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ICT Adoption and Digital Growth in Greece

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The **Foundation for Economic and Industrial Research (IOBE)** is a private sector, not-for-profit, charitable research organization. It was set up in 1975 to pursue two objectives: (a) to promote scientific research on the current and emerging problems facing the Greek economy and (b) to provide objective information and make useful proposals to shape policy decisions. For more information visit the website www.iobe.gr.

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Executive Summary

Nowadays, the rapid evolution of digital technologies and especially of Information and Communication Technologies (ICT) creates great challenges for a smart, sustainable and inclusive growth, being thus a crucial flagship initiative of the Europe Strategy 2020. Governments around the world design and implement ICT adoption and digital growth strategies in order to improve efficiency and transparency in public administration; stimulate new business formation, job creation, competitiveness, innovativeness and export activity of businesses; improve social welfare and the quality of life for citizens. At the same time new technologies and especially ICTs create a new business environment that represents the so called transition to a digital economy. This transformation creates new business opportunities of high added value and offer more dynamic patterns for a smart, sustainable and inclusive growth. These elements are currently being implemented all over Europe under the umbrella type Europe Strategy 2020.

Greece has not yet captured the benefits of ICT adoption since it still falls below EU average in 65 out of 84 ICT indicators (77%) based on the European Digital Agenda (Digital Agenda Scoreboard, 2013). Greece has low performance in broadband penetration, the frequency of internet use, the use of electronic transactions and electronic procurement. These shortcomings become even more important today in Greece. After a six-year period where about 25% of its gross value added was lost, and unemployment increased to the socially unacceptable level of around 27%, the economy is now struggling to recover. Policy makers are currently facing a great challenge to support the recovery process within a difficult fiscal environment. The challenge for the Greek government refers to its role as a motivator, contributor, carrier, facilitator or source of the digital growth process. Some of the tools that could help in this direction are discussed in this study.

The implementation of the 4 digital projects identified in this study is thought to render big benefits for the economy in terms of exports, country's competitiveness & transparency, job creation, innovation, e.t.c. The choice of the specific 4 priority areas was driven by the strategic framework in digital growth designed for the period 2014-2020 at European and Greek policy level of analysis. The **key priority areas** under examination include:

i) ***enhancement of e-skills***

ii) *development and use of* ***digital solutions*** *regarding the* ***transactions between public administration and citizens/businesses***

iii) *development of* ***open data***

iv) *creation of new* ***opportunities for innovative SME's and start-ups***

To explain the economic importance and potential benefits that could be derived from the implementation for each digital project suggested in this report, we provided 4 separate analyses. These analyses provide hard quantitative results on some of the benefits that we can achieve, by rapidly implementing such “digital projects”. The basic findings from the quantification analyses can be summarized as follows:

- The adoption of digital signature solution in the Greek public administration is expected to cut costs by about 380 million euros (1st year).
- A 100% increase in the diffusion of open data in Greece will result in a significant improvement in its ranking position in terms of competitiveness by 25 positions (from 56thto the 31st).
- A 100% increase in the diffusion of open data in Greece will result in a significant improvement in its ranking position in terms of transparency by 33 positions from (80th to the 47th).
- A 100% increase in the diffusion of open data in Greece will result in the creation of 6332 new businesses.
- If 1000 individuals obtain e-skills, exports in Greece will increase by 13.9 million euro.
- If 1000 individuals obtain e-skills, 72 new businesses will be created in Greece
- ICT adoption in Greek SME’s increases their probability to innovate by about 4-9 percentage points
- ICT penetration in Greek SME’s facilitates significantly their internationalization since it increases their likelihood to export by about 1.5-4 percentage points

1. Introduction

Nowadays, the **rapid evolution of digital technologies** and especially of Information and Communication Technologies (ICT) creates great **challenges for a smart, sustainable and inclusive[1] growth**, being thus a crucial **flagship initiative of the Europe Strategy 2020**. The digital economy and **ICT sectors are growing faster** (at seven times) compared to the rest economic sectors. It is also widely known that the **transition to digital information** technology **exhibits significant benefits** to businesses, citizens and public sector. At the same time, **Greece** after the severe and prolonged crisis seems to be **at a turning point** showing the first **encouraging signs of rebalancing and recovery**. To reboot Greek economy, **growth** is necessary to be **inextricably linked to the new digital priorities** established within Europe, taking advantage of the new opportunities and challenges that arise in the new era of digitization. In this respect, **policy makers in Greece** should **stimulate** the **ICT adoption** and use from citizens --including for example women, young people, older workers, unemployed individuals--, businesses and public administration.

Rapid evolution of Information and Communication Technologies (ICT) creates great challenges for a smart, sustainable and inclusive growth

In light of the above the **Greek government** should function as a **motivator**, **contributor**, **carrier**, **facilitator** or **source** of the digital growth process. In addition, the recent financial crisis that hit Greece underlined the need for **policy targeting** at the high levels of unemployment. Hence, it would be of great importance for policy makers, if the growth of firms by adopting ICT or the ICT infrastructure construction could **create jobs**. Further efforts are also required to **improve the competitiveness** of the Greek economy by **increasing ICT investment**, **using cloud-computing services, archiving data in a digital format[2], improving e-skills and ICT training of the labour force**, **developing the usage of TaxisNET services, enabling demand-driven innovation** from the public sector, and **reforming the regulatory and legislative framework** for the digital economy. Moreover,

[1] Inclusive growth according to the European Commission involves the following characteristics: the generation of jobs especially for women, young people, and older workers,the investment in skills and training helping individuals of all ages anticipate and manage changes, the modernization of labour markets and welfare systems, the allocation of the growth benefits towards all parts of the European Union.

[2] The implementation cost for the establishment of new datacenters should be compared to the expected benefits of cloud-computing services and digitization of data.

policy makers it is necessary to **design actions** that **stimulate the business export activity** of ICT producers and users..

The **main purpose of this study** is **to identify** the main **priority areas** to stimulate ICT adoption and usage to businesses, citizens and public sector in Greece. The **choice** of the specific priority areas is **driven by the strategic framework** in digital growth designed for the period **2014-2020** at European and Greek policy level of analysis. The main **contribution** of this study is the provision of **quantification analyses** of the **potential economic impact** that can be derived from the implementation of four specific digital projects. More particularly, these digital projects stand for:

i) **digital signatures** to public administration,

ii) development of **open data**,

iii) improvement of **e-skills**,

iv) enhancement of entrepreneurship and innovative ecosystem.

The report is structured as follows: the **second section describes** the **current situation** by providing a comparative analysis regarding the **basic ICT indicators between Greece and EU** and by identifying the **main barriers** to the efficient adoption and implementation of digital policy actions; the **third section presents** the **strategic priorities** related to **ICT adoption** as either they have been recently designed or they are currently under way aiming to support digital growth in the next medium-term period (2014-2020) at European and National level of analysis andbased on these strategic insights this section **suggests four key priorities** to be taken into account by policy (re)design actions focusing on the stimulation of digital growth in Greece; the **next 4 sections (4-7) analyze in detail each digital project** separately by highlighting the importance of them, **discussing the expected benefits** of them on public sector/businesses/citizens, and **providing a quantification analysis** (many technical details are provided in the appendix)in order to estimate and **capture the potential impact** from targeting in each digital project on the competitiveness, export activity, new business formation and innovativeness of the Greek economy. The **output from the quantification** of each digital project is expected to **assist the Greek authorities** in preparing and designing a **renewed policy framework** on digital growth in Greece. Finally, section 8 summarizes the main findings of this report.

2. Current Situation

2.1 ICT Indicators: A Comparative Analysis between Greece and EU

Recently the Ministry of Administrative Reform and e-Governance highlights that during the **year 2012 Greece fell below EU average in 65 out of 84 ICT indicators** (77%) based on the European Digital Agenda (**Digital Agenda Scoreboard, 2013**), reflecting **low performance** in **broadband penetration**, **the frequency of internet use**, **the use of electronic transactions** and **electronic procurement**. In view of that, according to this assessment report, **41.9% of citizens** have **never used the internet** in Greece in 2012. Also, Greece has achieved the **highest level for seven out of the twenty** basic **e-Government services** in the EU. However, the performance regarding the provision of **integrated electronic services** to citizens and businesses in the EU in 2010 placed Greece in the **last position**.

Greece fell below EU average in 65 out of 84 ICT indicators (Digital Agenda Scoreboard, 2013)

During the **last programming period**, the Greek Public Administration made **significant effort** to adopt digital technologies for its modernization including:

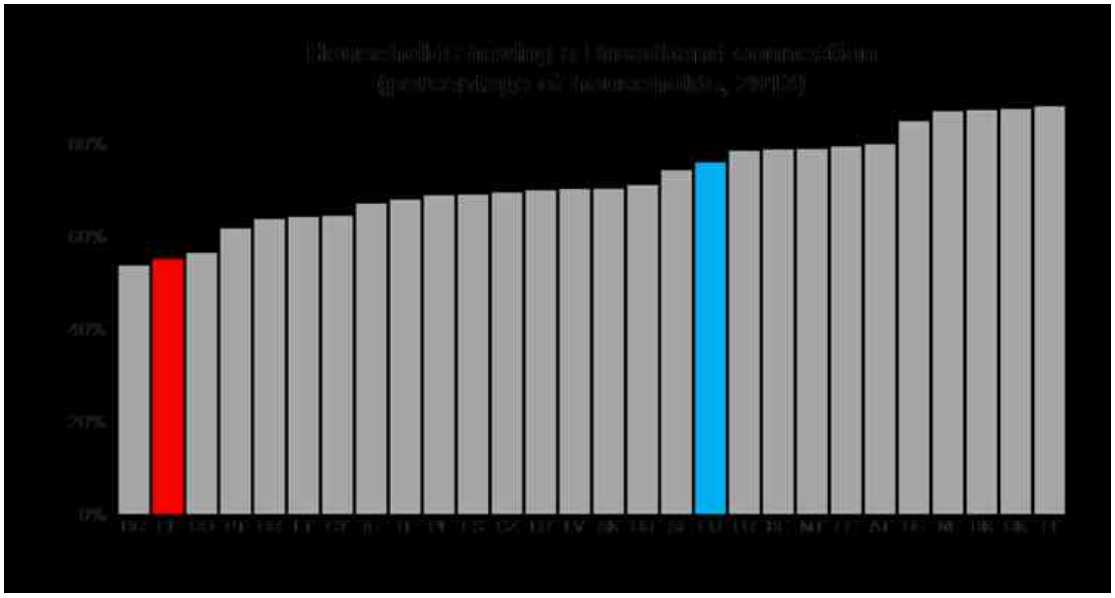
- the **function** of the central **portal (HERMES),**
- the **implementation** of **Diaugeia** to promote transparency,
- the **electronic system of fiscal services**, i.e. the so called **TAXIS**,

The abovementioned attempts imply that there are **tangible results** regarding ICT **adoption and diffusion** in the public administration. Moreover, **one out of three people** who use the internet declare that they **have received online public sector services**. More recent data for the year 2013 (**Digital Agenda Scoreboard, 2014**) show that the main **critical digital areas** with considerable **lag of Greece** compared to EU average can be summarized as follows:

- **Households** having a **broadband connection**
- **Mobile broadband penetration**
- **High speed broadband penetratio**n
- **Digital skills**
- **E-commerce** indicators
- **ICT use in SME's**

In particular, relevant data derived from Eurostat show that **55% of the households** had a **broadband registration** at the end of **2013**, **lower** than the **EU average (76%)** and 4 percentage points higher compared to the previous year. The **share of high speed connections** (providing at least 30 Mbps) appeared **lower than the EU average** (2% compared to 21% in the EU).

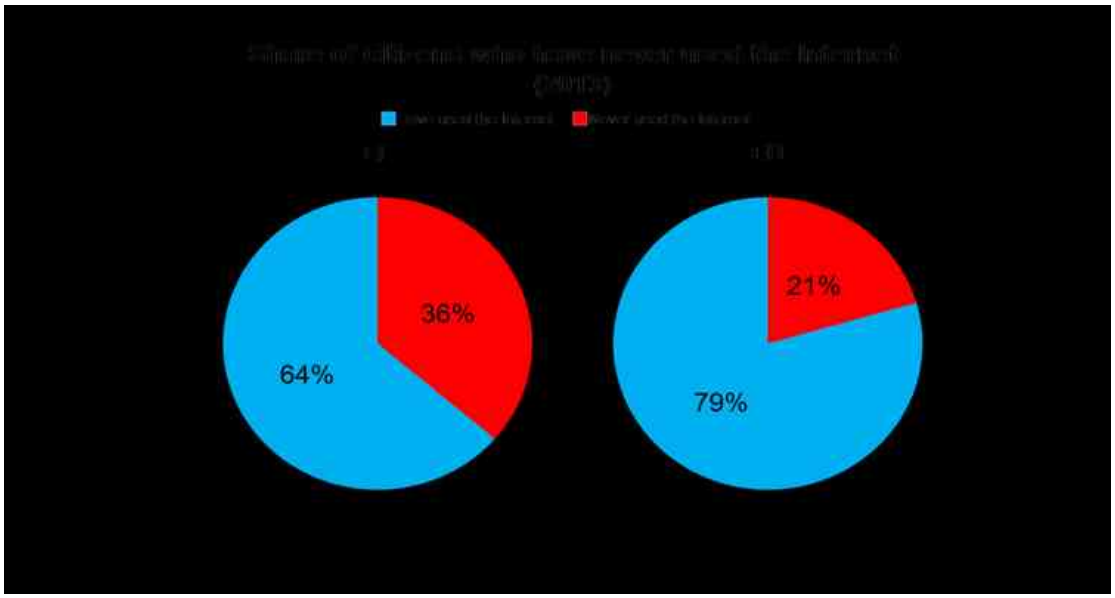
Figure 1: Access to broadband connections



Source: Eurostat, Digital Agenda for Europe Scoreboard (2014)

In **2013**, **36% of citizens in Greece had still never used the internet**. This percentage is lower compared to the previous year, but considerably **higher than the EU average (20%).**

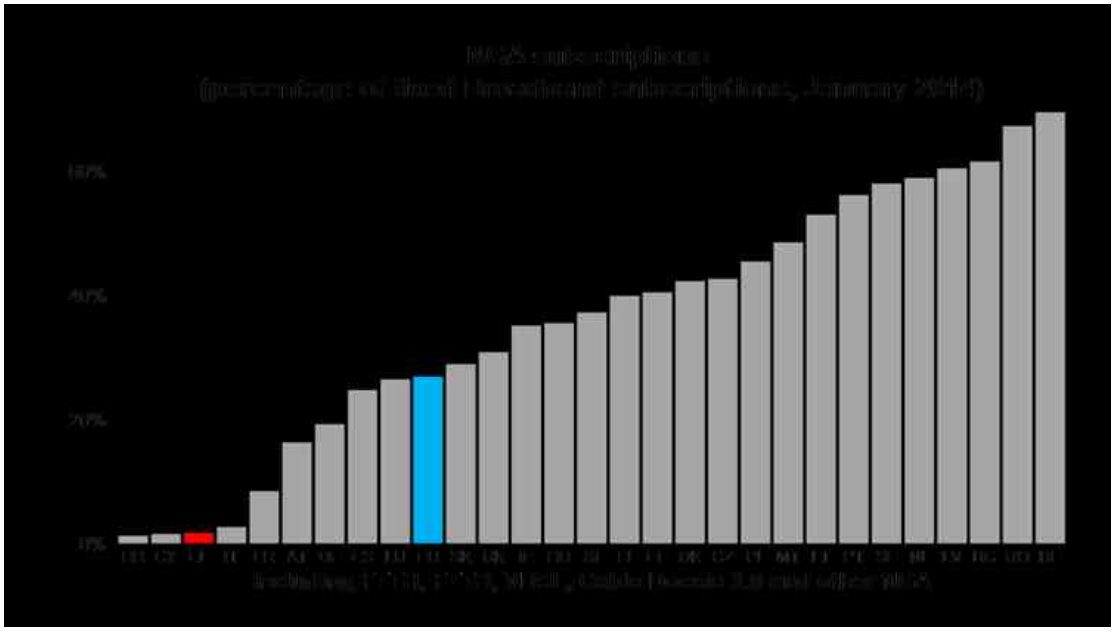
Figure 2: Internet use by citizens



Source: Eurostat, Digital Agenda Scoreboard (2014)

The following figure demonstrates that the **percentage of high speed connections** (providing at least 30 Mbps) was significantly **lower in Greece (2%)** in comparison with the **EU average (21%).** Also, it should be noted here that the indicator for **ultra-fast connection for Greece** is **almost zero**, where ultra-fast connection corresponds to a speed providing at least 100 Mbps. On the **mobile side**, the adoption rate of **mobile broadband (registration per 100 individuals) was 36%,** which is lower than the EU **average of 62%.**

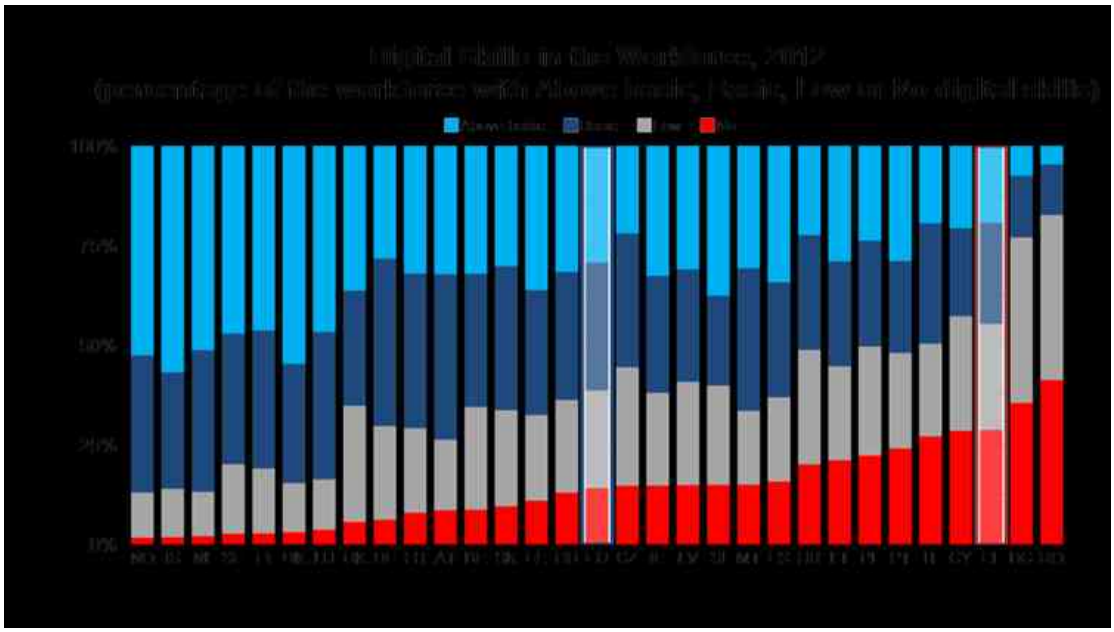
Figure 3: High-speed broadband penetration



Source: Digital Agenda Scoreboard (2014)

A newly developed indicator for **digital skills**, obtained from **Eurostat**, shows that, in the year **2012, 65% of individuals in Greece** had **low or no digital skills**, while the relevant average outcome for **EU** is significantly lower (**about 47%)**. Moreover, the specific groups of **old-aged (55-74 years old), low educated, unemployed, retired and inactive individuals in Greece** appear as **less digitally skilled** compared to the **EU average**. Within the group of labour force, 55% of individuals exhibit low or no digital skills. The relevant picture for EU is different, since on average 39% of the labour force has low or no digital skills.

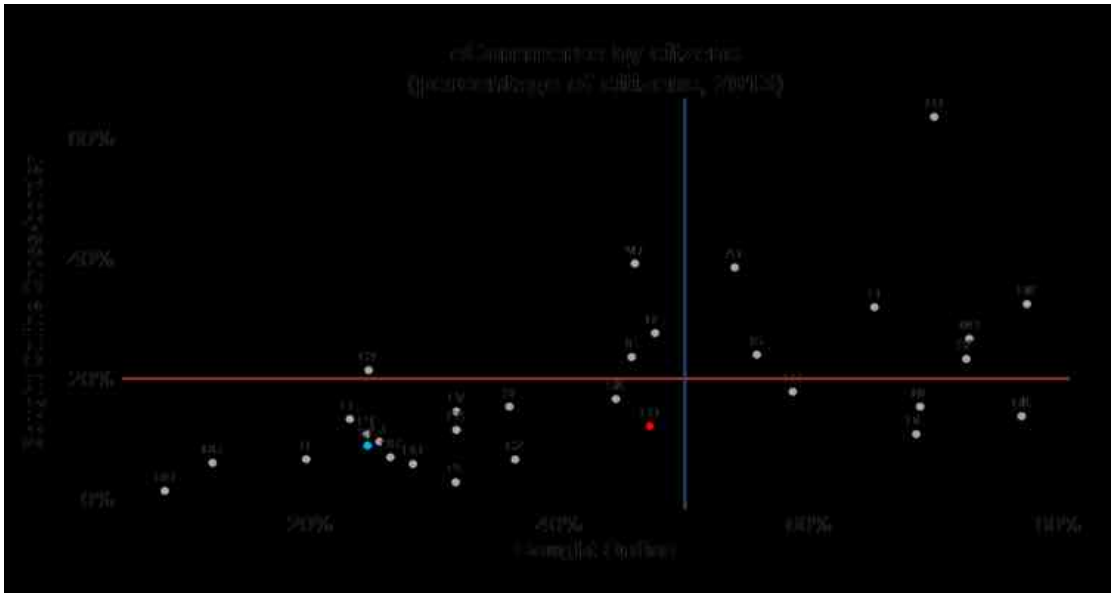
Figure 4: Digital skills in the labour force



Source: Eurostat, Labour Force Survey (2012)

With respect to **e-commerce**, in **2013**, **25% of citizens** in Greece declare that they had **purchased goods/services via internet** during the last 12 months. This means that the use of e-commerce was significantly **lower than the EU average of 47%.** Citizens in **Greece** exhibit worse rates of cross-border e-Commerce, since **only the 9% of individuals** declare that they have **bought online from other EU countries** in the last 12 months. This participation share is also low on average for **EU (12%).**

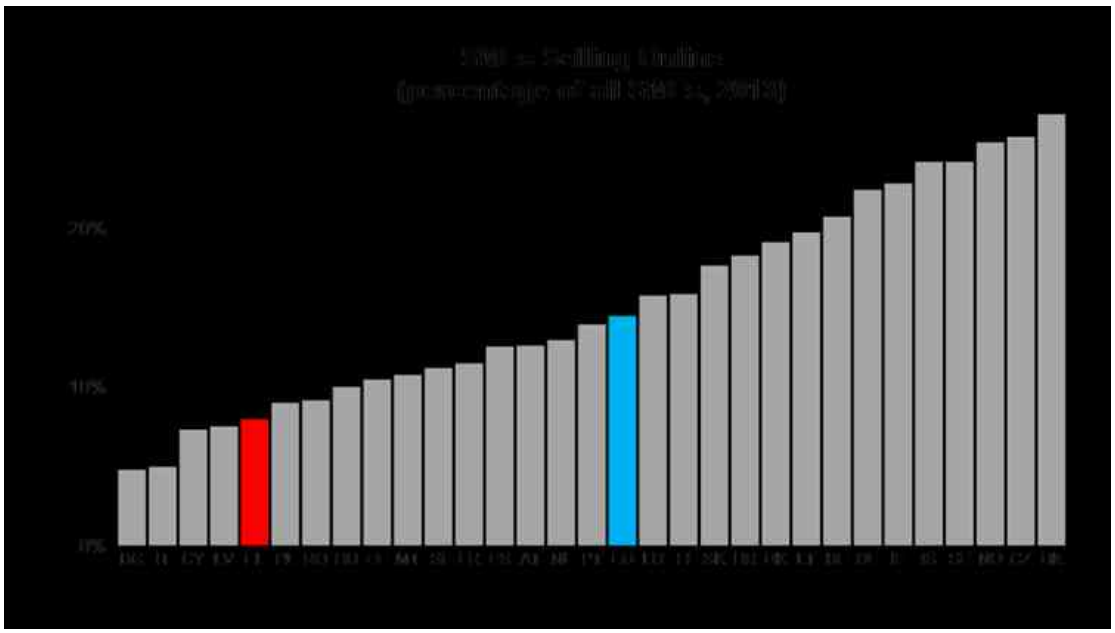
Figure 5: E-commerce use by citizens



Source: Digital Agenda Scoreboard (2014)

On the side of businesses, in 2013, **15% of large-sized firms in Greece** state that they were **selling through internet**. This share is higher compared to the previous year, but much **lower** compared to the **EU average (35%)**. On the other hand, **SMEs appear less active**, since in **2013 only 8%** of them declare that **sell online**, while the corresponding rate in **EU** is on **average 14%.**

