonishing 1229%, while the number of companies in the sector has tripled between 2003 and 2006. The mixed sector of traditional activity and electronic intermediaries has grown by 107%, while the electronic commerce has grown by almost 66%. It is noted that the growth rate of GDP in current market prices was 8.4% between 2003 and 2006. The internet developments are considered very crucial for economic policy formulation.

The paper is structured in five sections. The next section presents the conceptual framework of internet economy sectorial divisions. Section three discusses the data and section four deals with the empirical structural analysis of the new Greek economy. The final section concludes the paper and discusses ways for further research.

2. Conceptual Framework of the Digital Economy

This section first describes the technological and socio-economic framework within which the digital economy has sprung and continues developing. Basic differences between the traditional and digital economy are presented and the driving forces of the internet economy are discussed. Next, four main sectors of the new economic

activity are portrayed and their relationship to traditional economy, as well as their interconnections, are studied.

2.1. The Vital Role of Internet Technology (IT¹)

Internet has evolved into a uniquely independent information exchange, which can grow organically and it can operate reliably with little management. It is also built on common standards; a characteristic which has led to its amazing success and its ability to transform economic and social life for the whole world.

Its role in economic growth and development seems phenomenal in the years to come. IT has not only transformed industries, but it has spawned entirely new ones by leading creativity and innovation to almost an explosion. Thus, the invention of its crucial application, the web, led to the emergence of a new industry to create software and content for it. The development of the World Wide Web (WWW) revolutionized IT and promoted it to a global phenomenon. The web appeared in the late 1980s at the European Center for Nuclear Research (CERN) as a product of research carried out by Tim Berners who created it to share data on nuclear physics.

As IT and other computer technologies are becoming one of the key cultural and economic forces of our century, some developing countries appear grasping the opportunities to almost “leapfrog” the industrial revolution and jump straight into the Internet Age. It is emphasized that internet users in developing countries increased tenfold between 2000 and 2007. Using panel data for 207 countries between 1991 – 2000, Changkyu et al. (2003) found evidence that internet plays a significant role in economic growth. A recent report of the World Bank (2009) also finds that for every 10 percentage-point increase in high speed Internet connections in developing countries there is an increase in their economic growth of 1.3 percentage points. The same report identifies the mobile platform as the only most powerful way to deliver services to millions of populations in remote areas of the developing world.

It is apparent that IT has become a core sector of the digital economy and it has rightly been described as GPT (General Purpose Technology). According to Bresnahan and Trajtenberg (1996) there are three characteristics of the output of a sector which call for the term GPT:

- (1) diffusion to all other sectors
- (2) continuous improvement and declining prices
- (3) facilitation of invention and innovation

¹ The initials IT have been used to describe Information Technology. Since internet has already dominated the information sector, IT is used to declare internet technology in this paper.

All three of them coexist in IT, which has been described as an invention on the scale of the printing press and electricity. Thus, Jovanovic and Rousseau (2005) compared IT to electricity and found many similarities.

2.2. Digital Economic Environment

Digital economy variables may not sound different from their traditional counterparts; however, the way their concept arises is radically different. Thus, we continue using the basic traditional economic terms “demand”, “supply”, “production”, “consumption”, “investment” and so on. Let us take the demand and supply theoretical framework; it is still valid in the digital economy, and so is the traditional circular flow of income. The new characteristic is that digital demand and supply interact through electronic networks and especially through internet. This causes a dramatic shortening of the time needed for their interplay. Supply and demand schedules intersect much faster now. Moreover, there is a drastic reduction in the cost of acquiring the necessary information for the decision making process before economic transactions take place. This in turn leads to increased competitiveness and a price fall. An additional cause of price falling is identified as the gradual abolition of physical intermediacy. As Kuipers (2001) observes, the importance of the physical intermediaries – various commercial representatives, retailers, and so on – who facilitate the coordination between demand and supply, is reduced dramatically in the digital economy and this further contributes to falling prices.

Electronic networks have also played an important part in a more effective storage, elaboration and diffusion of information. Other important and novel characteristics of electronic networks are information sharing, increased transparency of markets, asynchronous communication – acquisition of information or placement of an order without requiring the other party’s simultaneous presence – , diminishing importance of time and location for communication, facilitation in processing information, increased personalization of information, and, in general, an obtained greater clarity and accuracy of communication – fewer mistakes and misinterpretations (Borenstein, et al, 2001).