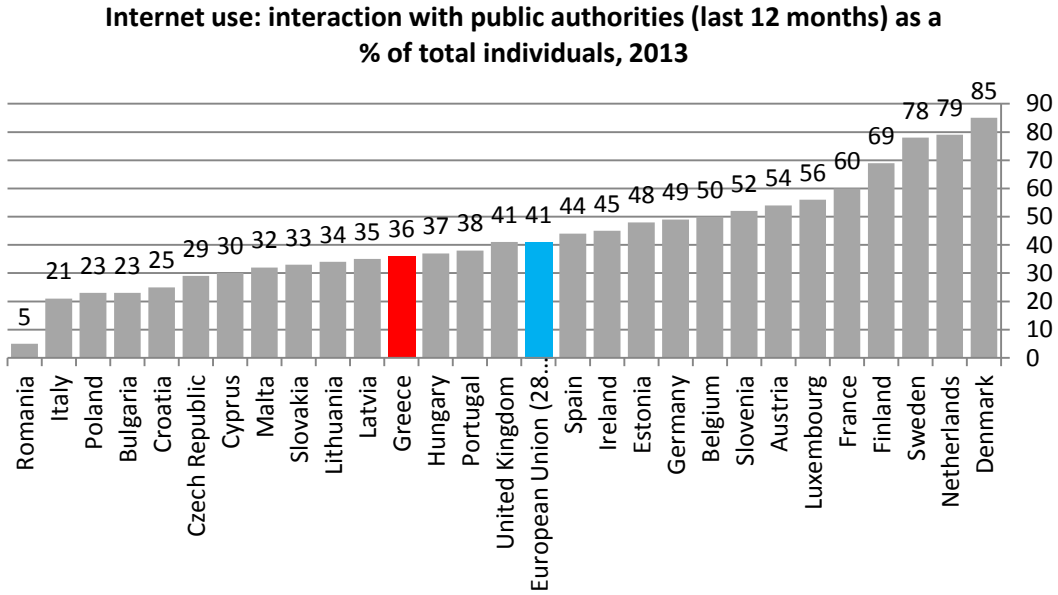
Figure 6: SMEs selling online



Source: Eurostat, Digital Agenda Scoreboard (2014)

Figure 7 shows the percentage of **citizens** interacting with public authorities by **using e-government services**, based on recent data (**2013**) provided by Eurostat for the EU(28) countries. In **Greece** the interaction of **individuals** with **public administration via internet use** appears lower **(36%)** compared to **EU average (41%).**

Figure 7: E-government services to citizens

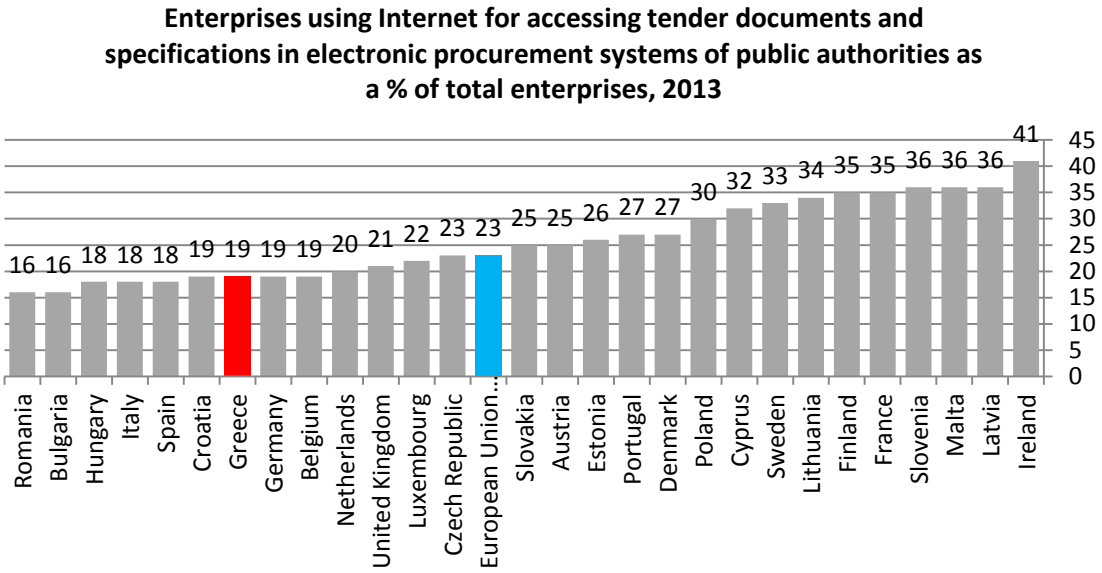


Source: Eurostat

The following figure depicts the **percentage of businesses using Internet** for **accessing tender processes** in public authorities' electronic procurement systems (**eTendering**). Again, **Greece** seems to exhibit a **lower percentage** than the **EU average**. In particular, near to **19% of the total businesses in Greece** makes use of internet for this reason, while in **EU28** is the respective percentage is somewhat higher, i.e. **23%.** Focusing on countries which have similar characteristics with Greece in terms of population, culture, size, GDP, it is noticeable that Portugal outperforms with respect to this ICT indicator not only Greece but also Germany, Spain and Italy. The Green Paper of the European Commission (2010) confirms that Portugal compared to other EU countries has achieved a great progress in the emergence of e-procurement systems. In particular, Portugal has an advanced e-Government infrastructure involving two major portals, that is the Enterprise's portal and the Citizen's portal. Both of them allow the easy interaction with the public administration. Also, the Portuguese e-Government infrastructure includes the Electronic Government Network, the Common Knowledge Network which is the connection point between central and local public bodies, businesses and citizens, and the Solidarity Network which contains 240 broadband access points in order to be used by old-aged and disabled persons. Moreover, in Portugal the Simplex programme is a well-developed Administrative and Legislative Simplification Programme which diminishes bureaucracy, enhances transparency in interactions with the State and efficiency in Public Administration's operations and consequently manages to gain the trust of the Portuguese people. In the same line, the action plan "Connecting Portugal"

mainly aims to ensure transparency in any interaction with the public administration, foster the extensive use of ICT in the private sector and guarantee a competitive environment in the telecommunication market.

Figure 8: Internet use



Source: Eurostat

To sum up Greece lags significantly compared to EU average in many ICT adoption indicators such as households access to broadband connection, mobile broadband penetration, high speed broadband penetration, digital skills of labour force, e-commerce indicators, ICT use in SME's. However, Greece performs relatively well in the electronic interaction of citizens and businesses with public authorities.

2.2 Barriers to Efficient Implementation of Digital Actions in Greece

The design or redesign of a **national digital strategy in Greece requires** first the **identification** of the main **weaknesses** and **failures** of **past attempts** regarding the stimulation of digital growth. As in almost **all countries focusing** on the support of ICT adoption in businesses, citizens and public sector, this **effort was accompanied by failures**. In **Greece** the **failures** were added to the rigidity and bureaucracy that characterize the operation of the public administration, generating **cumulative pathogenesis, delays and lags**. Within the context of the **National Strategic Reference Framework (2007-2013), fostering ICT use** was a **main concern of the Greek government**. However, some general **obstacles** have observed **to the efficient adoption and implementation** of relevant supportive operational programmes (such as the "Digital Convergence") related to the stimulation of ICT use and digital growth in Greece. In this respect, the **main factors hindering efficient adoption of ICT in businesses**, **citizens** and **public sector** are the following:

- ***Policy-driven limitations***
  - **Limited political willing** to stimulate digital growth and e-government
  - **Inadequate planning and funding** throughout the life-cycle of information systems
  - **Limited actions** related to the **reuse of public information and data**
  - **Inefficient mechanisms** of horizontal government schemes
  - **Discontinuity of adopted policies** at every governmental change
- ***Weaknesses related to technical design and planning***
  - **Lack of interoperability and interconnection** among the information systems of the public sector
  - **Lack of a common architecture in public sector** computing, absence of common standards and compliance policies for ICT use
  - **Low exploitation of ICT infrastructures**, business segmentation of systems, high dispersion and operational overlaps in the information systems of the public administration
  - **Weak networks** between public and private sector in ICT solutions
  - **Complexity and lack of simplification** in the relevant institutional and regulatory framework

- ***Obstacles to efficient implementation of ICT adoption***
  - **High cost of introduction and use of electronic infrastructure**, mainly due to the lack of appropriate programmatic agreements and licenses covering the needs of the public administration
  - **Complex projects and infrastructures** characterized by managerial and operational limitations implying a negative cost-benefit nexus
  - **Time-consuming public procurement processes** (due to significant delays in the stages of tendering, auctions, awarding etc.) overcoming the lifecycle of procured ICT products/services, resulting thus the introduction of old-fashioned products
  - **Lack of efficient monitoring**, evaluation and feedback in ICT activities
  - **No motivation to public servants** serving in ICT roles to be engaged in the process of EU funded projects
  - **Lack of expertise in public servants** serving in ICT roles to effectively support the process of EU funded projects

To sum up the main barriers for a more efficient implementation of previous "digital" programmes in Greece refer to policy-driven limitations, weaknesses related to technical design and planning, and complex/time-consuming processes.

3. Strategic Framework

3.1 Digital Priorities for the Period 2014-2020 in Europe

It is widely known that the **digital economy grows at fast rates globally**. In the context of knowledge and digital era, **new technological trajectories evolve rapidly** in several aspects, such as **key enabling technologies**, **mobile communications**, **cloud computing solutions** and **data analytics** creating in that way ne**w opportunities for public sector, businesses, citizens and society**. The **exploitation** of these types **of technologies** offer **promising prospects** since they have the **potential** to **contribute significantly** in future years to the efficient **improvement of public sector**, the **stimulation of innovative** and **knowledge-intensive entrepreneurship**, the **creation of new jobs**, the **enhancement of economies' competitiveness**, and the **improvement** of the **quality of life** of citizens. In this respect, the **purpose** of this **subsection** is to **describe** the **main strategic priorities** related to ICT adoption at national and European level as either they have been recently designed or they are currently under way to **support and stimulate ICT adoption and digital growth** in the **next medium-term period**, that is the period **2014-2020**.

The **strategy "Europe 2020**" aims to **stimulate smart, sustainable and inclusive economic growth**. Under the Europe 2020 strategy the **Digital Agenda for Europe** is one out of seven flagships initiatives, which **focuses** on the **realization of the digital single market** and the **exploitation** of the **potentials to innovate** through fast and ultra-fast internet and interoperable services and applications, recognizing thus the crucial role of ICT penetration and digitization. The general **objective of the Digital Agenda** for Europe is to **reboot European economy**, as well as, to **facilitate the citizens and businesses of Europe** to adopt and use the most updated ICT tools and services. It has been underlined that the **full implementation** of the updated Digital Agenda would **provide enormous economic benefits** in the European economy and society by 2020 since it is expected to:

Full implementation of the updated Digital Agenda would provide enormous economic benefits in the European economy and society by 2020

- **increase** the European **GDP by 5%**, or 1500€ per person,
- **increase investment in ICT**,
- **improve eSkills** levels in the labour force,
- **enable public sector innovation**,

- **reform the framework conditions** for the internet economy,
- **create 1.2 million jobs** through infrastructure construction. In turn, this would rise to 3.8 million new jobs to the whole economy in the long term.

The original Digital Agenda approach suggests 101 actions that should be implemented under the following **7 pillars**:

- **Pillar I:** Digital Single Market
- **Pillar II:** Interoperability & Standards
- **Pillar III:** Trust & Security
- **Pillar IV:** Fast and ultra-fast Internet access
- **Pillar V:** Research and innovation
- **Pillar VI:** Enhancing digital literacy, skills and inclusion
- **Pillar VII:** ICT-enabled benefits for EU society

3.1.1 Our Targets:

More specifically, under the umbrella of the flagship initiative of the Digital Agenda, **13 strategic targets for EU** have been also **set** for the **period 2014-2020**.

- the **entire EU** to be **covered** by **broadband above 30 Mbps by 2020**
- **50% of the EU** to subscribe to **broadband above100 Mbps by 2020**
- **50% of the population** to **buy online by 2015**
- **20% of the population** to **buy online cross-border by 2015**
- **33% of SMEs** to make **online sales/purchases by 2015**
- the **difference** between **roaming** and **national tariffs** to **approach zero by 2015**
- to **increase regular internet usage from 60 % to 75 % by 2015**, and **from 41% to 60% among disadvantaged people**.
- to **reduce** the proportion of the **population that has never used the internet from 30% to 15% by 2015**
- **50 % of citizens to use eGovernment by 2015**, with more than half returning completed forms
- **all key cross-border public services**, to be **agreed** by Member States in **2011**, to be **available online by 2015**
- to **double public investment in ICT R&D** to € 11 bn by 2020
- to **reduce energy use of lighting by 20% by 2020**

Progress against these targets is **measured** in the **annual Digital Agenda Scoreboard**. The Digital Agenda has met many of its targets and is on track to meet many others. Since **2010**, when the Digital Agenda was adopted, **the European Council and the European Parliament** have **called for further strengthening of the European digital leadership** and **completion of the Digital Single Market by 2015** (European Council conclusions of 28/29 June 2012 conclusions of 1/2 March 2012). **Efforts** to stimulate the conditions to create growth and jobs in Europe **should be put in 7 new key area**s:

1. **Create a new and stable broadband regulatory environment.**
2. **New public digital service infrastructures** through Connecting Europe Facility loans
3. **Launch Grand Coalition** on Digital Skills and Jobs
4. Propose EU **cyber-security strategy and Directive**
5. **Update EU's Copyright Framework**
6. **Accelerate cloud computing through public sector buying power**
7. **Launch new electronics industrial strategy** – an "Airbus of Chips"

The new key transformative actions[3] complement the original actions, and build on what has been achieved so far.

3.2 Digital Priorities for the Period 2014-2020 in Greece

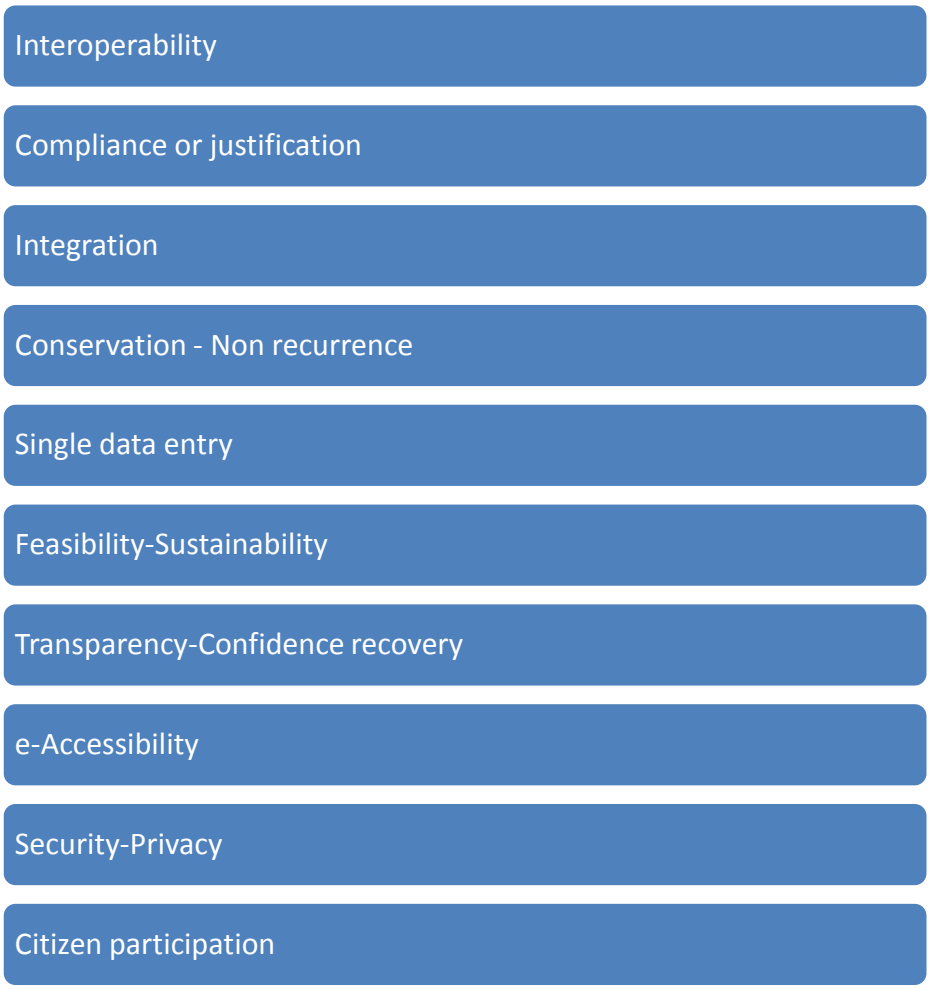
Focusing on the **Greek case** and especially on the national strategies for the next medium-term period, the Ministry of Administrative Reform and e-Governance presents the main vision of the **Greek e-government strategy** for the period **2014-2020** which can be specified as follows: *"Greece aims to **build a more efficient, transparent and accountable administration**, **through** the **use of ICT** and the support of the **necessary governance and monitoring mechanisms,** while **maximizing constituent satisfaction**, **increasing participation** and **recovering confidence** by offering constantly **enhanced electronic services** and **promoting a new digital culture**."* Within this context and given the crucial importance of e-governance for the efficient transaction of public administration with

*Greek e-government strategy for the period 2014-2020 aims to build a more **efficient, transparent and accountable administration***

[3] Digital "to-do" list: new digital priorities for 2013-2014,European Commission - IP/12/1389 18/12/2012

citizens and businesses, strategic priorities on digitization should be driven by several fundamental principles presented in the figure below:

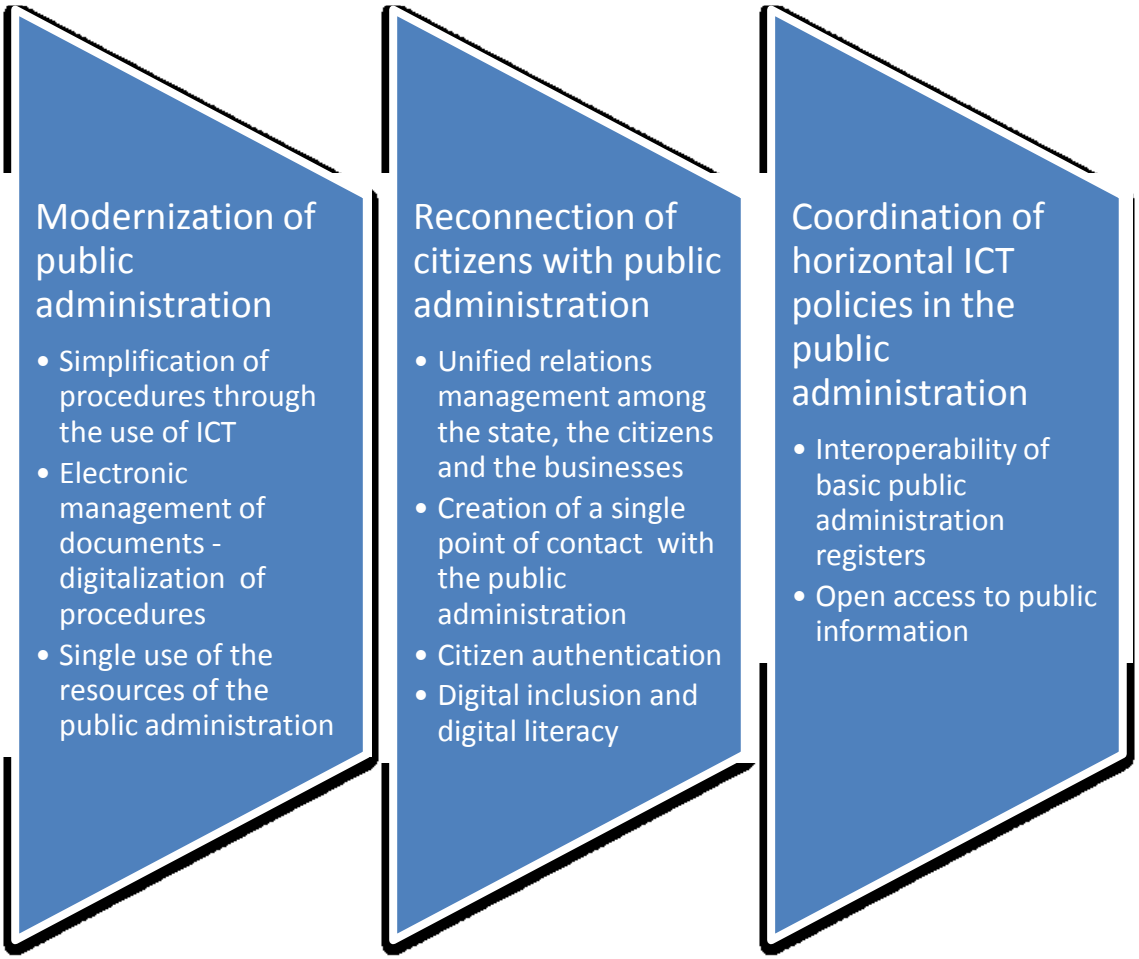
Figure 9: Core Principles of e-Governance



Source: Ministry of Administrative Reform and E-Governance

In order to develop e-government and efficient ICT penetration within the public sector, recently the relevant policy makers in Greece have set the following general strategic goals:

Figure 10: e-Government strategic targets (2014-2020) in Greece



Source: Greek e-government strategy (2014-2020)

The following table describes **digital projects** in **Greece** of which their **implementation** has **been recently undertaken**, characterized thus as an **ongoing process**, **or** their implementation has been recently decided and it is **expected to start in the near future**. More particularly**, table 1** provides **detailed information** on **recent digital programmes** with their **actions**, expected **benefits**, **cost** and the **dates** of design and start of implementation.

Table 1: Recent Digital Projects and Supportive Policy Actions in Greece

Programmes	Actions and Expected Benefits	Cost	Design/Tender	Start Implementation
Syzefxis II: National Networks	High level and secure broadband connection. • Network and telephony services to 34.000 buildings nationwide. • 50% savings on telecom expenses annually • Wireless access to 55.000 government smartphones • Secure services for the public sector	616 M€	Q1 2014	Q3 2014
Rural Broadband	Broadband Development in specific Rural White Areas of Greece • Broadband Convergence between rural and urban areas • Support at least the 95% of the targeted population • Enforce the digital growth and development in rural areas	161 M€	Q4 2013	Q2 2014
TaxisNet	Integrated online tax services for citizens and enterprises • 6,500,000 users • 19 million transactions yearly • Secure transactions • Citizen-centric approach • Integration with existing tax systems	8 M€		12/2012
Elenxis	Electronic tax & customs control and audit mechanism for improving tax compliance and fight tax fraud • Upgrade the operational capacity of audit services • Tackling tax evasion and tax fraud • Create and update "credible blacklist"	8 M€		12/2012
Government CRM	Unified relations management between the state and citizens and businesses • Better personalized services • Processes to unify offline and online • Strategic view of citizen and enterprises needs • Single sign-on to electronic services	14 M€	Q2 2013	Q2 2014
Government ERP	Fiscal reform project in order to support all stakeholders in Central Government from a single point with standard procedures and rules for the management of public resources.	14 M€	Q4 2013	Q3 2014

Programmes	Actions and Expected Benefits	Cost	Design/Tender	Start Implementation
Government HRMS	Introduction of a single unified HRMS for a more effective Human Recourses management and development. • Unified HRMS • Common HR policies • Talent and Time management • Supporting the idea of the State employee • Focus on Human Capital Development	14 M€	Q4 2013	Q3 2014
Data Center and G-Cloud	Creation of two identical DC's one for Ministry of Finance projects and one for the rest e-Government projects. • Tools for the effective management of Operational procedures and utilization of existing ICT infrastructures • Economies of scale in the costs of ICT purchases and maintenance	15 M€	Q1 2013	Q3 2014

Source: Greek e-government strategy 2014-2020

This study suggests 4 main priority areas to foster ICT penetration and usage to businesses, citizens and public sector in Greece

In the light of the abovementioned **strategic framework** in stimulating digital growth at European and Greek level of policy analysis, **this study suggests 4 main priority areas** to **foster ICT penetration** and **usage to businesses**, **citizens and public sector** in Greece. In this context, we give strategic insights and suggest four digital projects to be taken into account by policy (re)design actions for the period 2014-2020. The **key priority areas** under examination include:

v) ***enhancement of e-skills***

vi) *development and use of* ***digital solutions*** *regarding the* ***transactions between public administration and citizens/businesses***

vii) *development of* ***open data***

viii) *creation of new* ***opportunities for innovative SME's and start-ups***

To sum up in the light of the strategic framework designed for the next medium-term period (2014-2020) in Greece and Europe, such as the Digital Agenda for Europe and the Greek e-government Strategy, this study gives strategic insights and suggests 4 digital projects to be taken into account by policy (re)design actions including mainly stimulation of digital skills, wide use of digital solutions; development of open data; support of digital entrepreneurship and innovative ecosystem.