It is noted that increasing market transparency and decreasing transaction costs are functions of the existing infrastructure, applications, type of services supplied and the actual use of electronic networks (Kuipers, 2001). Also, because of the reduction in the cost of transactions, the balance between outsourcing and in-house activities is changing. If markets become more transparent and the transaction cost is low, firms can concentrate on their main business activities and gain benefits from the increased competition among their suppliers. Consequently, the distribution of value added in

the supply chain can change. Other benefits can take the form of productivity increases due to more effective interactions and transactions in certain industries and firms. The same may happen because of an improved innovation process which leads to increased productivity gains.

Digital economic change is taking place within a socio-economic environment which is much wider than in earlier times. Electronic networks and especially the internet have expanded and intensified the influences of the international setting on a national economy. Economic activities are influenced today by a huge number of complicated variables, among which are international competition, globalization and social concerns about it, protection of the environment, income distribution in other countries, international regulation, consumer preferences, and so on. It is also noted that both digital and traditional economic activity to a great extent use the same infrastructure of natural and economic resources, like natural environment, buildings and structures, various equipment, telecommunications, various services, human capital skills and so on.

By summarizing the vast changes in the interaction among the economic agents brought about by the fast growing internet technology, we can say that the socio-economic setting has today very closely come up to what Carley (2000) described as “intelligent space”, a space where all information is digitized and easily accessed by whoever agent, human or artificial. As space becomes more and more intelligent people’s infospheres² are getting enlarged. It is noted that when people move their infosphere moves with them. Figure 1 shows that people’s infosphere (the cloud above them) moves with them independently of whether they are at the office, or at home, or in the street, and so on. The straight lines symbolize interactions and the bold dashed lines symbolize knowledge networks.

² The term infosphere was introduced by the American Military. It is the information sphere surrounding an individual. It includes computers, various instruments, knowledge acquired through interaction with various socioeconomic agents, and information made available by the individual’s working environment.

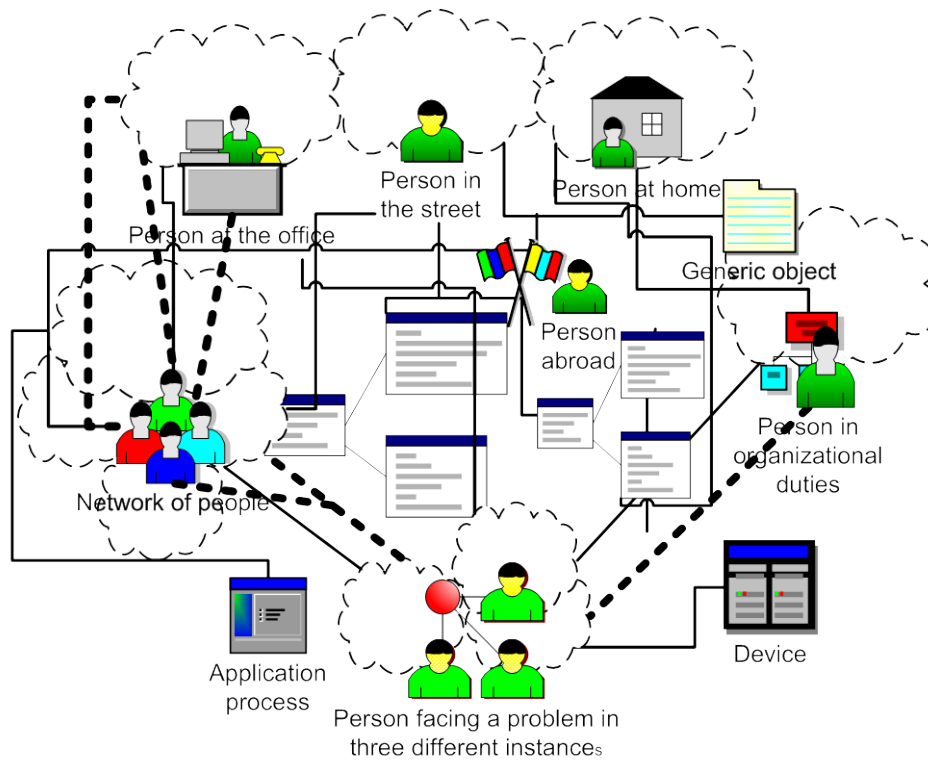


Figure 1: Intelligent space and infospheres (adjusted from Carley)

As people's infosphere gets larger there will be unparalleled increases in the size and complexity of the interaction and knowledge networks in which people (and other agents) are engaged. In an intelligent space the kind of interactions takes a vast variety of forms. Figure 2 presents an approximation of such a form.