4. Digital Signatures

4.1 Importance and benefits of digital signatures

The **broad use and adoption of digital signature solutions within public sector and private sector** as well, **could simplify** to a great extent **the transaction of citizens** with these parts and consequently it is expected to **improve the quality of life of citizens**. Apart from the undoubted benefits of electronic signatures to the social welfare, the **exploitation** of them has a high probability to make **more efficient the operation of public administration** and **reduce the operational cost of businesses**. The diffusion of electronic communication and e-commerce **necessitate** the use of 'electronic signatures' and related services allowing **data authentication**. **Electronic signature** is also thought to **prompt** the wide **diffusion** mainly **of e-government and e-banking applications**. More specifically:

- **e-government applications**: E-government applications are based on the use of electronic ID cards. The electronic ID card can be used both as an identification document and key for on-line access to public services for the citizens. In most cases these ID cards will contain the three functionalities**: identification, authentication and signing.**
- **E-banking applications**: Even though many **e-banking applications** are **relying on one-time passwords (OTP) and tokens**, **electronic signing** of transactions **is increasing.** For corporate **e-banking (business-to-business) and inter-bank clearing**, it is more **common** to use **smart cards** which are considered to **provide a higher level of security.**

In particular, the adoption and **diffusion of electronic signatures entails** the potential users (public sector/citizens/businesses) with a number of **benefits**:

- **Cost savings:** Using **postal or courier services** for paper documents is much **more expensive** compared to using digital signatures on electronic documents. Also **the use of electronic signature** deters from printing thus enabling **minimization of paper, ink costs e.t.c.**
- **Ease of use:** Documents can be signed **even from a mobile device**. Electronic signature enables people to **use it anytime, anywhere**
- **Increased efficiency:** Electronic processes are **less time consuming**. Businesses no longer have to wait for paper documents to be sent by courier. **Contracts are easily written, completed, and signed by all concerned parties** in a little amount of time no matter how far the parties are geographically.

Increased user satisfaction: Security and online advice on digital signatures improves the satisfaction of users/customers. Giv**en the above it can be argued that the diffusion and the development o**f electronic signature solutions may c**reate new opportunities for a smart, sustainable and inclusive growth** as set out in the Europe 2020 strategy.

Table 2: Benefits of using digital signatures

Benefit to government	Benefit to private sector	Benefit to NGOs / civil society
Diffusion of **E-government applications**	Wide use of **Ecommerce applications**	**Increased trust and confidence** in the digital world
	Diffusion of **E-banking applications**	Increased **user satisfaction** due to cost cutting, ease of use and efficiency gains
Increased **cost savings** due to minimization of printing and postal costs		
Efficiency gains through digitization and automation of processes		
New business opportunities since cross-border online services favors travelling, working and studying across the Union		

Boosting **trust and confidence** in the digital world along with ensuring **user convenience** constitute **essential conditions** to **foster further use** and d**evelopment of the digital single market.** The **importance of high confidence** in sender authenticity is **especially obvious** in a **financial context**. For example, suppose a bank's branch office sends instructions to the central office requesting a change in the balance of an account. If the central office is not convinced that such a message is truly sent from an **authorized source**, acting on such a request could be a grave mistake. Also in many scenarios**, the sender and receiver** of a message may have a **need for confidence** that the messa**ge has not been altered during transmission**.

Therefore, **other trust services** are also necessary in order to establish and ensure the security, authenticity and legal validity of an electronic transaction.

- **Time stamping**, i.e. the date and time on an electronic document which proves that the document existed at a point-in-time and that it has not changed since then
- **Electronic seal**, i.e. the electronic equivalent of a seal or stamp which is applied on a document to guarantee its origin and integrity
- **Electronic delivery**, i.e. a service that, to a certain extent, is the equivalent in the digital world of registered mail in the physical world
- **Legal admissibility** of electronic documents to ensure their authenticity and integrity
- **Website authentication**, i.e. trusted information on a website (e.g. a certificate) which allows users to verify the authenticity of the website and its link to the entity/person owning the website

Box 1: European policy measures for the improvement of the regulatory framework for electronic signatures

- In **1999**, the **European Commission**, having acknowledged the importance of electronic signature, has adopted an **e Signature Directive**. Its scope was to establish a legal framework for electronic signature and certain certification-services in order to ensure the proper functioning of the internal market. **However** the **legal framework for e-signature did not suffice** since it **did not cover** other critical matters such as **e-identification (eID)** and other needed trust services needed for on line transactions. Therefore the **revision of the eSignature directive** has been **integrated into the Digital Agenda Action list** (action 8).
- **In June 2012**, the **Commission adopted** the **proposal for a Regulation** on **electronic identification and trust services** for electronic transactions in the internal market. The **proposal** strives to contribute to unlocking the potential offered by the internet revolution. It **provides** a **trustworthy**, **secure** and **predictable environment** that enables the **development of cross-border secure services and business opportunities**. This will ensure that enterprises and citizens fully enjoy the opportunities provided by the digital economy in order to achieve a digital single market. Nowadays, **most** of the **countries** across EU have already **deployed digital signature schemes** for their two main application fields:
  – **entity authentication**, i.e. electronic identity (eid) schemes and
  – **data authentication and integrity**, i.e. digitally signed documents.

4.2 Economic impact of digital signatures: a quantification analysis

Transforming the administrative process **from paper-intensive to paper-free**, including all of the signature-dependent workflows, is an **ambitious** but yet high **promising project**. In the following lines we try to prove the benefits of **digitization for the public government sector** relying on an example of Arx Company that sells the CoSign digital solution.[4] For the **calculation of ROI** we **compute** the **inherent costs** using the **traditional** paper intensive process **versus** the proposed **new paper free solution**. We imply that the **traditional process includes costs such as printing, faxing, scanning, archiving and document loss recovery**.

The success of the methodology relies heavily on setting the right hypotheses that depict better the reality. Where applicable we use real data.

Table 3: Setting the main hypotheses

Public servant employees (2013)	*600.000 persons*
Number of signers	*65% of the public servant employees (2013) print and sign documents*
Gross salary of low educated employees *that perform faxing, scanning etc*	2,200 euros/month
Number of work days per year	*220*
Cost of printing per page	*Based on the real government expenditure of paper and ink (Public Government Procurement 2009) adjusted to year 2013*
Faxing, scanning, archiving cost per document	*Estimated actual cost based on time needed and gross salary of a low educated employees that perform these tasks*
ELTA 3 day delivery cost per document	0.830 €
Courier overnight shipping cost per document	5 €
Time for faxing, scanning, archiving per document	*3 minutes*
Time to retrieve lost documents	*30 minutes per document*
Time to replace lost documents	*60 minutes* per document

We also make the following hypotheses:

[4] Also, other companies such as Max MD provide relevant methods based on the ROI calculations of digital signatures. Moreover, several recent studies and reports describe practical deployment strategies for electronic signatures (e.g. Fiatech, 2012; ARX, 2012).

Table 4: Setting supplementary hypotheses

Metric			Base
General		Number of signed documents per signer per workday	*6*
		Number of pages per typical signed document	*3.5*
		Number of signatures per typical signed document	*2*
Scanning		% of documents scanned	*1%*
Archiving		% of documents archived	*50%*
External Routing	Faxing	% of documents faxed	*1%*
	Mailing	% of documents mailed	*5%*
	2nd Day Delivery	% of documents shipped	*3%*
		% of lost documents retrieved	50%
		% of lost documents replaced[5]	30%

The estimation of the cost of the new solution was adjusted from the CoSign digital solution example. The analysis entails initial system costs, cost of implementation and integration, annual vendor fee, annual internal maintenance cost, additional costs.

The application of the methodology renders the following results:

Table 5: Calculation of the costs inherent in the paper intensive process

Metric		Base	Monthly costs	Annual costs
General	Number of signers	***400,000***		
	Number of documents per signer per workday	*6*		
	Number of documents per signer per year	1320		
	Number of pages per typical signed document	*3.5*		
	Number of signatures per typical signed document	*2*		
Printing	Cost / page	0.007 €	1,003,811 €	12,045,729 €
Scanning	% of documents scanned	*1%*		
	Cost / document	0.688 €	302,500 €	3,630,000 €
Archiving	% of documents archived	*50%*		
	Archiving costs/document	0.688 €	15,125,000 €	181,500,000 €
nal Routi Faxing	% of documents Faxed	*1%*		
	Cost / fax page	0.688 €	302,500 €	3,630,000 €

[5] 20% of documents lost are neither retrieved, nor replaced

Metric		Base	Monthly costs	Annual costs
Mailing	% of documents Mailed	*5%*		
	ELTA 3 day delivery cost	0.830 €	1,826,000	21,912,000
2nd Day Delivery	% of documents shipped	*3%*		
	courier overnight shipping cost	5 €	6,600,000 €	79,200,000 €
Lost Documents	% of documents lost	3%		
	% of lost documents retrieved	50%		
	Cost to retrieve document	6.9 €	4,537,500 €	54,450,000 €
	% of lost documents replaced	30%		
	Cost to replace lost document	13.8 €	5,445,000 €	65,340,000 €
Total cost	**Cost per signed document:**	**0.80 €**	**35,142,311 €**	**421,707,729 €**

Table 6: Calculation of the costs inherent in the digital solution process

Digital Solution 1st year cost	**87,600,000 €**
Digital Solution S&M (annual cost)	17,520,000 €
Digital Solution IT management cost (4 years)	6,000,000 €
Total electricity costs (4 years)	960,000 €
4 year TCO (Total cost of ownership)	164,640,000 €

The calculation of ROI proves that the transition to the digital era may bring significant economic benefits to the operation of public administration. The **first year of the adoption of the digital signature solution, the Greek public administration is expected to cut costs by about 380 million euros.**

The adoption of digital signature solutions in the Greek public administration is expected to save costs by about 380 million euro (at the end of the 1st year of operation of digital signature solutions)

Table 7: ROI Calculation

Digital Solution Payback Period (months)	1.17
Cost Per User (per year)	102.90 €

The **adoption of ICT** may also help the **public sector** become **more flexible and cost effective**. Although the **Greek Government** has invested in some big IT projects in the past, it s**till lags behind** other European economies in digital economy. The literature also exhibits a series of

unsuccessful digital adoption projects in the private sector. **Business readiness** is a **critical driver of effective exploitation of new technology**. Matching new technology with business needs, culture etc. is also needed. The adoption of ICT including d**igital signature promises big benefits but it also inherits high risks** that should be properly administered. Therefore when it comes to investments on ICT careful analysis of the costs, benefits **is needed**, as well as **design of further complementary actions (training, incentives etc)**. **A pilot implementation phase** prior diffusion could be used as a **proxy of success of ICT adoption**.

Box 2: Policy suggestions to support the efficient adoption and use of digital signatures in public administration

Policy actions in the context of the Greek e-Government Strategy 2014-2020 (setting by the Ministry of Public Administration and e-Governance)

- **Adoption of electronic management of documents** and digitization of the procedures in public administration
- **Development of the citizen authentication**
- **Establishment of** the **single use of the resources** of the public administration
- **Creating e-identification (e-ID)** solutions for citizens and businesses
- **Creation of a single point of contact** with the public administration

Next Step Strategies

- **Amending the joint ministerial decision 25209/2011** in order to include the submission of applications and documents by electronic signature as it was highlighted by the 3rd review of the 2nd Adjustment Programme for Greece (July 2013)
- **Establishment of a clear and simple regulatory/legislative framework** for digital signature and wide use of electronic stamp and especially in aspects related to the manner in which the electronic identities of individuals are proofed, the processes for assigning signature privileges and the authentication method for an individual
- **Facilitation of the communication** between public sector and businesses/citizens via e-mail
- **Promoting wide use and control over digitized seals**
- Maintaining integrity of the document, report, record to which the e-signature is applied
- **Ensuring compatibility** with multiple content authoring applications
- **Facilitating access to high level application programming interfaces**
- **Binding together digitized seals** to documents and signatory

The main finding obtained from ROI analysis for digital signatures in public administration can be summarized as follows:

Box 3: Best practices for the adoption of digital signatures

The requirement for leveraging Digital Signature technology as part of ensuring authentication and verification in several legal processes is dominant in many areas of this world. One of the most demanding examples is the European Court of Human Rights (ECHR) in Strasbourg, France, which processes over 65,000 applications from European citizens each year, resulting in 500,000 letters to be signed.

To manage this huge volume of information traffic, the ECHR created its own advanced workflow and document management system with digital signatures as one of its essential elements. As the ECHR operates a very secure environment with stringent requirements, the digital signature solution had to meet highly demanding criteria. The system automated what would otherwise be a laborious and time-consuming manual process, helping to prevent any potential delays in case management. It captures all types of document, both inbound and outbound, and is the core engine for creating documents that require signing (approx. 500,000 per annum). It also enables users to check the status of any application or case and then call up related documentation.

The adoption of digital signatures was mainly driven by ECHR's willingness to process its extremely large caseload more quickly and efficiently. The use of digital signatures provides additional security benefits, arguably more so than hand-written or 'wet ink' signatures. The system has helped the ECHR deal with ever-increasing volumes of documents (already processed 3 millions of documents during its operation) without incurring processing delays, while adding a layer of structure and uniformity, as well as the ability to monitor and manage such a wealth of information.

Another great example of how digital signature technology can help eliminate paper and improve business processes, is the case of South Carolina Department of Mental Health (SCDMH) in United States. SCDMH supports the operation of 10 Community Mental Health Centers and operates under strict organization-wide HIPAA compliance.

The adoption of digital signatures was a necessity with the cost and bottleneck complications created by generating 10,000 paper-based medical forms each day.

SCDMH's transformation to an electronic workflow significantly improved process efficiency by removing the barriers that a paper-based workflow presents in the time and costs associated with physically routing and archiving vast amounts of documentation. SCDMH understood that making the thousands of documents created each day electronic would accelerate business processes, eliminate paper-related costs (i.e., paper, printing, ink, scanning, faxing, routing, replacing lost documents and prolonged processing time), and reduce the amount of money and manpower invested in archiving the documentation.

With over 1300 medical staff utilizing the digital signature solution as part of their overall electronic workflow, SCDMH locations were enabled to eliminate the printing and signing of close to 10,000 documents each day, while maintaining full compliance with HIPAA Security Standard Regulations, and saving over $4 million in the first year of implementation. In the SCDMH healthcare facilities currently using the digital signature solution, the migration to a paperless workflow has reduced document processing time from days to seconds. The environmental benefits of SCDMH's digital signature implementation are no less noteworthy, since the digital signature solution is expected to incur a vast amount of paper reduction. SCDMH estimates they will eliminate printing about 3 million documents each year.

The adoption of digital signature solutions in the Greek public administration is expected to save costs by about 380 million euro at the end of the first year of operation.

The above results become even more illustrative when they are compared to other cost savings mechanisms that have been used in the Public sector during the fiscal consolidation process that is underway for the last 4 years in Greece. More specifically the fiscal impact of the mobility and firing schemes that are expected in the Public Sector for the period 2013-2018 (15000 employees) is hardly 100 bill1€. This is a clear indication that the diffusion of such solution to the Public sector – even if only partially implemented – is by far more effective than personnel reductions. If designed properly, the Digital signature project can provide to policy makers a wider set of options when introducing human resource management policies in the Public Sector.

5. Open Data

5.1 Importance and benefits of open data

It is widely believed, that **open government data** can help increase **effectiveness and efficiency in the government operation.** For instance, putting **data and information online** helps **save service time for government bodies** and **administrative costs**. The Bristol City Council calculated that answering a request by telephone or in person, may cost up to 15 times more than over the internet. **Every minute** the **world generates 1,7 million billion bytes** of data, equivalent to 360,000 standard DVDs[6]. More digitized data was created in the last two years than in the rest of human history. This trend and the **mountains of data** it produces is **called "Big data**". The **big data sector is growing at a rate of 40% a year**. Correspondingly, the **public sector constantly produces data**, across all its activities and administration levels. The **open provision of this information is called "open (government) data (OGD)**".

Moreover, apart from the cost efficiency, the **public sector has** further and considerable **benefits** in terms of **transparency.** In particular, open data is a necessary condition for transparency and accountability in the public administration. In this manner **all citizens** are able to **question** and **control** the **decision making processes** of the public administration and are empowered to act accordingly. **Open data can also be used for informative purposes**. For instance, the Lithuanian tool www.kurgyvenu.lt ("where do I live"), which is built exclusively on government data, provides Lithuanian public with an easy way to learn about their neighbourhood -it provides information about pollution and noise around their house, crime levels, housing prices, schools and kindergartens nearby with their rankings, average estate and utility costs, distances to sites of interest etc. This has proved to be a tremendously relevant service to the public.

In addition to that, a very **important aspect to open data** is the fact that **many types of services can be *crowdsourced* and / or delegated to private sector**. For instance, applications re-using environmental data and offering, say, pollution maps or easy route-planning solutions help governments save time while at the same time providing **opportunity to generate income to private sector**. It is also thought that open data stimulates creation of **new business entities**. In **countries** where governmental bodies **providing public information**

[6] European Commission, "What is big data?" Memo 13/965, 07/11/2013

have moved to **marginal/zero cost** charging models, the number of **re-users increased by between 1,000% and 10,000% leading to an increase in revenues.**

Table 8: Benefits of using open data

Benefit to government	Benefit to private sector	Benefit to NGOs / civil society
Increased **tax revenues** through increased economic activity	**New business opportunities** for services / goods	**Better informed monitoring**
Creation of jobs	**Reduced costs for data conversion** (no need to convert into raw formats anymore)	**New venues** for project action: building tools/applications
Reduction in data **transaction costs**		
Increased **service efficiency** through linked data)	**Better decision-making** based on accurate information	**Increased sustainability** potential through increased capacity
Increased GDP	**Better-skilled workforce**	
Encouraged entrepreneurship (**economic growth**)		

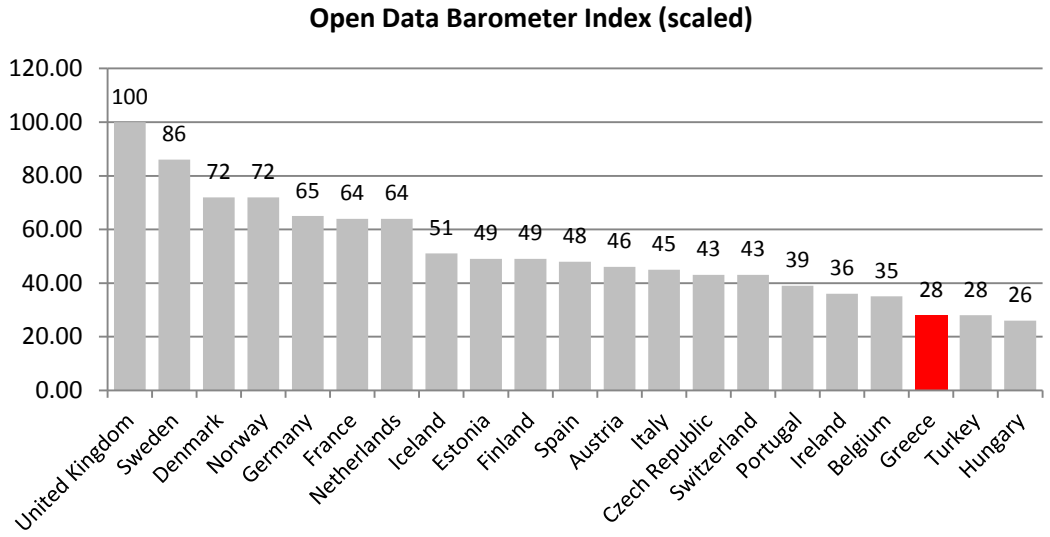
Examples of open (government) data are:

- **Business information** (including Chamber of Commerce information, official business)
- **Registers, patent and trademark information and public tender databases**
- **Geographic information** (including address information, aerial photos, buildings, cadastral information, geodetic networks, geology, hydrographical data and topographic information)
- **Legal information** (including decisions of national, foreign and international courts, national, legislation and treaties)
- **Meteorological information** (including climate data and models and weather forecasts)
- **Social data** (including various types of statistics on economics, employment, health, population, public administration)
- **Transport information** (including information on traffic congestion, work on roads, public transport and vehicle registration).

Open data has not been actively and systematically harnessed by **Greece**. According to **Open Data Barometer (2013)** which **analyzes global trends, and ranks countries** and regions **based on 1) readiness** to secure the benefits of open data 2) actual levels of **implementation** 3) **impact** of such initiatives, **Greece holds one of the last positions** compared to other

European countries. However, **among all countries** in the index, Greece is **ranked 27th out of 77 countries**, outperforming most countries in Africa, Middle East and Central Asia.

Figure 11: Open Data Barometer Index (scaled) (2013)



Source: Open data barometer index, Selection of countries in the European continent

However, **recently Greece has launched Geodata.gov.gr.** Geodata.gov.gr was **designed**, **developed**, and **maintained** by the **Institute for the Management of Information Systems of the "Athena" Research and Innovation Center in Information, Communication and Knowledge Technologies**, with the aim to provide a **focal point for the aggregation, search, provision and portrayal of open public geospatial information**. Geodata.gov.gr is one of the Greek Government's open government **initiatives** in the fr**amework of the Open Government Partnership**. Further, its op**eration** is **included** in the **Road Map** to support the **enforcement of Law 3979/2011** for e-Government, as a **best practice** example for the application of Information & Communication Technologies (ICT) in the public administration, and as an open data repository for the provision of geospatial information. Finally, geodata.gov.gr provides technical support to the National Spatial Data Infrastructure, in accordance to the National Strategy for ICT and e-Government.

Box 4: European policy measures for the improvement of the regulatory framework for electronic signatures

- According to a **study** by the Research Institute of **Finnish Economy**, **firms that reuse government** released geographical data, either freely or at marginal costs, **grew 15% more per annum** than in countries that price such information with an objective of recovering costs. Also the **Austrian public sector body** responsible for geographic information, BEV, **lowered charges by as much as 97%, resulting in a 7,000% growth in demand for certain product groups**. It seems that in a **long-term, economic benefits to government may come back if data charging policies change**.
- The use of open data can also help **save public funds**. The National Health Services (NHS) in **UK** started **publishing infection rates of all hospitals** on the portal data.gov.uk. This publication, coupled with the **sharing of league tables showing the worst hospitals**, encouraged exchange of best practices amongst hospitals. It **brought down infection rates** from around 5,000 patients annually to fewer than 1,200. The initiative also achieved a cost savings of £34 million.

Different approaches have been used in the literature in order to measure the value of open data and the potential benefits of open access and re-use. These have included **top-down econometric modelling, extrapolations** based on surveys of PSI producers and users scaled to national or regional markets, **estimates based on agency costs and consumers' willingness to pay**, and **estimates of elasticities and multipliers**.

Pira and University of East Anglia (2000), generalizing from case studies and scaling up, **estimated investment value of open data** (i.e. what governments invest in the acquisition of open data) and **economic value of open data** (i.e. the national income attributable to activities built on the exploitation of PSI) in the European Union, putting the former at around **EUR 9.5 billion per annum in 1999** and **the latter at around EUR 68 billion** (equivalent to approximately 1.4% of EU GDP –a seven-fold return on investment).[7] By comparison, they put

[7] PIRA (2000) Commercial exploitation of Europe's public sector information, European Commission, Brussels. April 2011

open data investment in the United States at EUR 19 billion per annum and economic value at EUR 750 billion, suggesting that the EU could reach US levels with more open access regimes, but would only need to double the value of PSI for governments to recoup the lost revenues from PSI sales in increased tax receipts.

Dekkers et al. (2006) employing a large survey of open data producers and users, **sought to estimate the size of the open data market in Europe** (i.e. the MEPSIR study). In the MEPSIR study of Dekkers et al. (2006), demand and economic performance were measured in an extensive survey by directly asking both public content holders and re-users for key economic data, such as total turnover against turnover related to open government data, total number of staff against the number of staff dedicated to handling open data, and estimates of domestic market for a particular type of open data.

The European open data market value was then estimated from the average revenues multiplied by the average number of re-users per open data domain, minus the cost of open data collection/generation. Based on the estimates of re-users they put the **overall market for open data in the EU plus Norway at around EUR 27 billion** (approximately 0.25% of aggregated GDP).[8] This is a much lower number than suggested by the PIRA study, despite it being market size rather than value added and coming five years later. Making some adjustments with the benefit of hindsight, **te Velde (2009) suggested that the value might drop further from EUR 27 to EUR 5 billion or even EUR 3 billion**[9] – only around 5% of the PIRA study estimate, and less than PIRA's estimate of investment value. Moreover, Huijboom and Van den Broek (2011) provide an international comparative analysis on open data strategies.

[8] Dekkers, M., Polman, F., te Velde, R. and de Vries, M. (2006) "MEPSIR: Measuring European Public Sector Information Resources", European Commission, Brussels, April 2011

[9] Te Velde, R. (2009) 'Public Sector Information: Why Bother?,' in Paul Uhlir (ed.) The socioeconomic effects of public sector information on digital networks: Towards a Better understanding of different access and reuse policies, National Academies Press, Washington DC, April 2011

Box 5: Best practices in open data from other countries

- **DotEcon (2006)** produced a report for the **UK** Office of Fair Trading (OFT) in which they developed a **bottom-up approach** to **estimating the economic value of open data products and services in the UK,** seeing the net economic value of PSI as the willingness to pay for PSI minus the cost of supplying it (essentially, the net consumer surplus). They also looked at the costs (detriment) of barriers to use, including: unduly high prices, distortion of downstream competition, and failure to exploit PSI. The results indicated that the net value of open data in the UK was around GBP 590 million per annum in 2005. The costs of the three types of detriment were estimated to be GBP 20 million from high pricing, GBP 140 million from restriction of downstream competition, and GBP 360 million from failure to exploit PSI – suggesting that the value of PSI could be doubled by resolving the problems identified.15
- Looking at spatial information in **Australia**, ACIL Tasman (2008) estimated that industry revenue in 2006-07 could have been of the order of $1.37 billion and industry gross value added around $682 million. Using a General Equilibrium (GE) modeling approach, they concluded that the economic footprint of the spatial information industry was larger.