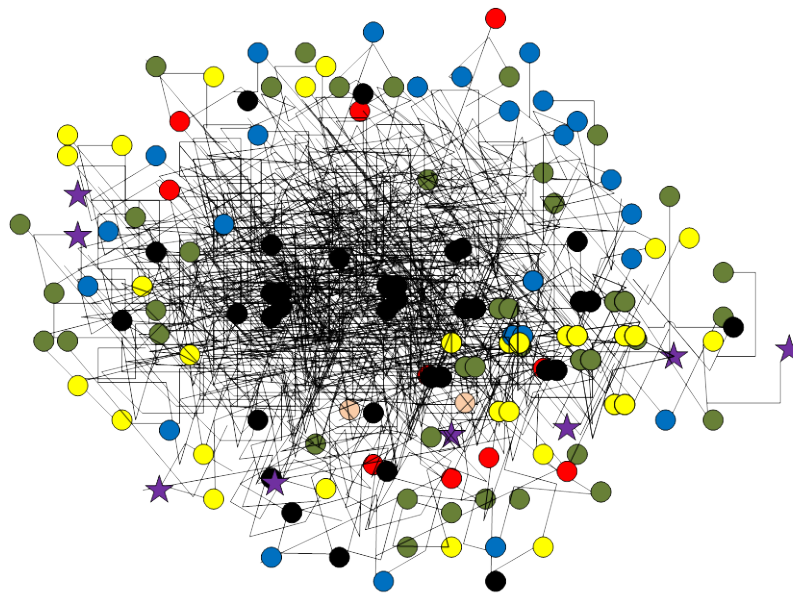


Figure 2: Interactions among the agents of the digital economy

If interactions among agents in the digital age look like in Figure 2, it becomes apparent that the effort to describe accurately the new economic structure is not easy.

2.3. Determinants of Digital Economy

Barua, Whinston και Yin (2000) identified three interrelated but distinct economic forces which have mostly promoted the development of digital economy. These forces are the following:

1. Positive network external economies.
2. Complementarity among the various components of internet technology.
3. Lower transaction cost.

The positive network external economies are important moving forces as long as consumers and companies find out that the more use is made of internet, the higher value is generated for those who participate in it. For example, as suppliers and customers of a company start using the internet in their daily work, this company is “pushed” to realize that it can benefit if it digitizes its own business functions. It is observed that complementarity is another strong characteristic of the internet economy. For example, as broadband expands, businesses dealing with software and other applications realize that they have to gain if they intensify their efforts to develop good multimedia software which will utilize the broadband expansion. On the other hand, the open nature of internet encourages innovation in the area of networks and applications. This leads electronic markets to utilize new technologies almost as soon as they appear. Furthermore, the direct and instantaneous communication and collaboration enjoyed by the internet users helps organizations to reduce their transaction costs through their virtual integration with their suppliers and customers. Because of its above novel beneficial characteristics, internet has replaced all previous network technologies like EDI (Electronic Data Interchange).

2.4. The Sectors of the Internet Economy

The study of internet economy requires information about the structure and functioning of the economic system itself. For this purpose it is useful to split the economy up into interrelated sectors, so that internal relationships can be observed. A functional three-sector breakdown of economic activity could be used: (1) the production sector, (2) the consumption sector, and (3) the government sector. These sectors include the economic activity of the whole economy, in the sense that an exhaustive listing of all the possible transactors in the economy can be fitted into these three groups. The sectors are functional in that they classify the function of the transaction under consideration rather than the nature of the agent involved in the transaction. In other words, we do not classify individuals into various groups with respect to their total activity, but rather we separate transactions according to their function.

Although it would perhaps be possible to divide government activity into production and consumption, there is excellent reason for considering government as a separate sector. To the extent that the government is in fact a producer, its activity could be recorded in the producing sector, but the rest of the activity of the government, like collection of taxes, even government expenditures on goods and services do not readily fit into either of the categories of production or consumption.