Studies conducted **on behalf of the European Commission** show that **industry and citizens** still **acknowledge difficulties** in finding and re-using public sector information. This implies that **open data** are still largely **undeveloped** in Europe. Even concerning geographical information, which is one of the most favorite and well known applications of open data almost 80% of the respondents to Commission surveys say that they are prevented from making full use of information held by public bodies. **Reasons include high fees, non-transparent rules and practices regarding re-use, a lack of transparency on what type of data is held and by whom, and exclusive licensing agreements which may have the effect of undermining competition**. In its 'Digital Agenda for Europe' the Commission identified the **re-use of public sector information**, alongside fast and ultra fast internet access, as **a key to delivering a Digital Single Market**. The **Commission** will also **lead by example**, opening its vaults of information to the public for free through a **new data portal**. It runs a data portal website as a **single access point for the information** that it holds, encouraging EU institutions,

agencies and bodies to use this access portal for their documents. It will continue **supporting** open data initiatives, through f**unding provided by Horizon 2020 and Connecting Europe Facility (CEF)**.

Box 6: Directives of European Commission for the development of open data

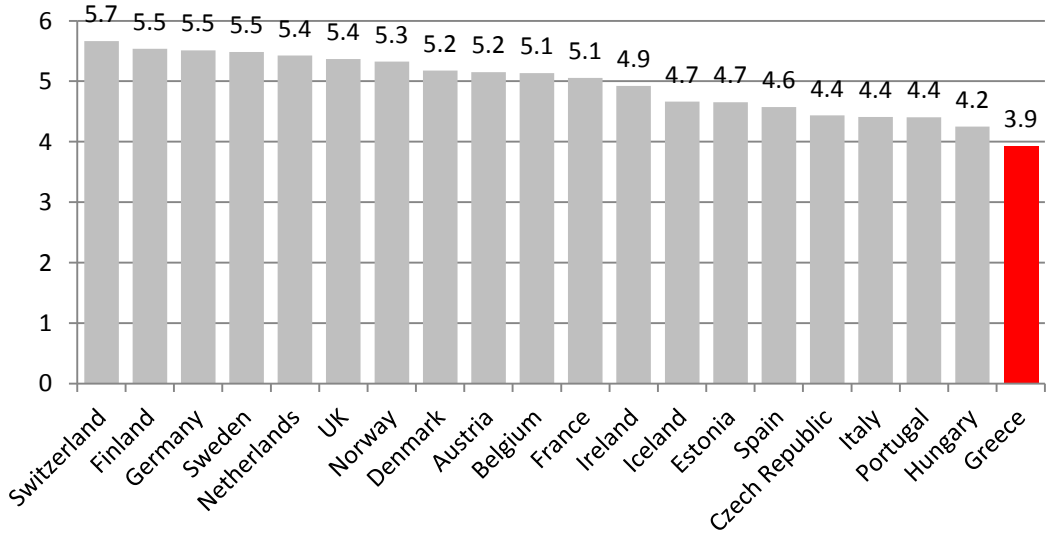
- A first set of measures for stimulating the development of open data in member countries has been the **Directive 2003/98/EC** on the re-use of public sector information. The **Commission** has also **launched** an **Open Data Strategy for Europe**. Member States such as the **United Kingdom and France that have acted earlier** are already demonstrating gains in terms of job creation, growth and social welfare.
- Therefore, in **June 2013**, a **revision of the Directive has been adopted**. **Member States** now have **2 years to transpose the provisions of the revised Directive into national law**. According to the new directive:
  - **Public sector bodies** are encouraged to **apply lower charges or to apply no charges for re-use of information**.
  - The **total income from charging should not exceed the costs incurred to produce and disseminate the information**, together with a reasonable return on investment.
  - Conditions for **re-use shall be non-discriminatory** for comparable categories of re-use.
  - Member States are encouraged to **use standard licenses in digital format**
  - **Licenses should not unnecessarily restrict possibilities** for re-use **or** be used to restrict **competition**.

5.2 Economic impact of open data: a quantification analysis

Besides from the direct revenue of the use of open data, it is eq**ually important to measure the impact of open data to critical aspects of the society and economy** (country competitiveness, government sector transparency, entrepreneurship).

a) In the midst of an increasingly open and integrated world economy where countries compete for investment and human capital that are critical to their economic growth **country competitiveness** has become a **central theme for both developed and developing nations**. This **focus on national competitiveness** has been increasingly **reinforced by global competitiveness rankings** published, on a regular basis, by a variety of institutions. **Greece lags behind most EU countries in terms of competitiveness and therefore has set the enhancement of national competitiveness as a top priority** in order to deal with the severe economic crisis.

Figure 12: Competitiveness of European countries based on Global Competitiveness Index



Source: World Economic Forum's Global Competitiveness Index (2013)

We apply **OLS regression technique** in order to measure the **effect of open data** (basic independent variable) **on the competitiveness** (dependent) **variable.** Some technical details on the models used are provided in the Appendix.

The findings have considerable policy implications for countries that want to prioritize open data initiatives especially in times of crises. The results of the empirical analysis are presented

in the following table. The OLS estimates reveal that a 1% increase of open data will result in a 0.097- 0.145 percentage increase in competitiveness (model 1, 2 & model 3). Thus, **a 100% increase of open data barometer of Greece will result in a significant increase in its ranking position in terms of competitiveness from the current (56th) to the 31st**. The variable pub, added in model 3 is also statistically important at 5% level having a smaller positive coefficient (0.016).

Table 9: Estimated impact of open data use on competitiveness: OLS regression results

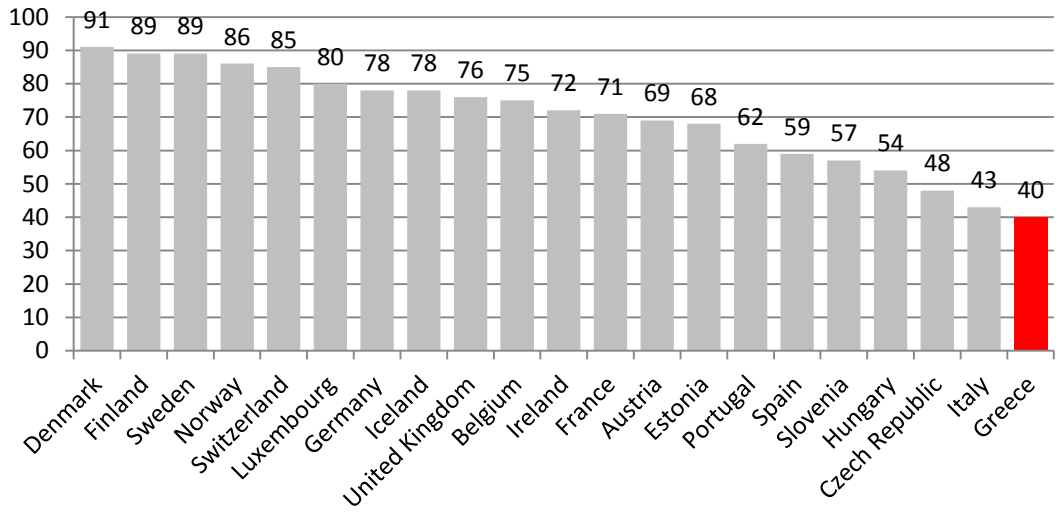
Dependent Variable Global Competitiveness Index (GCI)	Model 1	Model 2	Model 3
Open data Barometer(odb)	**0.145*** (0.015)**	**0.121*** (0.019)**	**0.097*** (0.022)**
Taxonomy based on GNI per capita (class)	-	**0.025* (0.013)**	0.016 (0.014)
Scientific and technical journal articles (pub)	-	-	**0.016** (0.007)**
Constant term	**1.004*** (0.051)**	**1.012*** (0.05)**	**1.006*** (0.05)**
R-squared	0.5498	0.5723	0.5855

Notes:

*The null hypothesis that each coefficient is equal to zero is rejected at the 10% level of significance.
**The null hypothesis that each coefficient is equal to zero is rejected at the 5% level of significance.
***The null hypothesis that each coefficient is equal to zero is rejected at the 1% level of significance. Standard errors are reported in parentheses. P-values of all tests are reported in square brackets.

b) Transparency is an **essential ingredient** for effective **political control and monitoring** of the **public sector** as well as an **important element of many trade and investment agreements**. We apply **OLS regression technique** in order to measure the **effect of open data** (basic independent variable) on **transparency** (dependent variable). Some technical details on the models used are provided in the Appendix.

Figure 13: Transparency International's Corruption Perception Index performance of European countries, 2013



Source: Transparency International's Corruption Perception Index, 2013

Focusing on the OLS estimates, our basic findings show **that open data affect significantly** and in a positive way the **transparency** at 1,% 5%, 10% level of statistic significance correspondingly. It seems that **a 1% increase of the open data use will result in a 0.215-0.362 percentage increase of the transparency index** (model 1, 2 & model 3). Thus, **a 100% increase of open data barometer of Greece will result in a significant increase in its ranking position in terms of transparency from the current (80th) to the 47th**. The variable "Time to prepare and pay taxes (hours)", in model 3 is also statistically significant at 1% level having a negative coefficient (-0,223). Delays in paying taxes as well as bureaucracy in general, hinder transparency.

Table 10: Estimated impact of open data on transparency

Dependent Variable Transparency International's Corruption Perception Index	Model 4	Model 5	Model 6
Open data (odb)	**0.362*** **(0.044)**	**0.300*** **(0.056)**	**0.215*** **(0.05)**
Taxonomy based on GNI per capita (class)	-	**0.065*** **(0.037)**	**0.091*** **(0.032)**
Time to prepare and pay taxes (hours) (timetax)	-	-	**-0.223*** **(0.041)**
Constant term	**2.694*** **(0.145)**	**2.714*** **(0.144)**	**4.099*** **(0.284)**
R-squared	**0.480**	**0.505**	**0.644**

Notes:

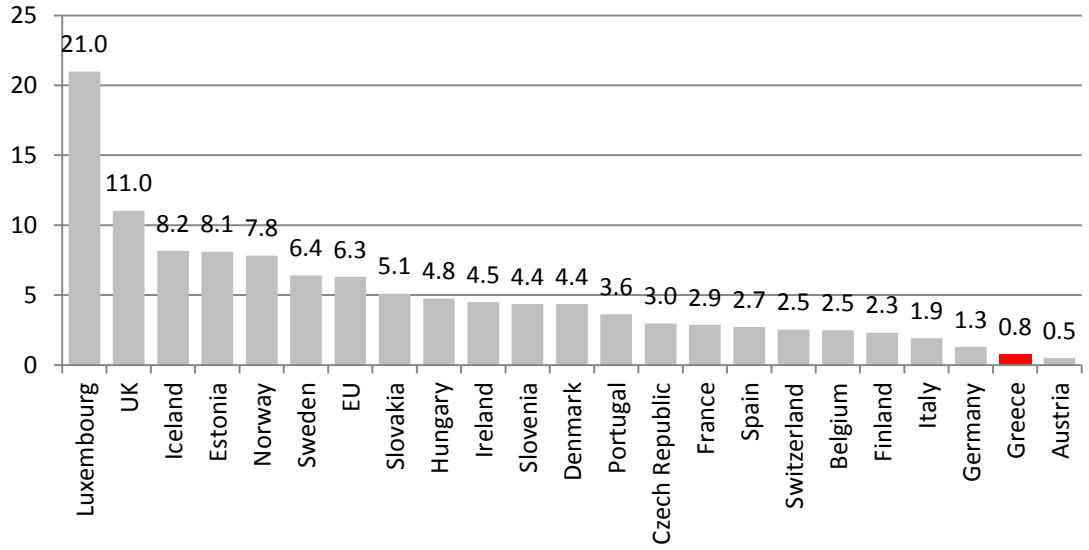
*The null hypothesis that each coefficient is equal to zero is rejected at the 10% level of significance.

**The null hypothesis that each coefficient is equal to zero is rejected at the 5% level of significance.

***The null hypothesis that each coefficient is equal to zero is rejected at the 1% level of significance. Standard errors are reported in parentheses. P-values of all tests are reported in square brackets.

c) **Entrepreneurship** is of particularly high significance in economies as it is thought to **trigger innovation and growth**. Especially in times of recession, **business activities help spur economic activity and encourage exchange**.

Figure 14: New business density (new registrations per 1,000 people, age 15-64) performance of European countries, 2012 or nearest year)



Source: Worldbank, 2012

We apply **OLS regression technique** in order to measure the **effect of open data** on **new business creation.** We apply **OLS regression technique** in order to measure the **effect of open**

data (basic independent variable) on **new business creation** (dependent variable). Some technical details on the models used are provided in the Appendix.

Focusing on the OLS estimates, our basic findings show that open data affect significantly and in a positive way the creation of new businesses at 1,% 5%, 10% level of statistic significance correspondingly. It seems that **a 1% increase of the open data use will result in a 0,572-1,102 percentage increase of new business registry** (model 1, 2 & model 3). The new variable "Time to prepare and pay taxes (hours)", in model 3 is also statistically significant at 5% level having a negative coefficient (-0,39). **Delays in paying taxes as well as bureaucracy in general, hinders entrepreneurship.**

Table 11: Estimated impact of open data on new business creation

Dependent Variable New business density (nbd) 2012	Model 7 Coefficient	Model 8 Coefficient	Model 9 Coefficient
Open data (odb)	**1.102*** (0.197)**	**0.703*** (0.232)**	**0.572** (0.235)**
Taxonomy based on GNI per capita (class)		**0.411*** (0.143)**	**0.423*** (0.139)**
Time to prepare and pay taxes (hours) (timetax)			**-0.39**(0.19)**
Constant term	**-3.245*** (0.674)**	**-3.083*** (0.64)**	-0.62(1.352)
R-squared	0.334	0.414	0.452

Notes: *The null hypothesis that each coefficient is equal to zero is rejected at the 10% level of significance.

**The null hypothesis that each coefficient is equal to zero is rejected at the 5% level of significance.

***The null hypothesis that each coefficient is equal to zero is rejected at the 1% level of significance. Standard errors are reported in parentheses. P-values of all tests are reported in square brackets.

Thus, a 100% increase in the diffusion of open data in Greece will result in the creation of 6332 new businesses.

The main findings of the quantification analysis for the economic impact of open data can be summarized as follows:

Box 7: Policy suggestions to support the development of open data

Policy actions in the context of the Greek e-Government Strategy 2014-2020 (setting by the Ministry of Public Administration and e-Governance)

- **Facilitationfor re-use** of public sector information
- **Organization of open data** by default principle
- **Provision of access to open data** for start-ups operating in high value-added activities
- **Improvement of the sustainability and access** to digital material
- **Creating digital material** for government files
- **Introduction of a single service registry**
- **Allowance and organization of open access to public information**
- **Creating two identical data centers**, one for the Ministry of Finance and the other one for the rest of e-Government projects

Next Step Strategies

- **Recording and diffusing knowledge** on the available data per public organization
- **Supporting partnerships** between public sector and private data centers
- **Creating a platform** for government practitioners to **exchange ideas and/or experiences** on open data projects
- **Development of a guide for government practitioners** to foster public sector information and data reuse
- **Educating and informing government practitioners** via workshops on how to publish public data online
- **Creating open technical standards** fostering interoperability in the services of public administration for related ministries
- **Monitoring the progress** being made with respect to open data projects
- **Investing in digital infrastructure** and multilevel architecture in the public sector to provide access to open data
- **Simplification of regulatory framework** to speed up and increase the use of open data within and between public sector organizations and ministries of

Box 8: Best practices for the development of open data

There are several open data initiatives taking place in many European Union countries. A few of those are briefly mentioned below:

Transport for London (TfL), the integrated transport organization responsible for the United Kingdom's capital city, wanted to give its customers more real-time data about journey options. So, it has removed since 2010 the restrictions on commercial use of its travel information, and has released several datasets for download from the cloud. This was the first major step forward as part of their comprehensive Digital Strategy and Open Data policy initiative. The London Datastore includes free access to information on planned weekend Tube works, location of stations, licensed taxi operators, Oyster card top-up points, bus routes and stops, timetables and schedules, even annual survey data showing typical door-to-door journey times.

By encouraging developers to use TfL data to create new applications for commuters and tourists, the transport operator hopes to relieve congestion and encourage more people to use options such as bicycle hire. TfL created a real-time data feed for its TrackerNet website for trains in just six weeks leveraging cloud technology. This specialist TfL website that previously had 1,000 hits a day has now reached approximately 2.3 million, while TfL has saved the millions of pounds it would have spent building its own IT infrastructure. This initiative was aiming to create a set of interesting new apps and resulted in a stronger relationship between the open data community and TfL.

In France, Ile-de-France Administrative Region offers open data on budget execution (budget numbers, expenses, etc.) by department and function, while City of Paris offers also publicly data on services contracts executed by the administration. These data come from both the institutions, their partners and associated organizations, other regional governments, or private data with a regional dimension. These initiatives aimed mainly in ensuring transparency, so that the people would be better informed and understand the public policies and the initiatives undertaken by the Region. The broad availability of such data is expected also to stimulate economic activity in Paris Region through the reuse of data and content to create new services through the launch of calls for projects and competitions. It will help develop long term participation and dialogue with citizens in a process of co-production and improving both the data and services.

- *A 100% increase in the diffusion of open data in Greece will result in a significant increase in its ranking position in terms of competitiveness from the current (56th) to the 31st.*
- *A 100% increase in the diffusion of open data in Greece will result in a significant increase in its ranking position in terms of transparency from the current (80th) to the 47th.*
- *A 100% increase in the diffusion of open data in Greece will result in the creation of 6332 new businesses.*

The results especially in terms of creating new businesses are reinforcing the fact that open data can provide a new test bed for entrepreneurship. New activities, products and services can be developed over a wide area of possible meta – data uses. With unemployment rate of 27% Greece is urgently looking for sectors that can fuel job creation and boost sustainable entrepreneurial ventures that can offer innovative services. That is why promoting open data policies represents a top priority issue and should not be acknowledged as a minor technical aspect of the digital agenda

6. E-skills

6.1 Importance and benefits of e-skills

It has been **widely recognized** that the **competitiveness, innovativeness and social cohesion** in the **European economy** are heavily **dependent on** the strategic and efficient use of digital technologies as well as on the k**nowledge, skills, and capabilities of the European labour force and citizens**. A large number of studies argue that **e-skills** can **play a key role in job creation** (e.g. Gareis et al. 2014). Moreover, it has been widely recognized that **e-skills and e-leadership** have a **strong** potential to influence in a positive way **competitiveness and innovation** (e.g. Hüsing et al., 2013). By definition "**e-skills"[10] encompass a wide range of ICT-intensive capabilities** (knowledge, skills and competences) which in turn can be exploited over a number of economic and social dimensions. Basically, **e-skills** can be **classified in** the following **3 groups:**

- **ICT user skills**: the capabilities required for the effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work. User skills cover the use of common software tools and of specialized tools supporting business functions within industry. At the general level, they cover "digital literacy": the skills required for the confident and critical use of ICT for work, leisure, learning and communication.
- **ICT practitioner skills**: the capabilities required for researching, developing, designing, strategic planning, managing, producing, consulting, marketing, selling, integrating, installing, administering, maintaining, supporting and servicing ICT systems.
- **e-business skills**: these cover a range of skills, attributes and attitudes related to: knowledge of the capabilities and limitations of software systems and information systems in use; ability to quickly assess new capabilities of existing systems and the relevance of offers of software and web services emerging on the market; ability to describe prototype solutions; understanding of the fundamentals of alignment of business and IT functions in an organization.

Nowadays, **Europe** is **at turning point** to return in economic recovery, following a prolonged and deep economic recession. In this context, **e-Skills appear as a central strategic tool** than

[10] European e-Skills Forum, Synthesis report "e-Skills for Europe: Towards 2010, 2004

ever in order **to help the European economy** to be oriented **towards a dynamic, smart, sustainable and inclusive growth**. Individuals with strong e-Skills are expected to play a key role in fostering innovativeness and competitiveness to the European economy. Also, It has been broadly recognized in several international studies and reports that the **successful implementation of ICT depends** mainly **on the availability of a labour force** possessing the relevant **ICT knowledge and skills**. **Digital skills** seem to be **essential for employees** and **leaders** working in SME's, for **young** people, for **unemployed** individuals. Given the rapid development of digital economy, **individuals with high knowledge on ICT-use** seem **to exhibit greater challenges and opportunities**.

While there is a **growing demand for people with good skills in the ICT** many countries across the globe are confronted by **e-skills shortages** - with insufficient numbers of adequately trained ICT practitioners to meet the growing needs of organizations, acting as a brake on regional productivity, competitiveness and innovation. Many young people today have some experience with ICT and know everything about games and social media, but most of them still are not digitally competent. Still it appears that especially **young people should be convinced of the importance of e-skills**.

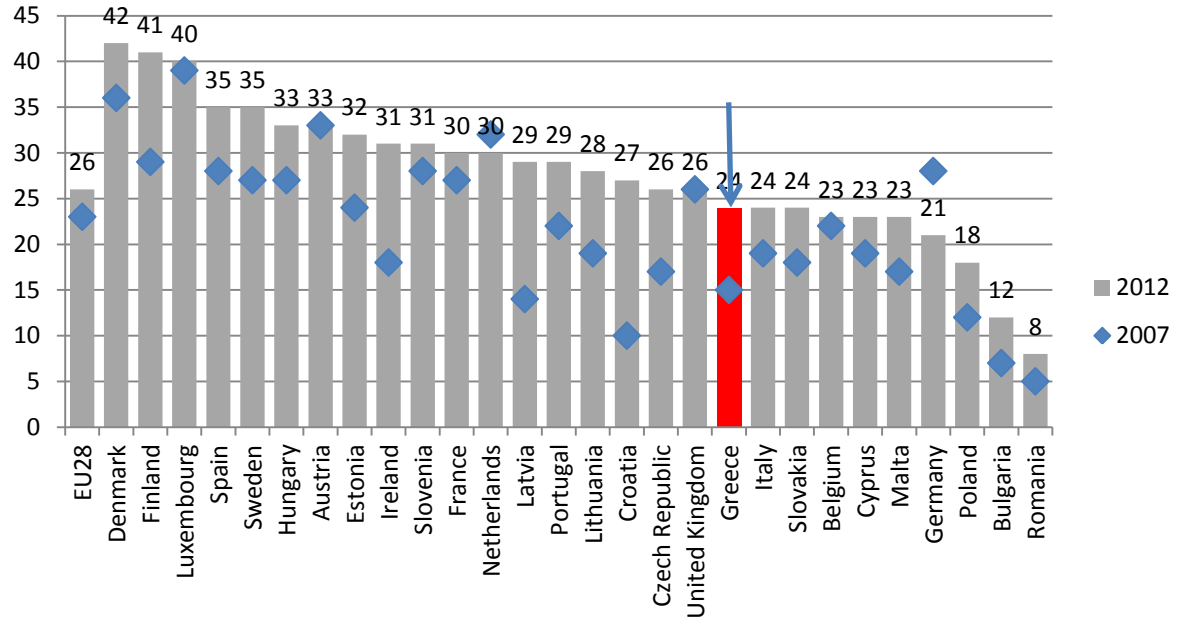
With high levels of unemployment and increasing inequality in many countries, there is **a new focus on programs** that are geared to**ward improving the workers' abilities to function effectively with modern ICT,** improving the employability of job seekers, increasing workplace efficiency and productivity, and enhancing personal, family and community functionality. In general, there should be more attention for e-skills at the European and national level. European **ICT companies must recognize that even the highest level of education is not a one-time event**. Indeed, learning can and must occur in all kinds of contexts and throughout life to enable Europeans to create products and services that are not easily replicated. **The future innovation strategy for the European ICT software and services sector is a skills- and learning-intensive strategy**. Europe should initiate forward-looking systemic reforms in the education and lifelong learning systems so that the workforce acquire skills and mind-sets that will enable Europe to take the lead in new and more open forms of market and user driven innovation.

Table 12: Benefits of e-skills

Benefit to public sector	Benefit to private sector	Benefit to citizens
Contribution to **economic growth**	Enhanced **competitiveness** and **innovation** capability	Increased **social cohesion**
Strengthened regional **productivity**, **competitiveness** and **innovation**	Better implementation results of ICT adoption in industry	Reduction of **unemployment** rates in ICT literate workers
		Increased **job security**

Eurostat for the year 2012 reports that approximately **24% of individuals (aged 15-64)** in Greece state that they **have carried out 5 or 6 of the 6 computer related activities**. This percentage is **below but very closely to 26% which is the EU average** for the specific indicator. This indicator constitutes a good proxy for e-skills since the use of a computer is inextricably linked to the ability of an individual to use the Internet. Notably, in **2007 only 15% of individuals used many computer related activities** while the **EU average was 23%,** implying thus that a significant trend of **convergence** in terms of computer use has been achieved **in Greece compared to the average rate of EU countries**.