The production sector can be further divided into two subsectors: (1) the physical infrastructure which includes physical and organizational structures, as well as the necessary services and facilities needed for the economy to function; and (2) the various durable and non-durable goods and services consumed. In today's internet age, a part of the producing sector is generated within the digital economy. Consequently, as far as our interest is focused on the internet economy, the producing sector may include the following:

- (1) production of goods and services of network infrastructure,
- (2) production of goods and services of network applications,
- (3) production of physical goods which generate revenues through digital channels, or electronic commerce,

(4) production of services which facilitate e-commerce, or electronic intermediacy, and

(5) production of electronic business processes, or e-business.

The following Figure 3 presents a structural picture of the economic activity of the whole economy in the internet age. A National Income approach has been followed: Consumption and expenditures are the other equivalent measure of production. We note that the analysis of this paper does not consider the government sector.

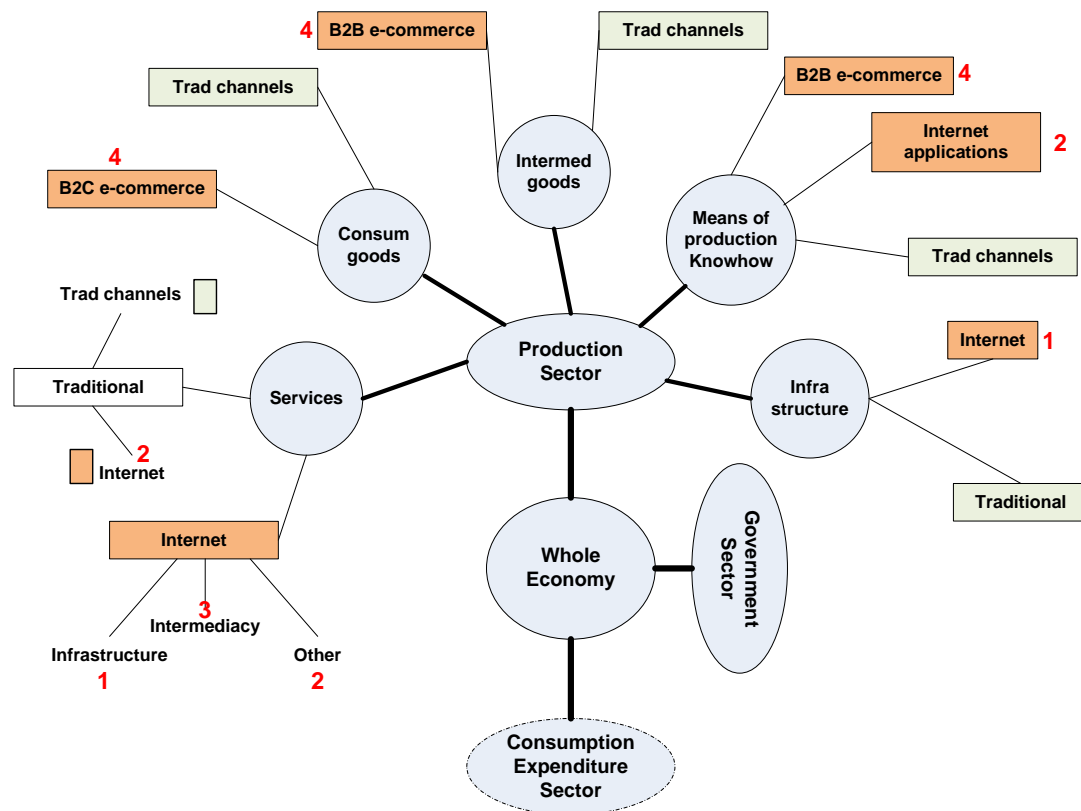


Figure 3: The Structure of Economic Activity in the Internet Age

In Figure 3, the green rectangles represent traditional economic activity, whereas the brown rectangles of the figure represent internet economic activity. It is noted that the relative size of the circles, ellipses and rectangles do not represent relative actual measurements, theoretical or empirical. The numbers 1 to 4 represent the four sectors of the internet economy which will be measured in this paper. Each sector is listed below with descriptions of the types of activities in each category.