Figure 15: e skills: Individuals' level of computer skills

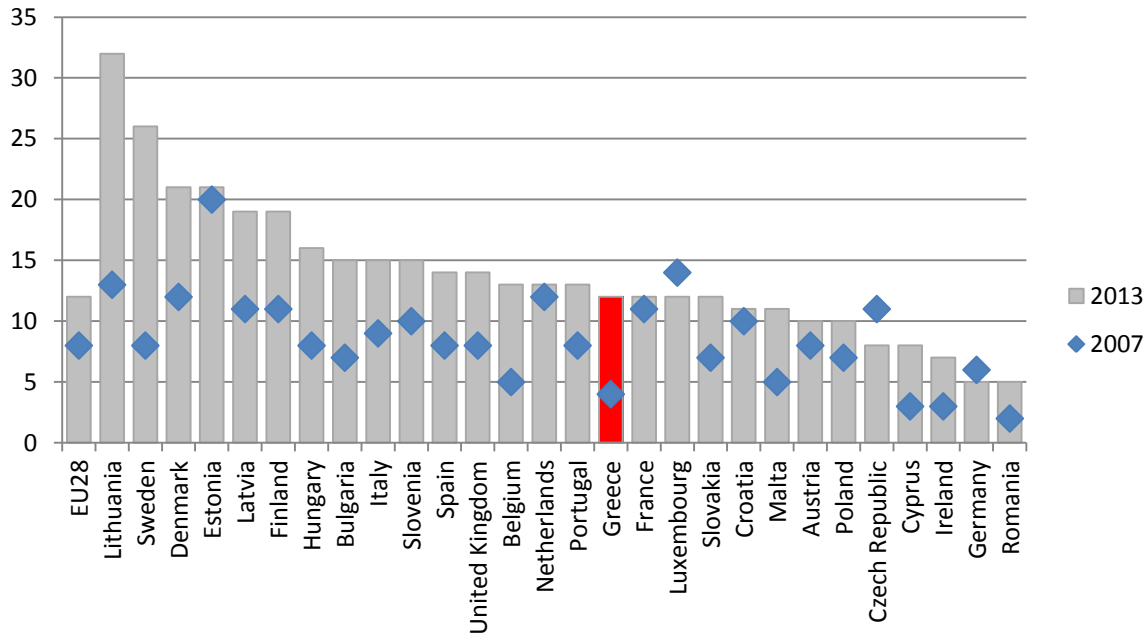


Source: Eurostat

According to Eurostat, a further **proxy indicator for e-skills** involves the **percentage of individuals who have carried out 5 or 6 of the 6 Internet related activities**. In **2013**, **12% of individuals (aged 15-64)** declared that they **used a large number of internet related activities**. This rate is **equal to the average rate of European Union**. It is worth noting that

this rate for Greece has **increased significantly compared to the year 2007**, where the value of the specific indicator for e-skills was only at the low level of 4%.

Figure 16: e skills: Individuals' level of Internet skills



Source: Eurostat

Box 9: Estimated impact of open data on new business creation

- In some countries such as **Denmark**, a new school subject "Computational Thinking and Practice" has been introduced with the objective to move the emphasis away from digital literacy to creational and constructional competencies.
- The **UK** will follow along similar lines in 2014. New approaches to VET are being sought as well: Many countries seek to provide students and workers with alternative channels of educational achievement and to offer improved means for “on-the job” and “just-in-time learning”.
- Career support has become particularly important on labour markets where ICT practitioners are faced with unemployment, such as in **Finland.** Here, it is combined with industrial policy to lure employers to regions with an oversupply of well-qualified ICT practitioners.

6.2 Economic impact of e-skills: a quantification analysis

In the present sub-section we provide a **quantification analysis** setting a **twofold objective**:

- **To estimate the impact of e-skills** (basic independent variable) **on the export activity** (dependent variable)
- **To estimate the impact of e-skills** (basic independent variable) **on new business creation** (dependent variable).

In doing so, we collected **data for e-skills, exports, GDP from Eurostat annually for a time span of a 10-year period (i.e. 2004-2013) for 28 EU countries**, while data for **new business creation selected from World Bank** for the same period and countries.

a) In Table 13 the empirical results obtained from GLS panel random effects estimations are reported. Some technical details and the description of estimated models are provided in the Appendix section. Column 1 provides the variables used in our estimated models. Columns 2-4 present the estimation results for each equation model respectively. The **quantification analysis yields interesting results**, since the $\boldsymbol{\beta_1}$ **coefficient appears highly positive** and significant at 1%. This implies a **strong and positive impact of e-skills on exports**. More specifically, **the coefficient ranges from 0.4 - 0.65 meaning that one percentage point increase in e-skills could cause a positive change in exports by about 0.4 - 0.65 percentage points**. In other words, export growth is heavily dependent on the development of e-skills. Also, GDP growth appears to influence in a strong and positive way the export activity of economies, as expected.

Table 13: The impact of e-skills on the export activity of EU countries: Random-Effects GLS Regression results

Dependent Variable Exports/GDP	Model 10	Model 11	Model 12
E-skills	**0.652 *** (0.160)**	**0.642 *** (0.181)**	**0.398 * (0.246)**
GDP growth rate	-	-0.043 (0.320)	0.059 (0.424)
Constant term	**0.525 *** (0.058)**	**0.526*** (0.059)**	**0.557*** (0.067)
Year dummy 2005	-	-	-0.040 (0.039)
Year dummy 2006	-	-	-0.018 (0.036)
Year dummy 2007	-	-	-0.018 (0.034)
Year dummy 2010	-	-	-0.012 (0.026)
Year dummy 2011	-	-	0.019 (0.025)

Notes: No of observations 158. *The null hypothesis that each coefficient is equal to zero is rejected at the 10% level of significance. **The null hypothesis that each coefficient is equal to zero is rejected at the 5% level of significance. ***The null hypothesis that each coefficient is equal to zero is rejected at the 1% level of significance. Standard errors are reported in parentheses. A Hausman test has been performed in order to choose between random effects and fixed effects regressions.

Given the above it seems that the increase of ICT users is not negligible in terms of exports, since our findings indicate that **if we increase digital literacy and e-skills by 1000 individuals, exports are expected to be increased by about EUR 13.9 million** in terms of the 2013 level of GDP in Greece (in constant prices).[11] This **conclusion** seems to be **logic** since the **estimation for exports per individual with eskills** based on Eurostat data equals **to 55,5 thousand euros.**

[11] This conclusion obtained from the following calculation: Change in exports = (Coefficient)*Change in independent variable*GDP_{2013}.

Data for Greece:

Population of the age group 15-64 =7,500,000

GDP (2013) 160,9 billion euros in constant prices

Exports (2013)= 50 billion euros

Individuals with eskills=12% of population with age 15-64 years old i.e.900 thousands persons wirh eskills

Table 14 provides the estimations obtained from **GLS panel random effects regressions**. Technical details of the models and variables used are provided in the Appendix. Column 1 presents the variables used in our estimated models. Columns 2-4 present the estimation results for each equation model respectively. The coefficient of e-skills appears positive and significant ranging from 0.12 - 0.17 implying that **one percentage point change in e-skills could cause a positive change in new business creation by about 0.12 - 0.17 percentage points**. Hence, e-skills influence positively new business creation. Also, **GDP growth** appears to **affect in a strong and positive way the new business formation**, as expected. Some technical details on the methodology used are provided in the Appendix.

Table 14: The impact of e-skills on the new business creation of EU countries: Random-Effects GLS Regression results

Dependent Variable New Business Density	Model 13	Model 14	Model 15
E-skills	**0.137*** (0.035)**	**0.171*** (0.034)**	**0.125** (0.054)**
GDP growth rate	-	**2.851*** (0.807)**	**1.933 * (1.022)**
Constant term	**1.665*** (0.185)**	**1.653*** (0.185)**	**1.560*** (0.198)**
Year dummy 2005	-	-	-0.066 (0.092)
Year dummy 2006	-	-	-0.007 (0.072)
Year dummy 2007	-	-	0.082 (0.064)
Year dummy 2010	-	-	-0.013 (0.055)

Notes: No of observations 121. *The null hypothesis that each coefficient is equal to zero is rejected at the 10% level of significance. **The null hypothesis that each coefficient is equal to zero is rejected at the 5% level of significance. ***The null hypothesis that each coefficient is equal to zero is rejected at the 1% level of significance. Standard errors are reported in parentheses. A Hausman test has been performed in order to choose between random effects and fixed effects regressions.

Regarding the estimated effect of e-skills on new business formation, it can be concluded that **if 1000 more individuals obtain e-skills, it is expected approximately 72 new businesses to be created[12].**

[12] This conclusion obtained from the following calculation: % Change in New Business Density = (Coefficient) percentage change in independent variable* Population

Data for Greece:

The main findings of the quantification analysis for the economic impact of e-skills can be summarized as follows:

Considering that our dataset for e-skills analysis includes 28 EU countries, **the coefficients correspond to the average estimates.** Assuming that Greece has the potential to converge in EU average levels -by targeting in the support of digital literacy via operational programmes- the exploitation of the abovementioned economic benefits seems to be feasible.

Box 10: Policy suggestions for the stimulation of digital and ICT skills

Policy actions in the context of the Digital Agenda for Europe (setting by European Commission: DG Enterprise and Industry)

- **Supporting the development of e-learning courses and exchange mechanisms** for e-skills training resources
- **Promoting successful strategies** and policies for e-learning
- **Fostering ICT education** to young people and women
- **Increasing participation of women** in the ICT workforce
- **Motivating mobility of highly-skilled ICT professionals**
- **Monitoring the supply and demand of e-skills**
- **Ensuring that workers** can regularly **update their e-Skills**
- **Developing digital literacy** and e-competence actions tailored to the needs of the workforce both in the public and the private sector, with a particular emphasis on SMEs

Next Step Strategies

- **Taking initiatives to support technology careers in workforce**, e.g. by including mentoring programmes and high-school/university work experience/internships in ICT sector and by establishing a Technology Education and Careers Council
- **Providing ICT training programmes** for immigrants and women
- **Delivering flexible design of ICT training and education programmes**
- **Developing an education system** oriented to technology or ICT leadership
- **Developing ICT human resource labour market** information systems
- **Expanding lifelong ICT learning** programmes
- **Stimulating the emergence of techno-starters**, applied science technologists and technicians e.g. through certified ICT professionals and foreign credential recognition
- **Reduction of the brain-drain of human capital with advanced ICT skills**

Ind

New business density (2013) based on 2010 estimates= 0.766 (per 1000 individuals aged 15-64)

- *If 1000 individuals obtain e-skills, exports in Greece will increase by 13.9 million euro*
- *If 1000 individuals obtain e-skills, 72 new businesses will be created*

There is a wide consensus that the new growth pattern of Greece should be focus on exports and investments. But being export oriented is not an easy option. It means that we need to invest in building capabilities, skills and technology, so our business practices can support this export oriented pattern. Augmenting e-skills can have a major impact on this process as they provide these dynamic capabilities that are necessary to have a global view on markets, clients and competitors.

7. Digital Entrepreneurship and Innovative SME's

7.1 Importance of digital entrepreneurship and innovative ecosystem

A large number of studies and academic papers pay attention to **Information and Communication Technologies** since they constitute a **key driver of innovation and growth** for national economies worldwide. **Fostering innovation-driven entrepreneurship** seems to become **a basic policy priority for developed economies** (for example see Unitated Nations, 2012 and World Economic Forum, 2014). As discussed in previous sections, European Commission gives strategic insights to stimulate Digital entrepreneurship which involves all new start-ups which adopt the latest technologies and established firms which replace old technologies with novel digital technologies. **Digital enterpreneurs are characterized by a high dependence on new digital technologies** (e.g. key enabling technologies, open and big data, mobile and cloud solutions) in order to improve business operations and introduce smart solutions in their transactions with customers and suppliers.

Box 11: The start-up ecosystem in Greece

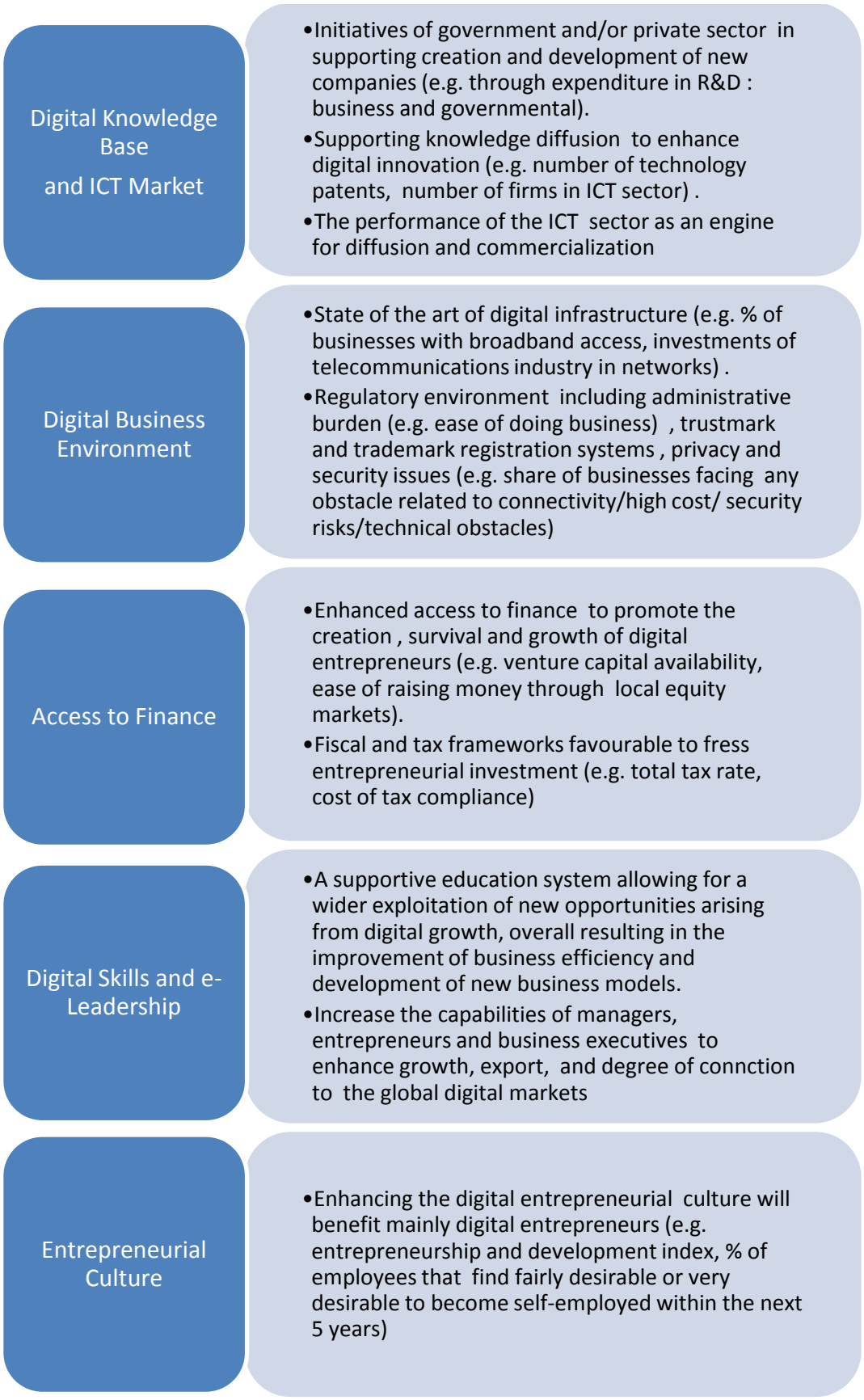
As regards the Greek startup ecosystem over the past five years it has grown in size and has developed its own identity becoming a notable source of innovative solution driven ideas developed by young people with diverse academic backgrounds and experiences. This growth has come as a result of combination of efforts, activities, initiatives and collaborations that had a catalytic role towards making startups an important element of Greek entrepreneurship. These have taken many forms: incubators, accelerators, co-working spaces, educational and idea development workshops, networking events, innovation competitions, inspirational speeches and knowledge sharing of successes and failures, mentorship and consultation. Knowledge, technology, expert insights and support are now available in abundance at no cost. The economic crisis combined with the high levels of skilled and educated youth unemployment have contributed in the reshaping of this notion entrepreneurship. Greek startup success stories achieving key milestones abroad (acquisitions, partnerships, funding, new markets) have helped putting the technology- startup entrepreneurship at the top of the governmental agenda while at the same time offering aspirational yet viable positive examples of employment prospects.

Within this framework new startup ideas in the areas of health care, social solidarity and tourism have been presented and are gaining more and more traction. Examples are: Doctor Any Time for booking appointments with doctors (www.doctoranytime.gr), Kinems educational games for children with disabilities (www.kinems.com), Discover Room booking service for small lodgings (www.discoveroom.com) and Travel Myth hotel recommendation engine (www.travelmyth.com). During this time some core barriers have progressively fallen- new company structures, such as the IKE, have been introduced and venture funds with technological focus backed by the European program JEREMIE (Joint European Resources for Micro to Medium Enterprises) have infused much needed early stage capital to high potential startups so they can reach their next milestones.

While this evolution is notable Greece is still at a very early stage of this type of entrepreneurial scheme and has a long learning curve to reach sustainability for such an environment. The domestic framework needs to assess the adjustments and changes that are required in order for this ecosystem to become an integral part of the Greek culture, education and consequently the economy itself thus allowing for development of knowledge intensive type entrepreneurial activities.

According to European Commission (DG Enterprise and Industry), a new strategic vision entitled “Digital Entrepreneurship” has been also specified aiming to create new challenges and opportunities for entrepreneurs and businesses through the penetration and diffusion of novel digital technologies in order to stimulate the entry, the survival and the growth of firms and consequently to generate jobs. After a dialogue between stakeholders and policy makers, the following 5-pillar strategy has been considered to be implemented in order to foster the development of Digital Entrepreneurship in EU by 2020.

Figure 17: Strategic Pillars for the Stimulation Digital Entrepreneurship in Europe



Source: European Commission: Enterprise and Industry

ICT penetration in businesses and especially in SME's **contribute significantly** to the **improvement and stimulation of productivity, innovativeness, internationalization** and generally to the **competitiveness of businesses**. New digital technologies and innovations evolve rapidly affecting many industries and value chains. Also, they **reduce entry barriers for potential new start-ups**, and at the same time may **motivate established businesses** to follow a creative destruction process in order to sustain their competitive advantage. In general, digital technologies **create** great challenges and **opportunities for the emergence of high-quality start-ups**, i.e. new entrepreneurs with a high potential to grow, create jobs, innovate and export. **Policy makers** throughout Europe it is necessary to **focus** on the **encouragement and support of SME's to adopt advanced digital technologies** and realize the potential economic benefits in terms of job creation and growth.

As regards the term "entrepreneurship and innovation ecosystem", it refers to independent factors working together to facilitate entrepreneurs to collaborate and allow innovation to be a possible and sustainable outcome in a specific location (World Economic Forum, 2009). The emergence of small-sized and multinational start-ups depends significantly on the exploitation of globalized digital communications. The formation of an international customer and supplier base, and human capital electronic specialization in a region with available digital infrastructures, tools and facilities should be a challenge and priority for policy makers to create opportunities for the emergence of digital entrepreneurship and international innovation ecosystems. The **proliferation of global communication networks** can play a role as facilitator, carrier and enabler for new start-ups and their employees worldwide, with the potential to stimulate the emergence of digital entrepreneurial activities and innovation ecosystems.

In the light of the above, **the first step for SMEs** to follow efficiently the evolution of the Digital economy **is to establish their own websites**. To go on-line is necessary for an SME, but it is not enough. At the same time, industrial value chains turn out to be more international and complicated. Hence, the **competitiveness of SMEs** becomes heavily **dependent on their technological capability** adopt efficiently novel digital technologies and do business with larger businesses. In this respect, it is necessary **for SME's** to be able to **integrate global value chains** and in turn to **develop an international business profile**. Smart use of ICT can help SMEs identify and exploit the new opportunities and challenges. However, regulatory framework at national level may constitute a significant obstacle to the exploitation of the abovementioned opportunities. Notably, the enormous potential of smart use of digital technologies in industry value chains, mainly by SMEs remains widely underexploited.

Table 15: Benefits of enhancing digital entrepreneurship and innovative ecosystem

Benefit to government/public sector	Benefit to businesses	Benefit to society/citizens
Encouraging **collaborations** between public sector – businesses – universities etc.	Facilitating the entry into the market of **new and dynamic players**	**Job creation**
Enhancing **technology transfer**	Strengthening **business networks** between SME's and large-sized firms	**Reducing unemployment rate** at regional and national levels
Increasing and ensuring **tax returns**	Making possible for SME's becoming fully integrated **international business partners**	**Knowledge diffusion** within and between regional locations
Increasing GDP and improving **productivity** and **competitiveness** of the economy	**Streamlining** business processes	**Improving skills** of human capital within a region
Increasing **returns on ICT investment**		
Improving **business transactions**		
Reducing administrative **costs** and **errors**		

7.2 Economic impact of Digital Entrepreneurship: a quantification analysis

In this sub-section we provide a **quantification analysis** -utilizing sound econometric techniques for an in-depth micro-economic analysis- **on the effects of ICT-adoption on the performance of businesses** in terms of their **internationalization, growth and innovativeness**. Given that **competitiveness and job creation** in the Greek economy are heavily **dependent on the export activity, innovation, and growth of firms**, the empirical analysis is expected to provide interesting and significant outcomes for the benefits of ICT penetration in businesses. In other words, the **main purpose of the quantitative analysis** is to help the **Greek authorities to assess the impact of ICT adoption in businesses on their innovativeness and export activity**. The results of this quantification will assist the Greek authorities in preparing and designing a renewed policy framework for the development of entrepreneurship and innovation ecosystems based on digital growth at the level of SME's and high-quality start-ups.

Hence, in this section we attempt to **quantify the effects of ICT adoption in businesses and especially in SME's on their innovativeness and export activity** in the light of the recent crisis that hit Greece. In doing so, our dependent variable is innovation and the main independent variable in our regressions stands for ICT adoption. The description of these variables and of the other independent variables used in this analysis are described in more detail within the Appendix section. The basic findings indicate that ICT adoption in businesses increases their probability to innovate by about 4 - 9 percentage points. Moreover, **probit regression**

estimates (marginal effects) show that ICT penetration in businesses facilitates significantly their internationalization since it increases their likelihood to export by about 1.5 - 4 percentage points. Some technical details on the methodology used are provided in the Appendix.

For the needs of this work **we used data on 3500 firms** derived **from a survey conducted by EOMMEX and IOBE in the year 2012**. This survey contains rich information at firm level for issues related closely to the entrepreneurship and innovation ecosystem in Greece since it captures the strategic behaviour of firms, human capital, R&D, ICT adoption, business networks etc. Table 16 presents the empirical results obtained from probit estimations. We report the estimated coefficients derived from marginal effects estimates since they calculate the elasticities in probit regressions. Column 1 provides the variables used in our estimated models. Columns 2-4 present the estimation results for each equation model respectively.

Table 16: Estimated impact of ICT adoption on the Innovativeness of Businesses: Probit Regressions (marginal effects) results

Dependent Variable Innovation	Model 16	Model 17	Model 18
ICT Adoption in SME's	**0.090*** (0.003)**	**0.074*** (0.003)**	**0.041*** (0.004)**
Firm Size	-	0.172*** (0.012)	0.115*** (0.012)
Firm Location	-	-0.040*** (0.009)	-0.025*** (0.009)
Business Activity	-	0.013*** (0.004)	0.012*** (0.004)
R&D	-	-	0.068*** (0.006)
Business Networks	-	-	0.015*** (0.005)
Culture and Initiatives of Employees to take risk	-	-	0.048*** (0.004)
LR χ^2	523.28	738.37	1117.74
Pseudo R^2	0.111	0.157	0.237

Notes: No of observations 3500. *The null hypothesis that each coefficient is equal to zero is rejected at the 10% level of significance. **The null hypothesis that each coefficient is equal to zero is rejected at the 5% level of significance. ***The null hypothesis that each coefficient is equal to zero is rejected at the 1% level of significance. Standard errors are reported in parentheses.

Focusing on the probit estimates of the impact of ICT adoption on the innovativeness of SME's, the **coefficient appears strongly significant and positive ranging from 4.1 percentage**

points to 9 percentage points in the three models under estimation. In other words, our basic finding reveals that the decision of SME's to adopt Information and Communication Technologies increases their likelihood to innovate by about 4 – 9 percentage points.

Regarding the effects of the rest independent variable that have been taken into account in the models 17 and 18, it can be argued that **size, activity and location of SME's seem to matter significantly the probability of SME's to innovate**. Moreover, the estimates in model 3a reveal the **existence of positive and significant linkages of SME's innovativeness to R&D, business networks and riskiness intensity in the business environment** at 1% level of significance. b) In Table 17 the empirical results obtained from probit estimations are presented. As we have explained previously, we report the estimated coefficients derived from marginal effects estimates since they calculate the elasticities. Column 1 provides the variables used in our estimated models. Columns 2-4 present the estimation results for each equation model respectively.