Sector 1: The Internet Infrastructure

This sector includes products and services that help create an Internet-Protocol based network infrastructure. The categories in this sector include:

- Internet backbone, national and regional
- Internet services
- Production of networking hardware and software
- Production of computers
- Security services
- Fiber optics production
- Production of line acceleration hardware

Sector 2: The Internet Applications

Products and services in this sector build upon the above IP network infrastructure and make it technologically feasible to perform business activities online. The categories in this sector include:

- Internet consulting services
- Internet commerce applications
- Multimedia applications
- Web development software
- Search engine software
- Online training
- Web-enabled databases

Sector 3: The Internet Intermediacy

Internet intermediaries increase the efficiency of electronic markets by facilitating the meeting and interaction of buyers and sellers over the internet. They act as catalysts in the process through which investments in the infrastructure and applications sectors are transformed into business transactions. The categories in this sector include:

- Market making in vertical industries
- Online travel-agent services
- Online brokerage services
- Content aggregator services
- Portals/Content providing
- Internet advertizing broker services
- Online advertising

Sector 4: The E-Commerce

E-commerce involves the sales of products and services to consumers or businesses over the internet. The categories in this sector include:

- E-retailing
- Manufacturers selling online
- Fee/Subscription-based activities
- Airline ticket selling online
- Online entertainment and professional services

Even though the four-sector Internet Economy framework makes it difficult to separate revenues for multi-sector players, this framework presents a more realistic and insightful view of the Internet Economy than a monolithic conceptualization that does not distinguish between different types of economic activities. Furthermore, as a multi-sectoral approach, this framework facilitates the analysis of births and deaths of e-business units.

The above four sectors are shown in Figure 4. They were first introduced as “layers of the internet economy” by the Center for Research in Electronic Commerce (CREC, 2001) of the University of Texas at Austin in USA.

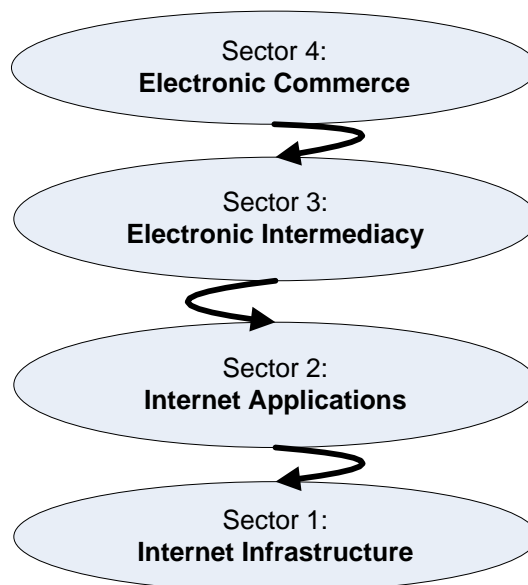


Figure 4: The Four Sectors of the Internet Economy
(adapted from CREC, 2001)

3. The Data

The data for the analysis of this paper come from two sources: first, the Databases of HELLASTAT iMENTOR, CBFA (Corporate Benchmarking Financial Analysis). The HELLASTAT databases are accessible online at www.cbfa.gr. It is noted that an alternative data source – the ICAP Group (www.icap.gr) – was initially considered, but was finally rejected because of the high cost involved in extracting the data in a form suitable for this work. On the contrary, HELLASTAT data is easily accessible; HELLASTAT S.A. is in effect the only business-data firm in Greece who uses the XBRL format. In addition, it owns the largest database of electronic economic and business information for more than 100,000 companies and 150 industries covering the whole range of economic activity in this country. HELLASTAT S.A. is a member of EADP (European Association of Database & Desktop Publishers) and ESOMAR (World Association of Opinion & Marketing Research Professionals). It is also a strategic partner of Standard & Poor's. The second source of this paper's data come from interviews and a questionnaire survey.

The statistical unit of analysis is the company which functions within the Greek geographical borders. In other words, this paper focuses on describing the digital economy on the basis of business activities of companies operating in Greece and not on the basis of private consumers who transact online or the government.

The variables used to describe the sectoral economic activity, as well as its evolution, are the following: (1) number of companies, (2) type of economic activity, (3) turnover and (4) number of employees. On the basis of these four variables, the “mixed” sectors are also delineated. Finally, the analysis is carried out by using two panels, for 2003 and 2006.