Table 17: Estimated Impact of ICT adoption on the Internationalization of Businesses: Probit Regressions (marginal effects) results

Dependent Variable Exports	Model 19	Model 20	Model 21
ICT Adoption in SME's	**0.039*** (0.004)**	**0.022*** (0.004)**	**0.013*** (0.004)**
Firm Size	-	0.197*** (0.010)	0.185*** (0.010)
Firm Location	-	0.017** (0.008)	0.022*** (0.008)
Business Activity	-	-0.006 (0.004)	-0.0045 (0.004)
Business Networks	-	-	0.021*** (0.004)
Managerial Growth	-	-	0.010*** (0.004)
Bonuses to Employees	-	-	0.008* (0.005)
LR χ^2	93.37	422.69	458.20
Pseudo R^2	0.021	0.096	0.104

Notes: No of observations 3500. *The null hypothesis that each coefficient is equal to zero is rejected at the 10% level of significance. **The null hypothesis that each coefficient is equal to zero is rejected at the 5% level of significance. ***The null hypothesis that each coefficient is equal to zero is rejected at the 1% level of significance. Standard errors are reported in parentheses.

The analysis of probit estimates of the impact of ICT adoption on the internationalization of SME's yields also interesting results, since the coefficient is positive and strong at the 1%

level of statistical significance. In particular, the coefficient ranges from 1.3 percentage points to 3.9 percentage points in the three models under estimation. This finding implies that **the decision of SME's to adopt Information and Communication Technologies increases their probability to export by about 1.5 – 4 percentage point**s.

The estimation for the rest independent variables including in models 20 and 21 show that **firm size and firm location play a significant role in the internationalization of SME's, while the coefficient of business activity does not appear significant**. Business networks and managerial growth affect positively the likelihood of an SME to export at 1% level of significance. **Bonuses to employees seem also to affect in a positive way the export activity** of firms at 10% level of statistic significance.

In overall, our basic findings obtained from the quantification analysis can be summarized as follows:

Box 12: Policy suggestions to enhance digital entrepreneurs and innovative SME's

Policy actions in the context of the Digital Entrepreneurship Strategy (setting by European Commission: DG Enterprise and Industry)

- **Enhancement of digital innovation and commercialization** of ideas in ICT sector
- **Improvement of digital infrastructure**, regulatory framework, and ease of doing business
- **Facilitating access to finance and enhance digital investments**
- **Fostering e-leadership skills** through education and training
- **Creation of a supportive entrepreneurial culture**

Next Step Strategies

- **Harmonization of the relevant laws** and regulations with international norms mainly on issues related to the internationalization of SME's, commercialization, protection of intellectual property rights
- **Alleviation of the administrative burden** on ICT-intensive start-ups
- **Simplification of the procedures governing** the establishment and operation of SME's
- **Implementation of deregulation in product and labour markets**
- **Protection** via legislation framework of **intellectual property rights** for digital entrepreneurs and innovative SME's
- **Stimulating the use of public-private partnership schemes** to promote investment and the involvement of businesses in commercialization and technology transfer
- **Facilitating closer linkages between SME's and universities**
- **Motivating the establishment of joint research ICT laboratories** e.g. by providing fiscal incentives
- **Establishment of technology transfer** offices within universities
- **Facilitating the open use of digital outputs** derived from a research organization through licensing
- **Stimulating the participation of SME's and universities in cross-border open innovation**
- **Facilitating technology transfer** of new digital knowledge through the international mobility of employees
- **Facilitating the access to external finance** for innovative-driven start-ups, e.g. through the development business-angels networks at National and European level, hybrid public-private funds, crowd-sourcing
- **Selection and dissemination of information on international best practices** of how to promote digital entrepreneurs

- *A ICT adoption in Greek SME's increases their probability to innovate by about 4 - 9 percentage points*
- *ICT penetration in Greek SME's facilitates significantly their internationalization since it increases their likelihood to export by about 1.5 - 4 percentage points*

Improving the value added of the products / services produced by the Greek productive system is a key component for improving international competitiveness. Greece cannot efficiently compete with low cost economies that focus on low labor cost and unskilled labour. Such a strategy is myopic and does not build on the capabilities that the human capital of the country possesses. But in order to increase the value content of our production we need to foster innovation and knowledge based entrepreneurship. The adoption and diffusion of ICTs in the productive process can provide cost and innovative advantages that go beyond the labour cost. That is why investing in ICTs is not a luxury type of investment, even in times of tight fiscal condition, but rather a precondition for innovative growth

8. Summary

Nowadays, the **rapid evolution of digital technologies** and especially of Information and Communication Technologies (ICT) creates great **challenges for a smart, sustainable and inclusive growth**, being thus a crucial **flagship initiative of the Europe Strategy 2020**. Governments around the world design and implement ICT adoption and digital growth strategies in order to improve efficiency and transparency in public administration; stimulate new business formation, job creation, competitiveness, innovativeness and export activity of businesses; improve social welfare and the quality of life for citizens. At the same time new technologies and especially ICTs create a new business environment that represents the so called transition to a digital economy. This transformation creates new business opportunities of high added value and offer more dynamic patterns for a smart, sustainable and inclusive growth. These elements are currently being implemented all over Europe under the umbrella type Europe Strategy 2020.

Greece has not yet captured the benefits of ICT adoption since it still falls below EU average in 65 out of 84 ICT indicators (77%) based on the European Digital Agenda (**Digital Agenda Scoreboard, 2013**). Greece has **low performance** in **broadband penetration**, **the frequency of internet use**, **the use of electronic transactions** and **electronic procurement**. These shortcomings become even more important today in Greece. After a six-year period where about 25% of its gross value added was lost, and unemployment increased to the socially unacceptable level of around 27%, the economy is now struggling to recover. Policy makers are currently facing a great challenge to support the recovery process within a difficult fiscal environment. The challenge for **the Greek government** refers to its role **as a motivator, contributor, carrier, facilitator or source of the digital growth process.** Some of the tools that could help in this direction are discussed in this study.

The implementation of the 4 digital projects identified in this study (digital signatures to public administration, development of open data, improvement of e-skills, stimulation of digital entrepreneurs and innovative SME's) is thought to render big benefits for the economy in terms of exports, country's competitiveness & transparency, job creation, innovation, e.t.c. **The choice** of the specific 4 priority areas **was driven by the strategic framework in digital growth designed for the period 2014-2020** at European and Greek policy level of analysis. To explain the economic importance and potential benefits that could be derived from the implementation for each digital project suggested in this report, we provided 4 separate analyses. These analyses provide hard quantitative results on some of the benefits that we can achieve, by rapidly implementing such "digital projects". The basic findings from the quantification analyses can be summarized as follows.

Digital Projects	Data and Methodology	Relationship under estimation	Empirical findings
Digital Signatures	ROI analysis, relying on an example of Arx Company that sells the CoSign digital solution Public Government Procurement 2009	**Impact** of digital signatures solution in public administration **on government cost savings**	The adoption of digital signature solution in the Greek public administration is expected to **cut costs by about 380 million euros (1st year).**
Open Data	OLS regressions, 78 countries including Greece, 2010-2012	**Impact** of open data **on country competitiveness**	**A 100% increase in the diffusion of open data in Greece** will result in a significant **improvement** in its **ranking position** in terms of **competitiveness** by 25 positions (**from 56th to the 31st**).
		Impact of open data **on new business creation**	**A 100% increase in the diffusion of open data in Greece** will result in a significant improvement in its **ranking position** in terms of **transparency** by 33 positions from **(80th to the 47th).**

Digital Projects	Data and Methodology	Relationship under estimation	Empirical findings
		Impact of open data on **country transparency**	**A 100% increase in the diffusion of open data in Greece** will result in the **creation of 6332 new businesses.**
E-skills	GLS Random Effects Panel regressions, 28 EU countries including Greece, 2004-2013	**Impact** of e-skills on **export activity**	**If 1000 individuals obtain e-skills**, **exports** in Greece will **increase by 13.9 million euro**
		Impact of e-skills on **new business creation**	**If 1000 individuals obtain e-skills**, **72 new businesses will be created in Greece**
Digital Entrepreneurship and Innovative SME's	Probit Regressions (marginal effects), 3500 Greek SME's 2012	**Impact** of ICT adoption within businesses on **the innovativeness of SME's**	**ICT adoption in Greek SME's increases their probability to innovate by about 4-9 percentage points**
		Impact of ICT adoption within businesses **on the internationalization of SME's**	**ICT penetration in Greek SME's facilitates** significantly their **internationalization** since it **increases their likelihood to export by about 1.5-4 percentage points**

Furthermore, the implementation of the following actions could arguably enhance the adoption of ICT in the above mentioned priority areas:

Specific policy suggestions to support the efficient adoption and use of digital signatures in public administration

- **Establishment of a clear and simple regulatory/legislative framework** for digital signature and wide use of electronic stamp and especially in aspects related to the manner in which the electronic identities of individuals are proofed, the processes for assigning signature privileges and the authentication method for an individual
- **Facilitating the communication** between public sector and businesses/citizens via e-mail
- **Maintaining integrity** of the document, report, record to which the e-signature is applied
- **Ensuring compatibility** with multiple content authoring applications

Policy suggestions to support the development of open data

- **Recording and diffusing knowledge** on the available data per public organization
- **Creating a platform** for government practitioners to **exchange ideas and/or experiences** on open data projects
- **Development of a guide for government practitioners** to foster public sector information and data reuse
- **Educating and informing government practitioners** via workshops on how to publish public data online
- **Monitoring the progress** being made with respect to open data projects
- **Supporting partnerships** between public sector and private data centers

Policy suggestions for the stimulation of digital and ICT skills

- **Taking initiatives to support technology careers in workforce**, e.g. by including mentoring programmes and high-school/university work experience/internships in ICT sector and by establishing a Technology Education and Careers Council
- **Provision of ICT training programmes** for immigrants and women
- **Expansion of lifelong ICT learning** programmes
- **Stimulating the emergence of techno-starters**, applied science technologists and technicians e.g. through certified ICT professionals and foreign credential recognition

Policy suggestions to enhance digital entrepreneurs and innovative SME's

- **Harmonization of the relevant laws** and regulations with international norms mainly on issues related to the internationalization of SME's, commercialization, protection of intellectual property rights
- **Stimulating the use of public-private partnership schemes** to promote investment and the involvement of businesses in commercialization and technology transfer
- **Motivating the establishment of joint research ICT laboratories** e.g. by providing fiscal incentives
- **Establishing and exploiting technology transfer** offices within universities
- **Facilitating the access to external finance** for innovative-driven start-ups, e.g. through the development business-angels networks at National and European level, hybrid public-private funds, crowd-sourcing
- **Selection and dissemination of information on international best practices** of how to promote digital entrepreneurs

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10.Appendix

10.1 Open data methodology

a) We apply **OLS regression technique** in order to measure the **effect of open data on competitiveness** (model 1). We **gradually build up controlling for low / high income countries** in year 2012 (model 2) and **including the variable scientific and technical journal articles** as an independent variable (model 3).

Model 1: $\mathrm{gci_i} = \alpha_\mathrm{i} + \beta_1 \mathrm{odb_i} + \mathrm{u_i}$

Model 2: $\mathrm{gci_i} = \alpha_\mathrm{i} + \beta_1 \mathrm{odb_i} + \beta_2 \mathrm{class_i} + \mathrm{u_i}$

Model 3: $\mathrm{gci_i} = \alpha_\mathrm{i} + \beta_1 \mathrm{odb_i} + \beta_2 \mathrm{class_i} + \beta_3 \mathrm{pub_i} + \mathrm{u_i}$

where the dependent variable, "gci_i" stands for the natural logarithm of the global competitive index of country i. The natural logarithm has been used for scaling purposes.

"odb" corresponds to natural logarithm of the open data Barometer index in country i.

"$class$" is a categorical variable controlling for low/high income countries.

"pub"corresponds to natural logarithm of the number of scientific and engineering articles published in country i.

The constant term α_i captures the unobserved specific effect of open data, while the term "u_i" is the error term. Finally, parameters β denote the slope coefficients. Note that coefficient β_1 is of primary interest in our study since it captures the effect of open data on the global competitiveness index.

In doing so, we utilize data collected from the following data sources:

- World Economic Forum's Global Competitiveness Index (2013) -The World Economic Forum's Global Competitiveness Index is one of the most reliable and famous rankings. It covers 142 economies, representing 99% of world GDP.
- The Open Data Barometer[13] (ODB) (2012-2013). The Open Data Barometer (ODB) takes a multidimensional look at the spread of Open Government Data (OGD) policy

[13] The Open Data Barometer is structured in three sections to reflect the different stages involved in realising the benefits of open data, and the different groups who may be involved in, and may benefit from, open data. The three sections are readiness, implementation and impact.

and practice across the world. Combining peer-reviewed expert survey data and secondary data sources, the Barometer explores countries readiness to secure benefits from open data, the publication of key datasets, and evidence of emerging impacts from open government data.

- World bank- Scientific and technical journal articles (2011). Scientific and technical journal articles refer to the number of scientific and engineering articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences.

We control for low / high income countries in year 2012 using GNI per capita, calculated using the World Bank Atlas method. Economies are divided to categories according to GNI per capita. The variable takes the value 1 for low income countries if GNI per capital equals to $1.035 or less; 2 for lower middle income, $1.036 - $4.085; 3 for upper middle income, $4.086 - $12.615; and 4 for high income, $12.616 or more.

b) We apply **OLS regression technique** in order to measure the **effect of open data on transparency** (model 1). We **gradually build up controlling for low / high income countries** in year 2012 (model 2) and **including the variable scientific and technical journal articles** as an independent variable (model 3).

Model 4: $\mathrm{trans}_i = \alpha_i + \beta_1 \mathrm{odb}_i + u_i$

Model 5: $\mathrm{trans}_i = \alpha_i + \beta_1 \mathrm{odb}_i + \beta_2 \mathrm{class}_i + u_i$

Model 6: $\mathrm{trans}_{i_i} = \alpha_i + \beta_1 \mathrm{odb}_i + \beta_2 \mathrm{class}_i + \beta_3 \mathrm{timetax}_i + u_i$

Readiness - identifies how far a country has in place the political, social and economic foundations for realising the potential benefits of open data. The Barometer covers the readiness of government, entrepreneurs and business, and citizen and civil society.

Implementation – identifies the extent to which government has published a range of key datasets to support innovation, accountability and more improved social policy. The barometer covers 14 datasets split across three clusters to capture datasets commonly used for: securing government accountability; improving social policy; and enabling innovation and economic activity.

Emerging impacts – identifies the extent to which open data has been seen to lead to positive political, social and environment, and economic change. The Barometer looks for political impacts – including transparency & accountability, and improved government efficiency and effectiveness; economic impacts – through supporting start-up entrepreneurs and existing businesses; and social impacts – including environmental impacts, and contributing to greater inclusion for marginalised groups in society.

Where the dependent variable, "trans" stands for the natural logarithm of Transparency International's Corruption Perception Index in country i for the year 2013. The natural logarithm has been used for scaling purposes.

"odb" corresponds to the natural logarithm of the open data Barometer index in country i.

"$class$" is a categorical variable controlling for low/high income countries.

"$timetax$" corresponds to the natural logarithm of time (hours per year) to prepare and pay three major types of taxes: the corporate income tax, the value added or sales tax, and labor taxes, including payroll taxes and social security contributions.

The constant term α_i captures the unobserved specific effect of open data, while the term "u_i" is the error term. Finally, parameters β denote the slope coefficients. Note that coefficient β_1 is of primary interest in our study since it captures the effect of open data on the entrepreneurship.

In doing so, we utilize data collected from the following data sources

- **Transparency International's corruption perception index (2013)**. The Corruption Perceptions Index ranks countries and territories based on how corrupt their public sector is perceived to be. A country or territory's score indicates the perceived level of public sector corruption on a scale of 0 - 100, where 0 means that a country is perceived as highly corrupt and 100 means it is perceived as very clean. The hierarchical ranking indicator of transparency involves 177 countries including Greece.
- **The Open Data Barometer[14] (ODB) (2012-2013).** The Open Data Barometer (ODB) takes a multidimensional look at the spread of Open Government Data (OGD) policy

[14] The Open Data Barometer is structured in three sections to reflect the different stages involved in realising the benefits of open data, and the different groups who may be involved in, and may benefit from, open data. The three sections are readiness, implementation and impact.

Readiness - identifies how far a country has in place the political, social and economic foundations for realising the potential benefits of open data. The Barometer covers the readiness of government, entrepreneurs and business, and citizen and civil society.

Implementation – identifies the extent to which government has published a range of key datasets to support innovation, accountability and more improved social policy. The barometer covers 14 datasets split across three clusters to capture datasets commonly used for: securing government accountability; improving social policy; and enabling innovation and economic activity.

Emerging impacts – identifies the extent to which open data has been seen to lead to positive political, social and environment, and economic change. The Barometer looks for political impacts – including transparency & accountability, and improved government efficiency and effectiveness; economic impacts – through supporting start-up entrepreneurs and existing businesses; and social impacts – including environmental impacts, and contributing to greater inclusion for marginalised groups in society

and practice across the world. Combining peer-reviewed expert survey data and secondary data sources, the Barometer explores countries readiness to secure benefits from open data, the publication of key datasets, and evidence of emerging impacts from open government data.

- World Bank
    - **Time to prepare and pay taxes (2012).** Time to prepare and pay taxes is the time, in hours per year, it takes to prepare, file, and pay (or withhold) three major types of taxes: the corporate income tax, the value added or sales tax, and labor taxes, including payroll taxes and social security contributions.

We also **control for low / high income countries in year 2012 using GNI per capita**, calculated using the World Bank Atlas method. Economies are divided to categories according to GNI per capita. The variable takes the value 1 for low income countries if GNI per capital equals to $1.035 or less; 2 for lower middle income, $1.036 - $4.085; 3 for upper middle income, $4.086 - $12.615; and 4 for high income, $12.616 or more.

c) We apply **OLS regression technique** in order to measure the **effect of open data** on **new business creation** (model 1). We gradually **build up controlling for low / high income countries** in year 2012 (model 2) and including the **variable "Time to prepare and pay taxes"** as an **independent** variable (model 3).

Model 7: $\mathrm{nbd_i} = \alpha_i + \beta_1 \mathrm{odb_i} + \mathrm{u_i}$

Model 8: $\mathrm{nbd_i} = \alpha_i + \beta_1 \mathrm{odb_i} + \beta_2 \mathrm{class_i} + \mathrm{u_i}$

Model 9: $\mathrm{nbd_i} = \alpha_i + \beta_1 \mathrm{odb_i} + \beta_2 \mathrm{class_i} + \beta_3 \mathrm{timetax_i} + \mathrm{u_i}$

Where the dependent variable, "nbd_i" stands for the natural logarithm new business density (new registrations per 1,000 people ages 15-64) in country i for the year 2012. The natural logarithm has been used for scaling purposes.

"odb" corresponds to the natural logarithm of the open data Barometer index in country i.

"$class$" is a categorical variable controlling for low/high income countries.

"$timetax$" corresponds to the natural logarithm of time (hours per year) to prepare and pay three major types of taxes: the corporate income tax, the value added or sales tax, and labor taxes, including payroll taxes and social security contributions.

The constant term α_i captures the unobserved specific effect of open data, while the term "u_i" is the error term. Finally, parameters β denote the slope coefficients. Note that coefficient β_1 is of primary interest in our study since it captures the effect of open data on the entrepreneurship.

In doing so, we utilize data collected from the following data sources

- The Open Data Barometer[15] (ODB) (2012-2013). The Open Data Barometer (ODB) takes a multidimensional look at the spread of Open Government Data (OGD) policy and practice across the world. Combining peer-reviewed expert survey data and secondary data sources, the Barometer explores countries readiness to secure benefits from open data, the publication of key datasets, and evidence of emerging impacts from open government data.
- World Bank
    - New business density (new registrations per 1,000 people ages 15-64) (2012): New businesses registered are the number of new limited liability corporations registered in the calendar year. Data are collected through World Bank's Entrepreneurship Survey.
    - Time to prepare and pay taxes (2012). Time to prepare and pay taxes is the time, in hours per year, it takes to prepare, file, and pay (or withhold) three major types of taxes: the corporate income tax, the value added or sales tax, and labor taxes, including payroll taxes and social security contributions.

[15] The Open Data Barometer is structured in three sections to reflect the different stages involved in realising the benefits of open data, and the different groups who may be involved in, and may benefit from, open data. The three sections are readiness, implementation and impact.

Readiness - identifies how far a country has in place the political, social and economic foundations for realising the potential benefits of open data. The Barometer covers the readiness of government, entrepreneurs and business, and citizen and civil society.

Implementation – identifies the extent to which government has published a range of key datasets to support innovation, accountability and more improved social policy. The barometer covers 14 datasets split across three clusters to capture datasets commonly used for: securing government accountability; improving social policy; and enabling innovation and economic activity.

Emerging impacts – identifies the extent to which open data has been seen to lead to positive political, social and environment, and economic change. The Barometer looks for political impacts – including transparency & accountability, and improved government efficiency and effectiveness; economic impacts – through supporting start-up entrepreneurs and existing businesses; and social impacts – including environmental impacts, and contributing to greater inclusion for marginalised groups in society.

10.2 Eskills Methodology

Methodologically, we exploited the selected panel data by using GLS (Generalized Least Squares) random effects regressions.

a) In order to estimate the impact of e-skills on export activity we use the following models:

Model 10: $$Exp_{i,t} = a_i + \beta_1 Eskills_{i,t} + u_{i,t}$$

Model 11: $$Exp_{i,t} = a_i + \beta_1 Eskills_{i,t} + \beta_2 GDPgrowth_{i,t} + u_{i,t}$$

Model 12 : $$Exp_{i,t} = a_i + \beta_1 Eskills_{i,t} + \beta_2 GDPgrowth_{i,t} + \beta_3 D_t + u_{i,t}$$

where the dependent variable "Exp" stands for the export activity of a country i in time period t. This variable is measured by the ratio of exports to GDP. The basic independent variable under examination in our models, that is "Eskills", is measured by the percentage of individuals who have carried out 5 or 6 of the 6 Internet related activities. The GDP growth rate controls for countercyclical effects in economies during the examined time period, while the vector "D_t" corresponds to year dummies.

The constant term "α" stands for the unobserved firm specific effects taking thus into account potential heterogeneity among firms, while the term "u" corresponds to the disturbance term. Finally, parameters "β" denote the slope coefficients. Noticeably, that coefficient β_1 is of primary interest in quantification analysis of digital skills since it captures the impact of e-skills on exports.

b) To quantify the impact of e-skills on new business creation we estimate the following equation models:

Model 13: $$Entrepr_{i,t} = a_i + \beta_1 Eskills_{i,t} + u_{i,t}$$

Model 14: $$Entrepr_{i,t} = a_i + \beta_1 Eskills_{i,t} + \beta_2 GDPgrowth_{i,t} + u_{i,t}$$

Model 15: $$Entrepr_{i,t} = a_i + \beta_1 Eskills_{i,t} + \beta_2 GDPgrowth_{i,t} + \beta_3 D_t + u_{i,t}$$

where the dependent variable "Entrepr" denotes the new business creation in country i at t period. This variable is measured by the indicator of new business registration provided by World Bank per country. The independent variables have been described in the abovementioned analysis remaining the same to previous models.

10.3 Digital Entrepreneurship and Innovative SME's Methodology

a) To estimate the impact of ICT adoption on the innovativeness of businesses we utilize the following equations by building gradually the following three models:

Model 16: $Innov_i = a_i + \beta_1 ICT_i + u_i$

Model 17: $Innov_i = a_i + \beta_1 ICT_i + \beta_2 Size_i + \beta_3 Loc_i + \beta_3 Activ_i + u_i$

Model 18: $Innov_i = a_i + \beta_1 ICT_i + \beta_2 Size_i + \beta_3 Loc_i + \beta_4 Activ_i + \beta_4 R\&D_i + \beta_5 Netw_i + \beta_6 Cult_i + u_i$

where the dependent variable "Innov" denotes a dummy capturing the innovativeness of businesses. In particular,

- it takes the value of 1 when a firm declares that they introduced at least one innovation in the last three years,
- and the value of 0 when a firm declares that none innovation has been launched by the company during the last 3 years.

"ICT" is a categorical variable and stands for the ICT adoption in businesses. This variable takes the following values:

- 7 if the firm adopts quickly (before its competitors) new ICT in the total activities,
- 5 if the firm exhibits significant efforts to adopt ICT by introducing all the technologies that its competitors use,
- 3 if the firm exhibits limited efforts to adopt ICT by introducing the most popular technologies in the industry,
- and the value of 1 if the firm makes no effort for the adjustment to the new conditions through the introduction of ICT.

Size denotes the size group of the firm taking

the value of 1 if firm is micro (0-9 employees),

the value of 2 if firm is small-sized (10-49 employees),

the value of 3 if firm is large-sized (above 50 employees).

"Loc" and "Activ" are categorical variables controlling for the location and the activity of a firm respectively.

"R&D" is also a categorical variable measuring the intensity of research and development expenditures at firm level taking values

- 1 (the firm declares none R&D expenditures),
- 3 (the firm declares a low rate in R&D expenditures <2%),
- 5(the firm declares a moderate rate in R&D expenditures e.g. 5%-7%),
- 7(the firm declares a high rate in R&D expenditures: above 10%).

"Netw" corresponds to business networks of a firm, taking the following values:

- 1: the firm has not developed any collaboration with other businesses
- 2: there was an interest but no initiative was taken by the firm
- 3: the firm took an initiative that has not resulted in collaboration
- 4: there was a collaboration/synergy plan but with no implementation
- 5: the firm participated in a collaboration or in a joint research project
- 6: the firm participated in two collaborations or joint research projects
- 7: it is a consistent practice of the business to develop synergies and collaborations

"Cult" measures if the business environment and culture encourage employees to take initiatives and propose new ideas, allowing the risk of potential failure. Specifically this categorical variable takes the following values:

- 1: the culture and business environment do not allow any initiative and risk to be taken by employees, while any failures are unacceptable.
- 3: the culture and the business environment encourage employees to a limited extent to take initiatives and risks.
- 5: the culture and the business environment encourage employees to a considerable extent to undertake initiatives and risks.
- 7: there are highly developed business systems which strongly encourage initiatives and risks to be undertaken by employees, while potential failures can be exploited as a valuable experience for the future.

The constant term "α" stands for the unobserved firm specific effects taking thus into account potential heterogeneity among firms, while the term "u" is the error term. Finally, parameters "β" denote the slope coefficients. Note that coefficient β_1 is of primary interest in the present analysis since it captures the effect of ICT adoption in SME's on their probability to innovate.

b) To estimate the impact of ICT adoption on the internationalization of businesses we make use of the following equations by building gradually the following three models:

Model 19*:* $Exp_i = a_i + \beta_1 ICT_i + u_i$

Model 20: $Exp_i = a_i + \beta_1 ICT_i + \beta_2 Size_i + \beta_3 Loc_i + \beta_3 Activ_i + u_i$

Model 21: $Exp_i = a_i + \beta_1 ICT_i + \beta_2 Size_i + \beta_3 Loc_i + \beta_4 Activ_i + \beta_4 Netw_i + \beta_5 ManGr_i + \beta_6 Cult_i + u_i$

where the dependent variable "Exp" corresponds to the export activity of a firm. In particular, it is a dummy taking

- the value of 1 if a firm declares that performs exports,
- the value of 0 if a firm does not perform exports.

The new variables that have been added in the analysis of internalization of SME's concern the managerial growth ("ManGr") and the bonuses provided to their employees ("Bon"). In particular, managerial growth is a categorical variable capturing the dependence of the goals of managers and business executives with the growth of the firm. Hence, managerial growth variable takes the following values:

- 1 if there is no dependence
- 2 if there is a limited dependence
- 3 if there is a significant dependence
- 4 if there is a very strong dependence.

Also, bonuses denote also a categorical variable standing for the establishment of a bonus system within a business to recognize successful ideas and/or innovations by employees. This variable takes the following values:

- 1: if there is no recognition or bonus system
- 2: if there is a limited informal recognition, without the establishment of a bonus system
- 3: if there is a relatively developed bonus system
- 4: if there is a fully operational bonus system

The other variables of the models under estimation, i.e. firm size, firm location, business activity, business networks have been included and described in the analysis of innovation of SME's above. Again, the constant term "α" stands for the unobserved firm specific effects

taking thus into account potential heterogeneity among firms, while the term “u” is the error term. Finally, parameters “β” denote the slope coefficients. In should be highlighted here that coefficient β_1 is of primary interest in the present analysis since it captures the effect of ICT adoption in SME’s on their probability to innovate.

Παρουσίαση Μελέτης «Η Υιοθέτηση των Τεχνολογιών Πληροφορικής και Επικοινωνιών (ΤΠΕ) και η Ψηφιακή Ανάπτυξη στην Ελλάδα»

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Επίκουρος Καθηγητής Οικονομικής Αξιολόγησης Τεχνολογικών

Συστημάτων ΕΜΠ,

Επιστημονικός Σύμβουλος ΙΟΒΕ

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Υιοθέτηση των ΤΠΕ και ψηφιακή ανάπτυξη στην Ελλάδα

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Επιστημονικός Σύμβουλος ΙΟΒΕ

Ερευνητική ομάδα: Α. Τσακανίκας, S. Danchev, Ι. Γιωτόπουλος, Ε. Κόρρα, Γ. Παύλου

10 Ιουνίου 2015

Σχετική ερευνητική δραστηριότητα ΙΟΒΕ

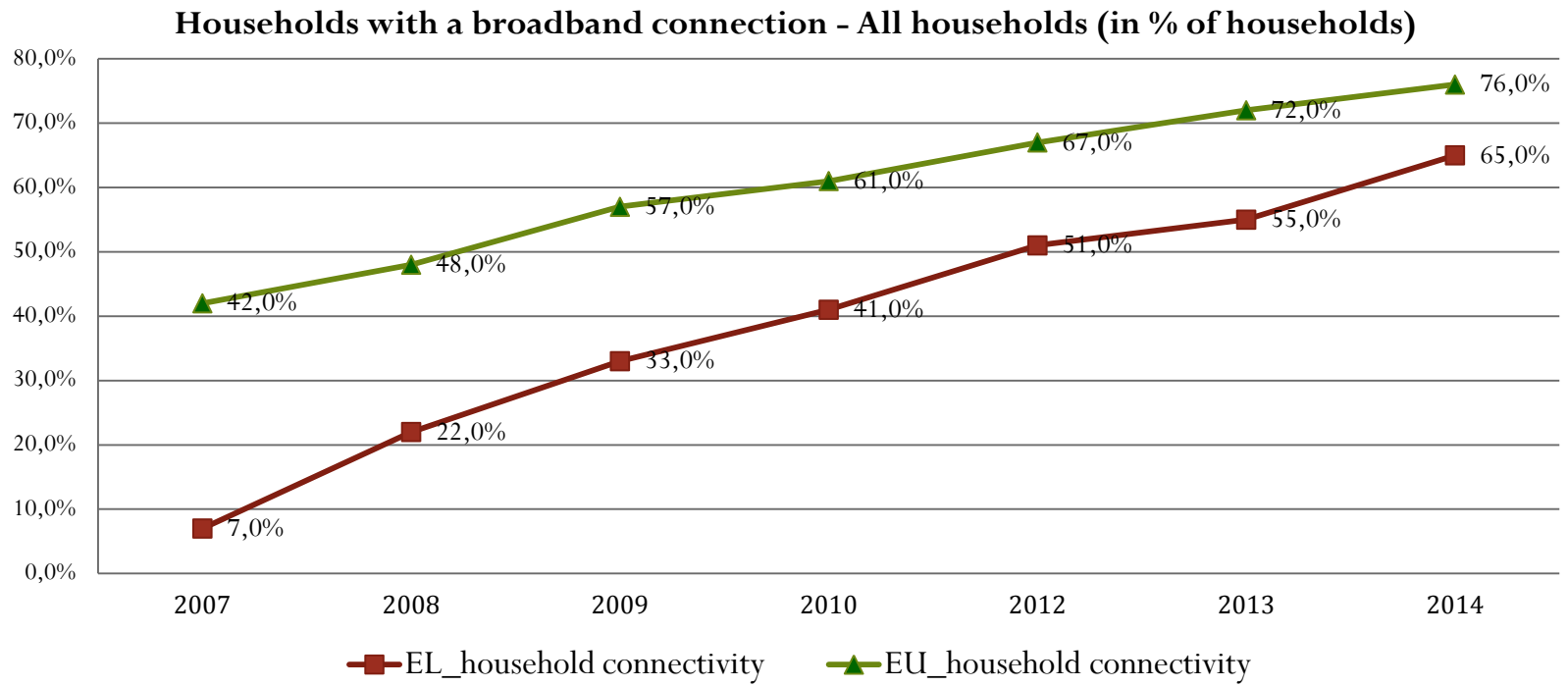
- Μελέτες για τον κλάδο των ΤΠΕ και τη διάχυση της Κοινωνίας της Πληροφορίας
  - Ειδική Γραμματεία για την ΚτΠ (2004)
  - Παρατηρητήριο για την ΚτΠ (2006-2009)
  - Στέγη Ελληνικής Βιομηχανίας (2010-2014)
- Εσωτερικά έργα:
  - Κλαδική μελέτη για τη σχέση Καινοτομίας και Κλάδων Υψηλής Τεχνολογίας
- Μελέτη για τα εμπόδια στη διάδοση του Internet στην Ελλάδα (Google, 2012)
- Μελέτη για το mobile communication (ΕΕΚΤ, 2012)
- Μελέτη για το Cloud computing (Microsoft, 2011)

Οι ΤΠΕ στον πυρήνα του νέου αναπτυξιακού προτύπου της χώρας

- Τόσο ως κλαδικό οικοσύστημα (πλευρά της προσφοράς)
- Όσο και ως διαδικασία ενσωμάτωσης / διάχυσης της χρήσης τους σε
  - Δημόσιο (e-government)
  - Επιχειρήσεις (σχέσεις με e-gov, αλλά και B2C, B2B)
  - Πολίτες (χρήση ΤΠΕ)
- Απτά οφέλη σε όρους παραγωγικότητας, εξωστρέφειας και ανταγωνιστικότητας της οικονομίας, εξοικονόμησης κόστους, αλλά και ποιότητας ζωής πολιτών και ενίσχυση της διαφάνειας

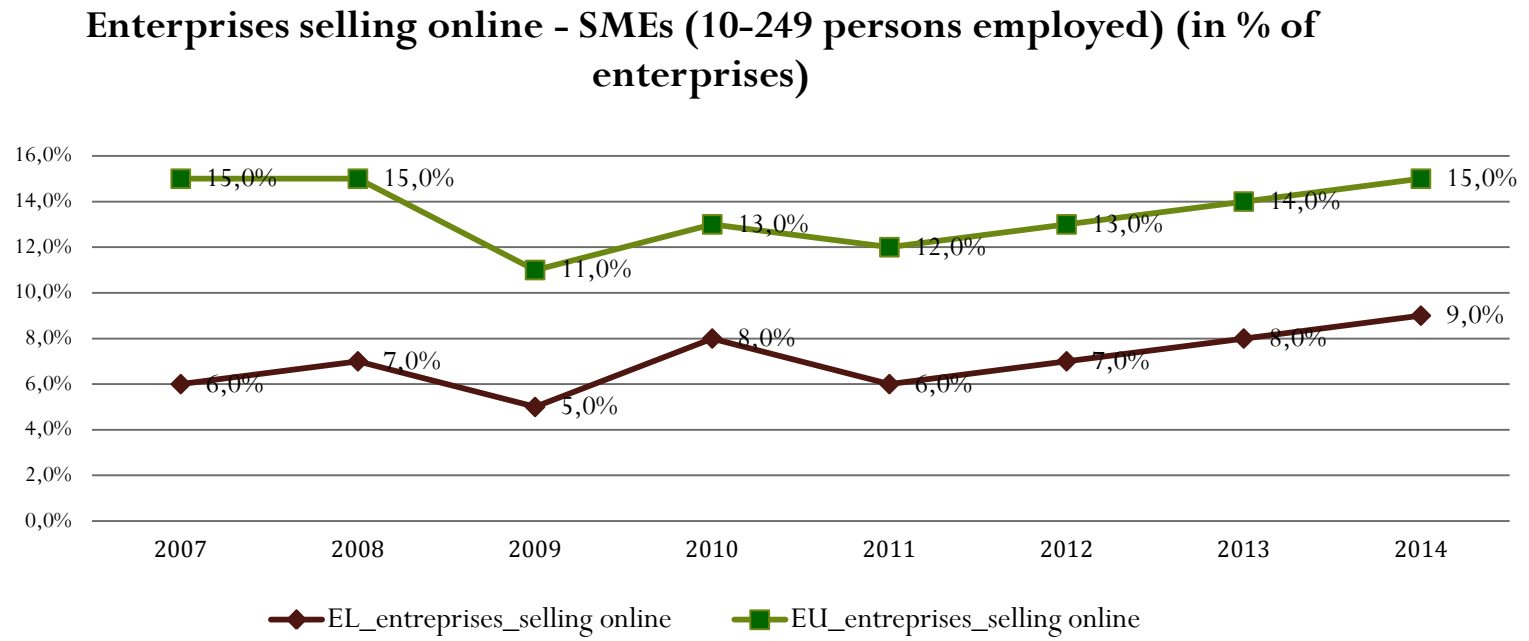
Συνδεσιμότητα: Σταθερή ευρυζωνική σύνδεση (νοικοκυριά)

- Η Ελλάδα έχει βελτιωθεί σημαντικά σε συνδεσιμότητα όμως οι επιδόσεις της εξακολουθούν να είναι χαμηλότερες από αυτές των περισσότερων χωρών ΕΕ

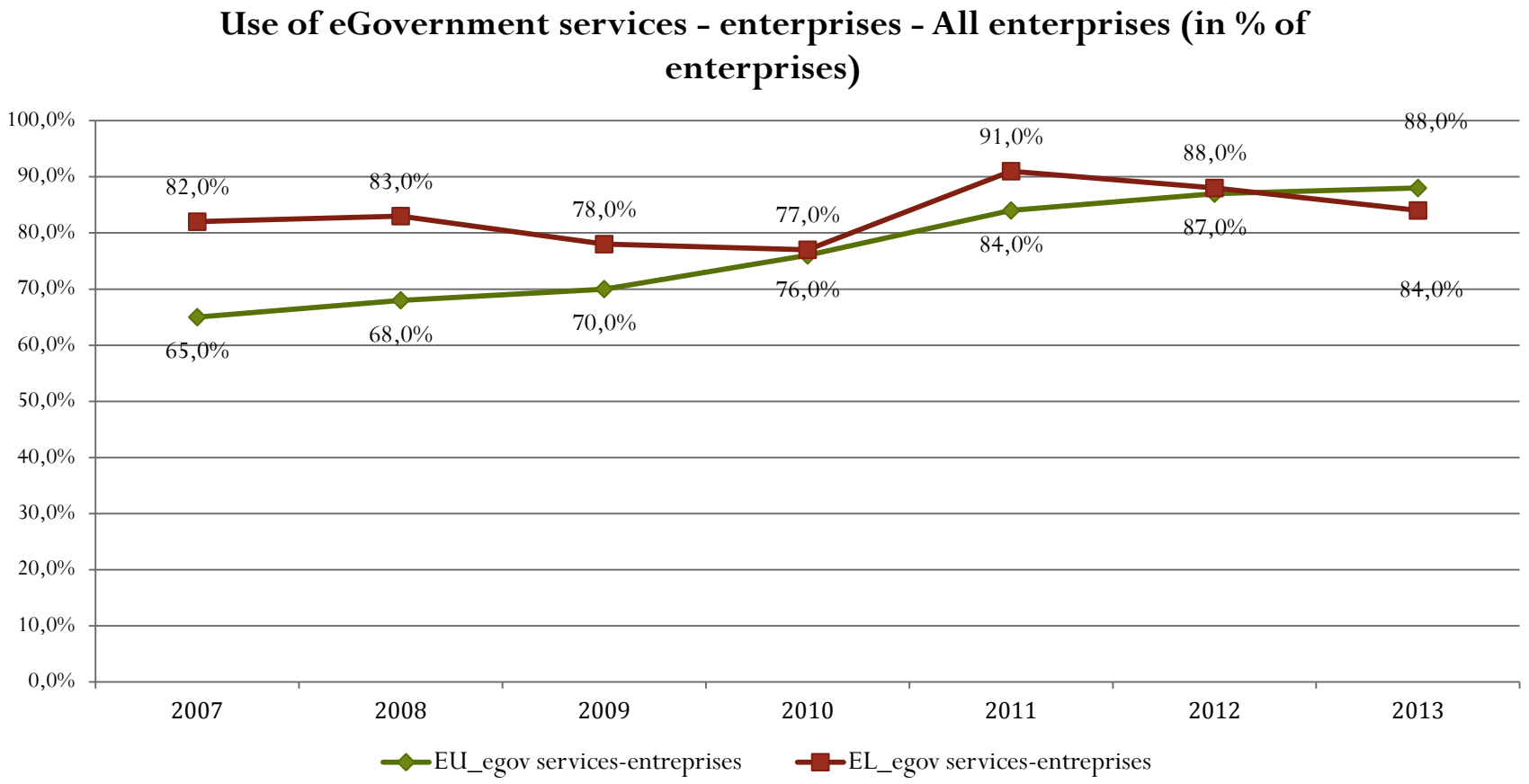


Πωλήσεις μέσω διαδικτύου (επιχειρήσεις)

- Ο ρυθμός αύξησης του % των επιχειρήσεων στην Ελλάδα που πραγματοποιούν πωλήσεις μέσω διαδικτύου είναι αντίστοιχος με την ΕΕ
  - Η Ελλάδα εξακολουθεί να απέχει από τον Μ.Ο. στην ΕΕ.

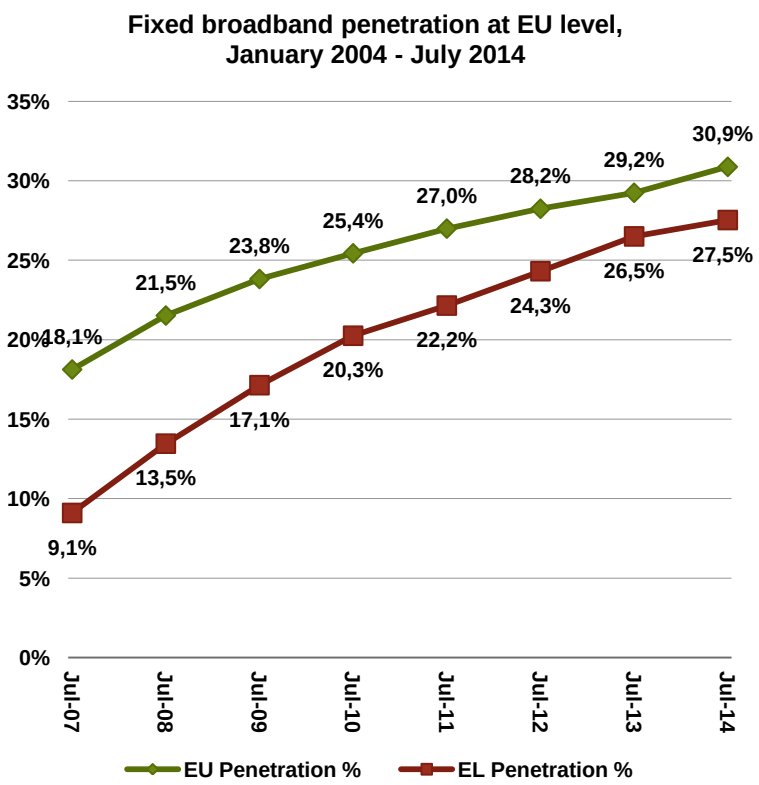


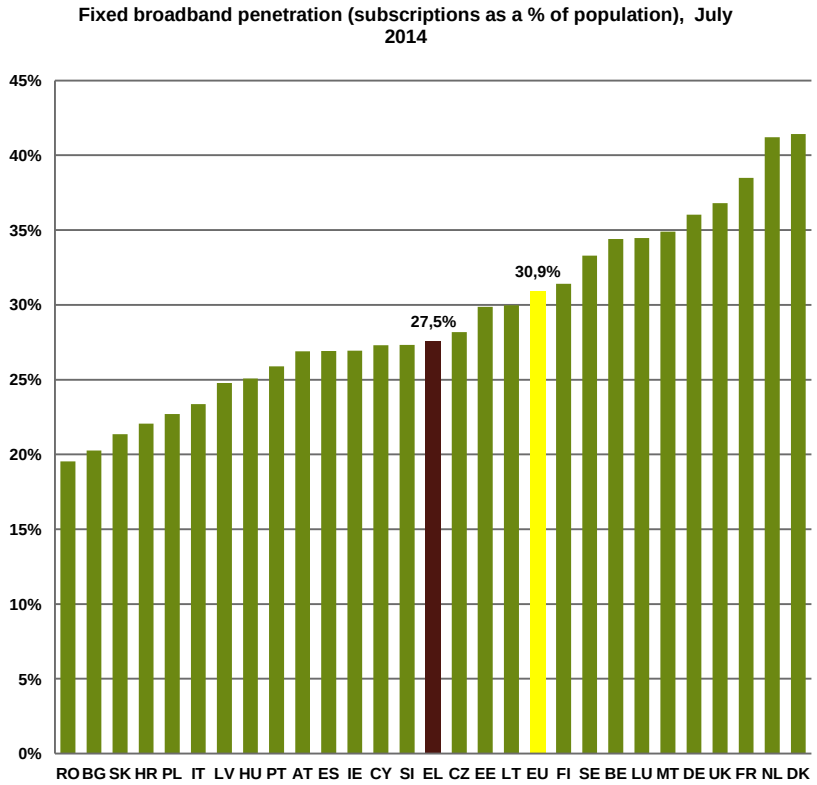
Χρήση υπηρεσιών e-government από τις επιχειρήσεις



Συνδεσιμότητα: Σταθερή ευρυζωνική σύνδεση

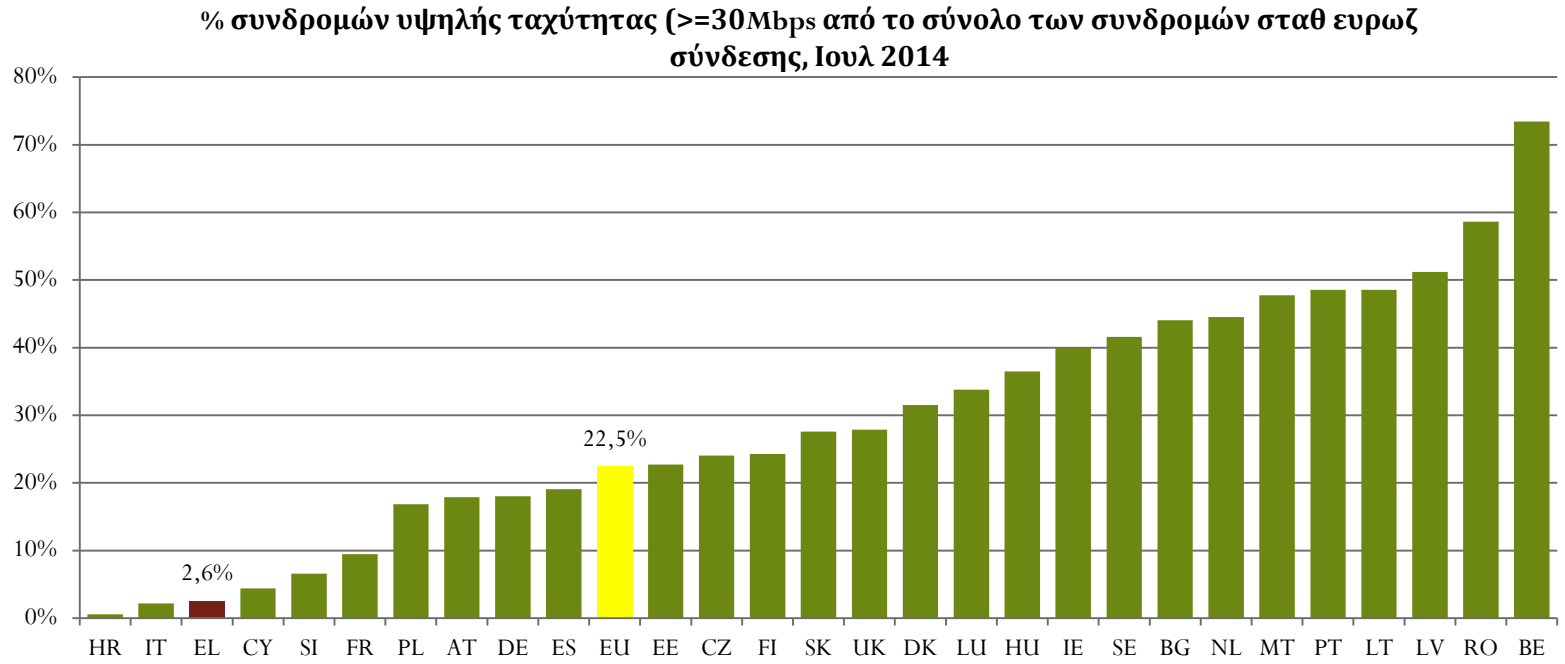
- Η Ελλάδα έχει βελτιωθεί σημαντικά σε ευρυζωνικότητα όμως οι επιδόσεις της εξακολουθούν να υστερούν σε σχέση με τις περισσότερες χώρες της ΕΕ