The statistical population consists of all companies operating in Greece and active in 2007 in all legal forms; this is SA, Ltd, business partnerships, and all companies keeping books of 3rd category who were obliged to publish their economic statements. This is a total of 65,500 units. This population was “cleaned” with respect to the following criteria – additively satisfied:

1. For each company the data should include information on turnover and employment for at least the years 2003 to 2005.
2. If a company, although active in 2007, appeared not to have a record either on its turnover, or the number of its employees for the year 2006, it was included in the “cleaned” population. In such a case we would obtain this information during the interview, provided this particular company was selected in the sample.
3. For each company the data should include information on its main business activity.
4. Availability of the title of the company.
5. Availability of information about how to contact the company.

Taking account of the above five criteria, the final clean population was 27,498 companies. For this population size, the statistically required sample size is 379 units. This sample size has been determined at the $\pm 5\%$ confidence interval and 95% level of confidence. The actual sample of 379 companies was selected by random stratified sampling by using the statistical tool “research randomizer” (<http://www.randomizer.org/form.htm>).

Table 1 presents the distribution of the population and the sample by broad economic activity according to NACE rev1. To compare the sample’s activity with the overall economic activity as measured in the National Accounts of Greece, the distribution of GVA (Gross Value Added) and employment is calculated and shown in Table 2 together with the percentage distribution of turnover and number of employees in the sample, by groups of NACE.

Table 1: Distribution of population and sample by economic activity (2003)			
NACE rev	# of companies in population	% of total	# of companies in sample
A: Agriculture, Hunting and Forestry	241	0.88	3
B: Fishing	136	0.49	2
C: Mining and Quarrying	124	0.45	2
D: Manufacturing	6,011	21.86	82
E: Electricity, Gas and Water	114	0.41	2
F: Construction	1,790	6.51	25
G: Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles and Personal and Household Goods	8,454	30.74	116
H: Hotels and Restaurants	3,762	13.68	52
I: Transport, Storage and Communication	1,393	5.07	19
J: Financial Intermediation	843	3.07	12
K: Real Estate, Renting and business activities	3,373	12.27	46
L: Public Administration and Defense; Compulsory Social Security	44	0.16	1
M: Education	277	1.01	4
N: Health and Social Work	378	1.37	5
O: Other Community, Social and Personal Service Activities	558	2.03	8
P: Private Households with Employed Persons	0	0.00	0
Q: Extra-Territorial Organizations and Bodies	0	0.00	0
TOTAL	27,498	100.00	379

Table 2:					
Distribution of number of companies, turnover and employees by economic activity Sample (2003) (Numbers in parentheses are % of total)				From National Accounts 2003 Gross Value Added (current prices) Employment	
NACE rev	# of companies	Turnover % of total	Empl % of total	GVA % of total	Empl % of total
A+B+C: Agriculture, Hunting and Forestry, Fishing, Mining and Quarrying	7 (2)	2	2	7	15
D+E: Manufacturing, Electricity, Gas and Water	84 (22)	26	30	14	15
F: Construction	25 (7)	4	8	9	8
G+H+I: Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles and Personal and Household Goods, Hotels and Restaurants, Transport, Storage and Communication	187 (49)	58	42	29	30
J+K: Financial Intermediation, Real Estate, Renting and business activities	58 (15)	7	14	20	9
L+M+N+O Various services	18 (5)	3	4	21	23
TOTAL	379 (100)	100	100	100	100

As Tables 1 and 2 show, there is roughly a similar pattern of distribution of economic activity in both our sample and the officially measured National Accounts. It is reminded though that the sample in this paper does not include governmental activities. The following Table 3 presents summary statistics of the employed variables. It is noted that seven of the sampled companies did not fully answer the questionnaire. Thus, the final sample size was 372 units as can be seen in Table 3.

Variable	Obs.	Mean	Std. Dev.	Minimum	Maximum
Empl07	372	40.882	87.20319	1	1050
Year_establ	372			1931	2003
Tover03	372	5,908,075	1.98e+07	5,099	2.94e+08
Tover06	372	8,401,382	4.08e+07	1,110	7.15e+08
Empl03	372	34	73.126	1	913
Empl06	372	38	84.347	1	1045

As Table 3 shows, the sample includes small and large companies, which were established between 1931 and 2003. There are 192 companies established between 1995 and 2003, 139 companies established between 1980 and 1994, and 41 companies were established between 1931 and 1979. Table 4 shows the regional distribution of the sampled companies. The 13 regions are presented in Map 1.

Regions	# of Companies	% of Total
1	207	55.65
2	12	3.23
3	57	15.32
4	19	5.11
5	14	3.76
6	1	0.27
7	11	2.96
8	8	2.15
9	9	2.42
10	16	4.30
11	6	1.61
12	9	2.42
13	3	0.81
TOTAL	372	100.00



Map1: The 13 regions of Greece

As Table 4 shows, the majority of companies operate in regions 1 and 3, indicating the high degree of regional economic concentration in Greece.

4. The New Economic Structure

Figure 3 in Section 2.4 presents the theoretical economic structure in the digital age. According to Figure 3, the whole economy consists of five broad economic sectors: (1) the traditional economy, (2) the internet infrastructure, (3) the internet applications, (4) the internet intermediaries, and (5) the e-commerce. The study and analysis of our data identify seven broad sectors of the Greek economy in the digital age: (1) the traditional economic sector (TRAD), (2) the sector of internet infrastructure (IS1), (3) the sector of internet applications (IS2), (4) the sector of mixed economic activities including traditional and internet infrastructure activities (TRIS1), (5) the sector of mixed economic activities including traditional and internet applications activities (TRIS2), (6) the sector of mixed economic activities including traditional and internet intermediate activities (TRIS3), and (7) the sector of mixed economic activities including traditional and electronic commerce activities (TRIS4). Table 5 presents the distribution of economic activity in those seven sectors and Table 6 shows the evolution of economic activity between 2003 and 2006.

Table 5: The seven sectors of the Greek economy in the digital age (2003 and 2006)

sector	# Firms 03 (% of total)	# Firms 06 (% of total)	TOV03_TR % of total	TOV03_IS % of total	TOV06_TR % of total	TOV06_IS % of total	EMPL03_TR % of total	EMPL03_IS % of total	EMPL06_TR % of total	EMPL06_IS % of total
TRAD	275 (74)	230 (61.8)	61.3		49.8		75.0		64.3	
IS1	4 (1)	6 (1.6)		41.4		59.2		40.2		38.0
IS2	1 (0.3)	3 (0.8)		0.3		2.3		1.7		5.7
TRIS1	9 (2.4)	7 (1.9)	1.5	33.0	0.5	12.0	0.8	22.8	0.5	13.9
TRIS2	7 (2)	6 (1.6)	0.1	4.5	0.1	2.8	0.5	12.0	0.3	12.0
TRIS3	4 (1)	10 (2.7)	0.6	0.4	0.8	0.6	0.7	1.5	2.6	6.4
TRIS4	72 (19)	110 (29.6)	36.5	20.4	48.8	23.1	23.0	21.7	32.3	24.0
TOTAL	372 (100)	372 (100)	100	100	100	100	100	100	100	100

**Table 6:
The evolution of the seven sectors of the Greek economy in the digital age between 2003 and 2006**

sector	# Firms 06 % change of structure with respect to 2003	TOV06_TR/ TOV03_TR % change	TOV06_IS/ TOV03_IS % change	EMPL06_TR/ EMPL03_TR % change	EMPL06_IS/ EMPL03_IS % change
TRAD	-16.4	15.2		-4.1	
IS1	50.0		110.4		35.8
IS2	200.0		1229.0		375.0
TRIS1	-22.2	-54.2	-46.3	-35.1	-12.3
TRIS2	-14.3	-19.2	-6.5	-43.3	42.9
TRIS3	150.0	107.6	96.3	304.5	43.0
TRIS4	52.8	89.6	65.8	57.0	58.4
TOTAL	0.0	41.8	47.1	11.7	43.7

As can be seen in Table 5, the traditional economy's share decreased between 2003 and 2006 regarding all three variables: number of companies, turnover and number of employees. An important characteristic of the Greek economy is that although the sectors of internet infrastructure and applications have developed independently of the traditional activities, the other two internet sectors, e-intermediacy and e-commerce, are developing as mixed only activities with the traditional economy. We can see in Table 5 that the two sectors IS1 and IS2 in 2003 were the 41% and .3% of the total economic activity, but in 2006 their share increased to 59.2% and 2.3% respectively. We can also see that the traditional component of the mixed sectors TRIS1 and TRIS2 is getting reduced in favor of the internet component. Regarding the mixed sectors TRIS3 and TRIS4 we observe an increase in both components, the traditional and the internet one.

According to Table 6, which shows the evolution of the economy from 2003 to 2006, we can see that the internet sectors exhibit astonishing growth rates, especially the sector of internet applications which increased by 1229% during the three years we examine. The number of firms in these two sectors, IS1 and IS2, increased by 50% and 200%, respectively, while the number of firms in the traditional sector decreased by 16.4%. The mixed sectors, TRIS3 and TRIS4, also exhibit very high rates of growth during the examined period.

Employment in the traditional sector decreased by 4.1%, while it increased by 35.8% and 375%, respectively, in the sectors IS1 and IS2. Employment in the mixed sectors, TRIS3 and TRIS4, increased by 304.5% and 43% regarding the traditional and internet component, respectively, for the sector TRIS3, and by 57% and 58.4% for the two components, respectively, of the sector TRIS4. The following Table 7 presents the overall structure of the Greek economy in 2003 and in 2006.

Table 7: The overall structure of the Greek economy, 2003 and 2006.				
sector	TOV03	TOV06	EMPL03	EMPL06
TRAD	56.8	46.0	72.2	61.3
IS1	3.1	4.5	1.5	1.8
IS2	0.02	0.2	0.06	0.3
TRIS1	3.8	1.4	1.6	1.1
TRIS2	0.5	0.3	0.9	0.8
TRIS3	0.5	0.8	0.8	2.8
TRIS4	35.3	46.9	23.0	31.9
TOTAL	100	100	100	100

These findings indicate that the Greek digital economy is characterized by a strong dynamism, which has to be taken into account by the policy makers.

Furthermore, the trend in the labor market shows that the new economy generates employment, contrary to the prevailing common notion that the opposite may be true.

5. Conclusions and Further Research

This paper has introduced a framework to measure the Greek digital economy. It has also presented the first effort to quantify the contribution of the internet economic activities to economic growth. The various research efforts to date have been concentrated on calculating a number of indicators of the diffusion of the Information and Communication Technologies (ICT) in the Greek society and economy (see, among others, Sfakianakis, 2009; Georgopoulos et al. 2002; EBEA; European e-Business W@tch, 2005).

In contrast to these studies, the present paper describes the sectoral structure of the Greek economy by delineating seven broad sectors: the traditional economy, the internet infrastructure, the internet applications, and four sectors of mixed economic activity with the traditional component combined with e-commerce, e-intermediacy, internet infrastructure and internet applications.

The analysis was based on original and very detailed field work covering both semi-structured interviews and a questionnaire survey of 379 firms operating in Greece. The sample size and selection was scientifically drawn and is considered representative of the Greek economy. The variables employed were the turnover, the number of employees and the number of firms in two panels, 2003 and 2006. The total turnover of the sampled units was the 1.3% of the Greek GDP in 2003 and the 1.7% in 2006. The following Table 8 shows the turnover of the sampled units distributed by the seven broad sectors of the Greek economy in the digital age.

Table 8: Turnover (mill. euros) of the sampled units (372) by broad sector of the Greek economy, 2003 and 2006				
sector	TOV03	TOV06	EMPL03	EMPL06
TRAD	1,248.1	1,437.8	9,127	8,750
IS1	67.1	141,1	187	254
IS2	0.4	5.4	8	38
TRIS1	83.7	42.5	200	154
TRIS2	10.0	9.0	116	114
TRIS3	11.9	24.7	95	399
TRIS4	776.6	1,464.8	2,902	4,558
TOTAL	2,197.8	3,125.3	12,635	14,267

The contribution of the internet economy to GDP was found to be equal to 7% in 2003 and 8% in 2006. It is emphasized that while the GDP increased by 8.4% in 2006 as of 2003, the internet economy increased by more than 47% during the same period. The findings show a dynamism which cannot be discerned by simply calculating certain indicators. This work is useful to policy makers and it can also be used to guide the revision of the economic-activity classification system followed by the National Statistical Service.

Of course, further work is needed to establish an officially followed statistical measurement of the digital phenomenon. This is necessary in order to have the appropriate data to study the new Greek economy and formulate useful and effective macro and micro policies.

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