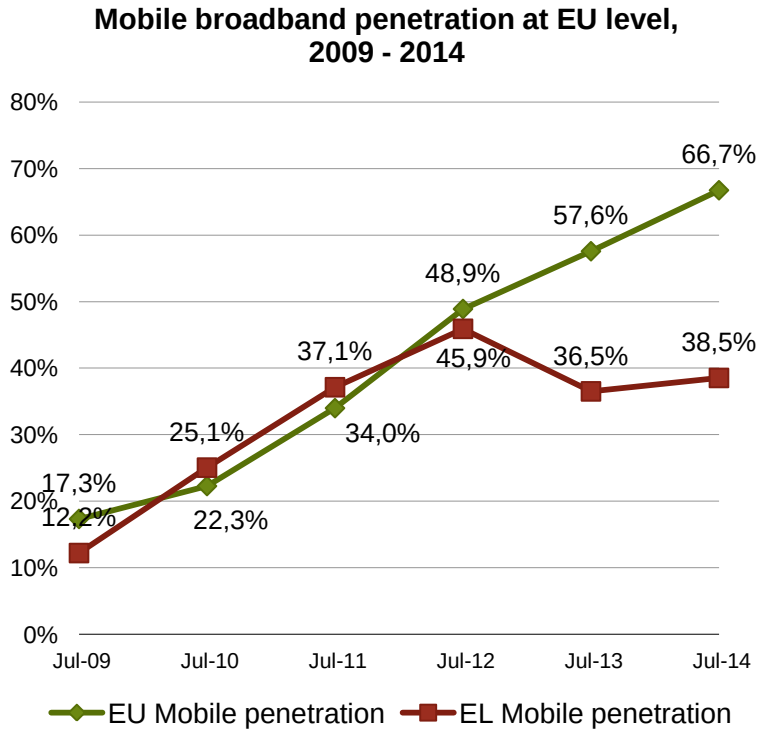
Συνδεσιμότητα: Δίκτυα υψηλής ταχύτητας(>=30 Mbps)

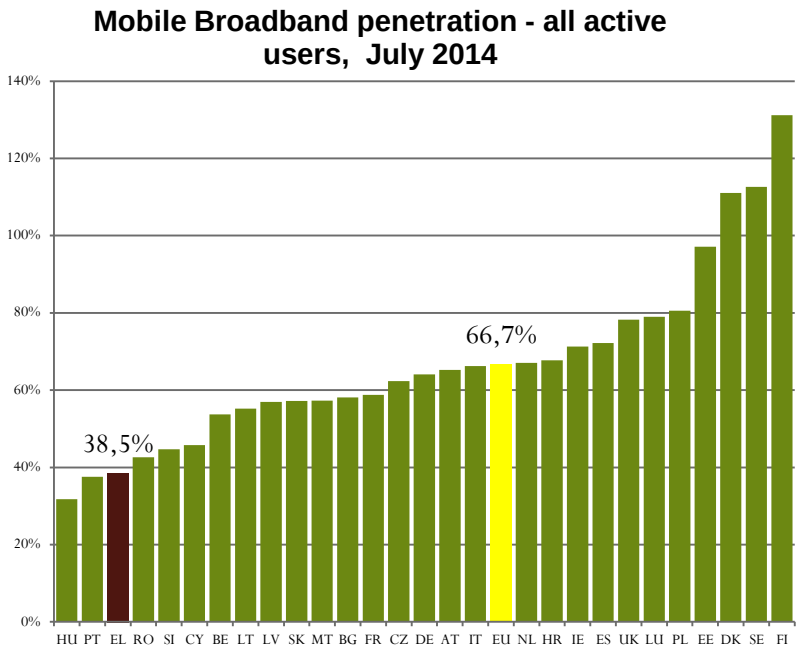
- Χαμηλή κάλυψη δικτύων υψηλής ταχύτητας (NGA): χαμηλότερη από το ήμισυ του Μ.Ο της ΕΕ
- Ακόμα χαμηλότερη η διείσδυση σε δίκτυα υψηλής ταχύτητας στην Ελλάδα



Συνδεσιμότητα: Διείσδυση κινητών ευρυζωνικών υπηρεσιών (συνδρομητές ανά 100 άτομα)

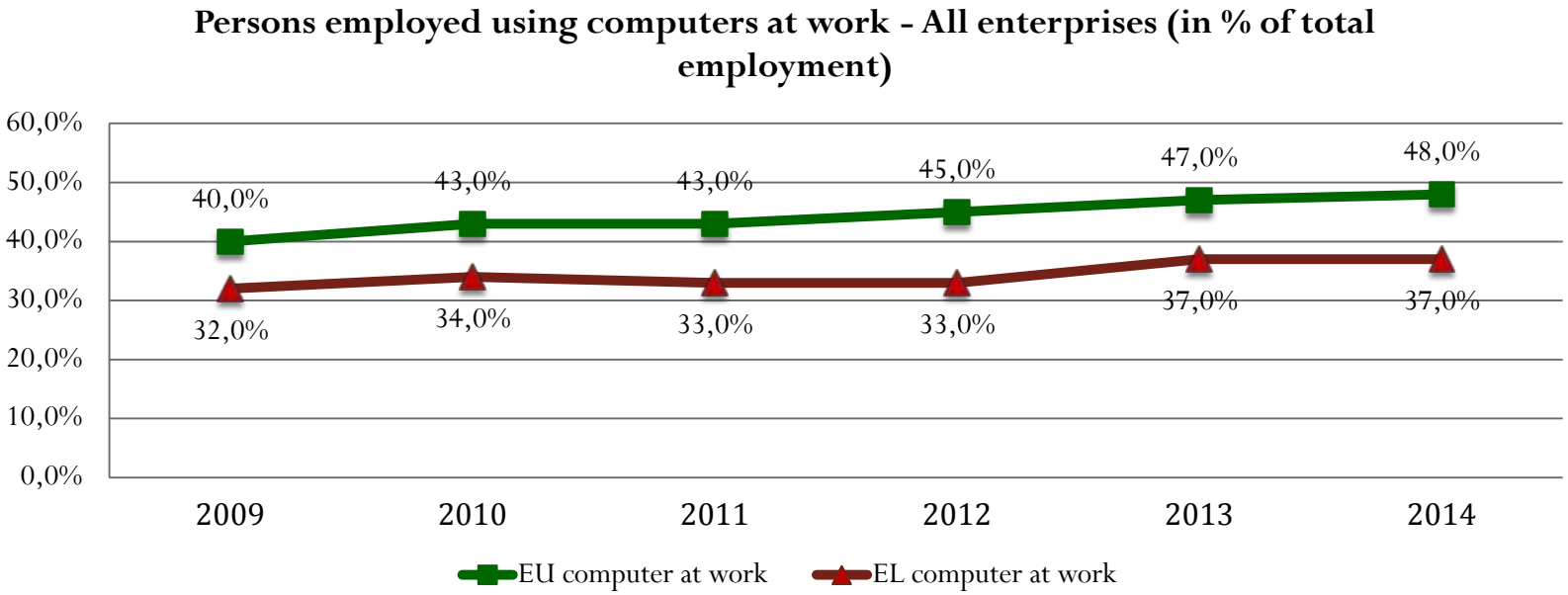
- Ο ρυθμός αύξησης της διείσδυσης σε κινητά ευρυζωνικά δίκτυα διορθώθηκε βίαια το 2013 με αποτέλεσμα το 2014 να βρισκόμαστε στις χαμηλότερες θέσεις της κατάταξης





Ψηφιακές δεξιότητες

- Το % των ατόμων που χρησιμοποιούν Η/Υ στην εργασία τους δεν σημειώνει τα τελευταία χρόνια αξιοσημείωτη μεταβολή



Εμπόδια στρατηγικού χαρακτήρα

- Προγραμματική ευφράδεια, στην ανάγκη τόνωσης της ψηφιακής ανάπτυξης και της ηλεκτρονικής διακυβέρνησης, αλλά όχι ικανοποιητικά αποτελέσματα
- Ανεπαρκής σχεδιασμός και χρηματοδότηση (συντήρηση) καθ'όλη τη διάρκεια του κύκλου ζωής των πληροφοριακών συστημάτων
- Περιορισμένες δράσεις σχετικές με τη διάθεση και αξιοποίηση δημοσίων πληροφοριών και δεδομένων
- Έλλειψη συνέχειας των υιοθετούμενων πολιτικών

Αδυναμίες στον τεχνικό σχεδιασμό και τον προγραμματισμό

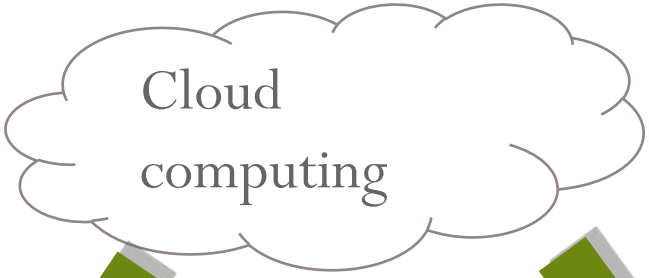
- Έλλειψη διαλειτουργικότητας και διασύνδεσης στα διάφορα λειτουργικά συστήματα του δημοσίου τομέα
- ‘Ελλειψη κοινής αρχιτεκτονικής στον δημόσιο τομέα της πληροφορικής, απουσία κοινών προτύπων και πολιτικές συμμόρφωσης για τη χρήση των ΤΠΕ
- Χαμηλή αξιοποίηση υποδομών ΤΠΕ, κατακερματισμός συστημάτων, μεγάλη διασπορά και επικαλύψεις στα λειτουργικά συστήματα της δημόσιας διοίκησης.
- Πολυπλοκότητα στο θεσμικό και κανονιστικό πλαίσιο
- Χρονοβόρες διαδικασίες για δημόσιες συμβάσεις (σημαντικές καθυστερήσεις στα στάδια του διαγωνισμού, της δημοπρασίας, της ανάθεσης κλπ) ξεπερνώντας τη διάρκεια ζωής των προμηθευόμενων προϊόντων/ υπηρεσιών ΤΠΕ, οδηγώντας έτσι στην υιοθέτηση τελικά ξεπερασμένων ως ένα βαθμό προϊόντων/λύσεων

Στρατηγικοί Στόχοι Ηλεκτρονικής Διακυβέρνησης στην Ελλάδα (2014-2020)

Εκσυγχρονισμός της δημόσιας διοίκησης	• Απλοποίηση διαδικασιών μέσω της χρήσης ΤΠΕ • Ηλεκτρονική διαχείριση των εγγράφων-ψηφιοποίηση των διαδικασιών
Επανασύνδεση των πολιτών με την δημόσια διοίκηση	• Ενοποιημένη διαχείριση των σχέσεων μεταξύ του κράτους, των πολιτών και της δημόσιας διοίκησης • Δημιουργία ενός κοινού σημείου επαφής με τη δημόσια διοίκηση • Ταυτοποίηση των πολιτών • Συμπερίληψη ψηφιακής τεχνολογίας και ψηφιακή εκπαίδευση
Συνεργασία οριζόντιων πολιτικών ΤΠΕ στη δημόσια διοίκηση	• Διαλειτουργικότητα των βασικών μητρώων της δημόσιας διοίκησης • Ανοικτή πρόσβαση στη δημόσια πληροφορία

Source: Ministry of Administrative Reform and E-Governance

Cloud Computing: εξοικονόμηση κόστους, αυξημένη παραγωγικότητα, διαχείριση / επέκταση της ζήτησης



Κόστος εξοπλισμού IT

Παραγωγικότητα εργασίας

Κόστος ενέργειας

Επιπλέον δαπάνες για CC

Εξοικονόμηση δαπανών

Διαχείριση αιχμών ζήτησης

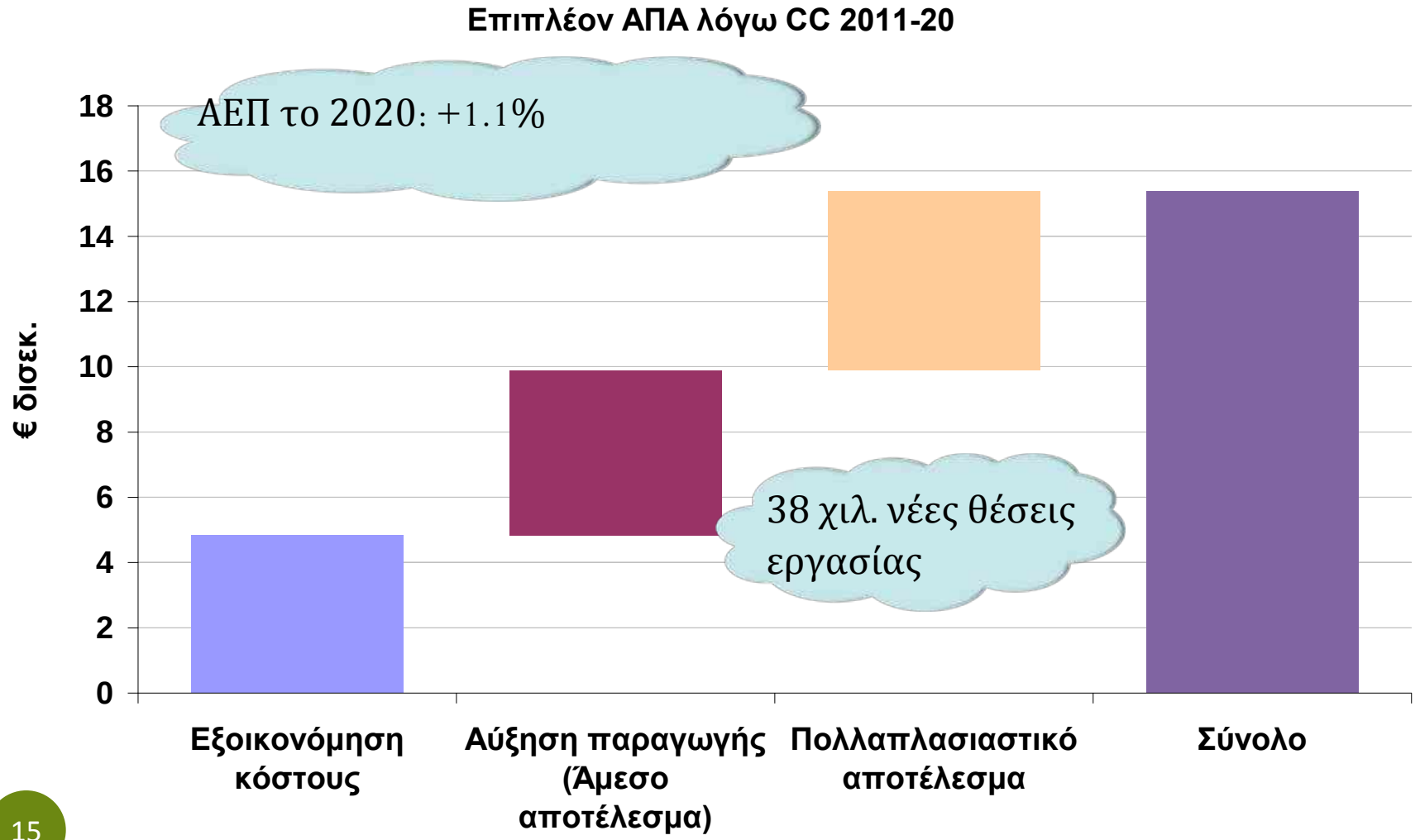
Ευελιξία (Scalability)

Νέες επιχειρήσεις

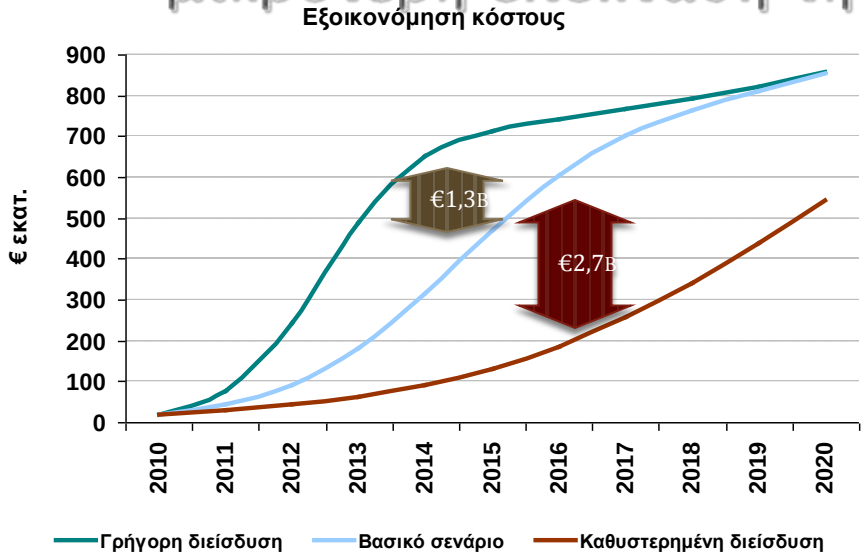
Ανταγωνιστικότητα

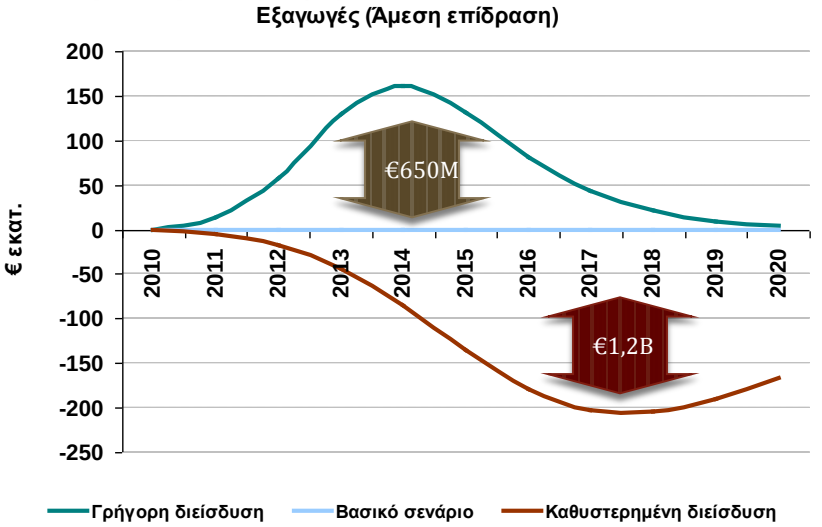
Επιπλέον παραγωγή

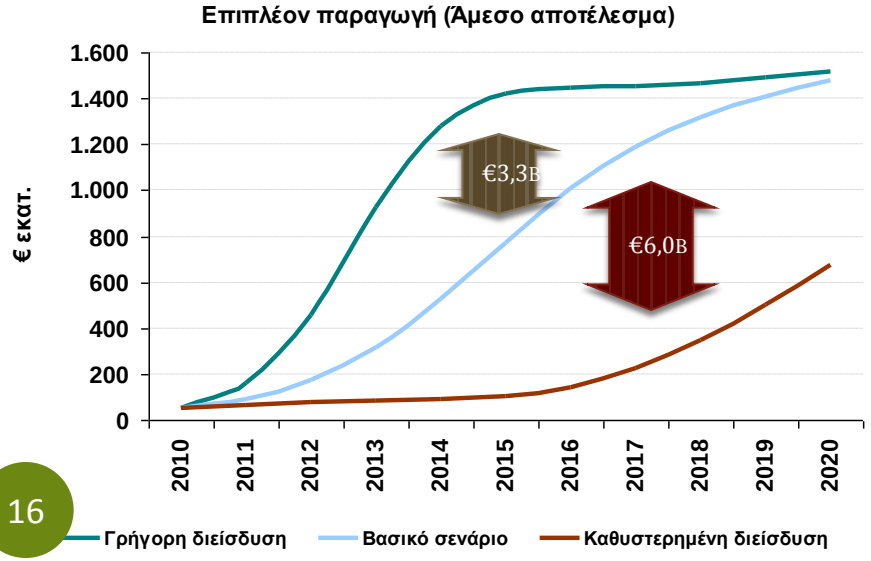
Την τρέχουσα δεκαετία η ελληνική οικονομία θα μπορούσε να κερδίσει ~ €16 δισεκ. σε ΑΕΠ

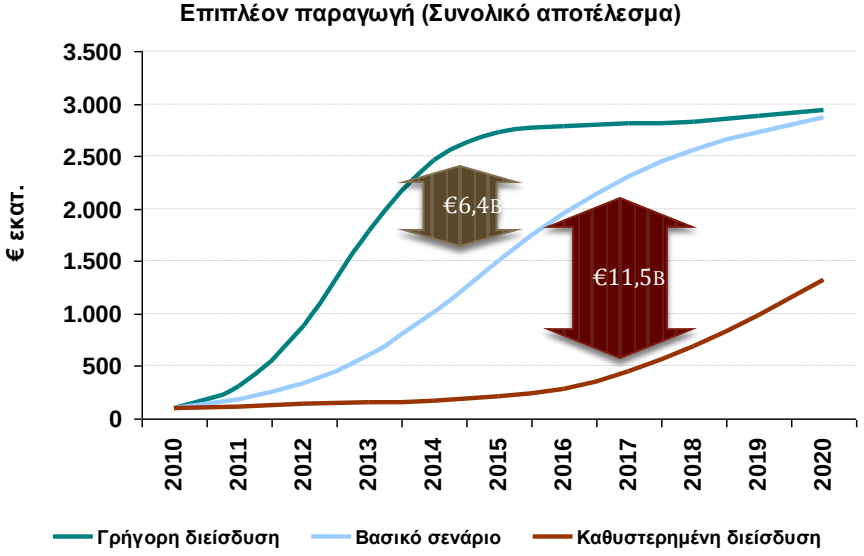


Καθυστερημένη διείσδυση συνεπάγεται μικρότερη εξοικονόμηση κόστους, πτώση των εξαγωγών και μικρότερη επέκταση της παραγωγής









Στόχος μελέτης «Υιοθέτηση των ΤΠΕ και ψηφιακή ανάπτυξη στην Ελλάδα»

- Ανάλυση υφιστάμενης κατάστασης ως προς την ψηφιακή σύγκλιση
- Χαρτογράφηση εμποδίων στην Αποτελεσματική Εφαρμογή των Ψηφιακών Δράσεων στην Ελλάδα
- Αποτύπωση στρατηγικού πλασίου πολιτικών για την προώθηση των ΤΠΕ στην Ευρώπη και την Ελλάδα
- Ποσοτικοποίηση ωφελειών για επιχειρήσεις, δημόσιο τομέα και ευρύτερα για την οικονομία από την υλοποίηση κομβικών για τη λειτουργία της οικονομίας εφαρμογών ΤΠΕ με ισχυρά και μετρήσιμα οφέλη σε όρους
  - Εξοικονόμησης κόστους
  - Παραγωγικότητα και εξωστρέφεια των επιχειρήσεων
  - Επιχειρηματικότητας
  - Προώθησης της καινοτομίας
  - Εξαγωγών
  - Δημιουργίας θέσεων απασχόλησης
  - Ανταγωνιστικότητας

Στόχος μελέτης «Υιοθέτηση των ΤΠΕ και ψηφιακή ανάπτυξη στην Ελλάδα»

- Κριτήριο επιλογής: Προτεραιοποίηση δράσεων στο πλαίσιο του στρατηγικού σχεδίου για τη ψηφιακή ανάπτυξη 2014-2020
- Έμφαση στην υλοποίηση τεσσάρων μεγάλων «ψηφιακών» παρεμβάσεων στην οικονομία.
  - «Προώθηση των ψηφιακών υπογραφών στο δημόσιο τομέα»
  - «Ανάπτυξη ανοιχτών δεδομένων»
  - «Βελτίωση των ηλεκτρονικών δεξιοτήτων (e-skills) του πληθυσμού»
  - «Ενδυνάμωση του επιχειρηματικού και καινοτόμου οικοσυστήματος

    Η ποσοτική ανάλυση ενθυλακώνει μέρος μόνο των ωφελειών που μπορούν να επιτευχθούν με τη γρήγορη υλοποίηση τέτοιων ψηφιακών έργων.
- Προτεραιότητες και μέτρα πολιτικής

Οικονομική Επίδραση Χρήσης Ψηφιακών Υπογραφών στο δημόσιο

Οφέλη από χρήση ψηφιακών υπογραφών

Οφέλη για τη δημόσια διοίκηση	Οφέλη για τον ιδιωτικό τομέα	Οφέλη για τις πολίτες/ κοινωνία
Διάδοση των εφαρμογών ηλεκτρονικής διακυβέρνησης	Ευρύτερη χρήση εφαρμογών e-commerce	Αύξηση της εμπιστοσύνης στον ψηφιακό κόσμο
	Διάδοση εφαρμογών ηλεκτρονικής τραπέζης	Αύξηση ικανοποίησης των χρηστών λόγω μειωμένου κόστους, ευκολίας χρήσης και αυξημένης αποδοτικότητας
Αυξημένη εξοικονόμηση κόστους λόγω ελαχιστοποίησης ταχυδρομικών εξόδων και εκτύπωσης		
Βελτίωση αποτελεσματικότητας μέσω της ψηφιοποίησης και της αυτοματοποίησης των διαδικασιών		
Νέες επιχειρηματικές ευκαιρίες και διευκόλυνση επιχειρησιακής εργασίας		

Αλλά υπάρχουν και άλλες προϋποθέσεις για υιοθέτησή τους

- Εφαρμογή και άλλων πρόσθετων υπηρεσιών **για εδραίωση εμπιστοσύνης** και καθιέρωση ασφάλειας, γνησιότητας και νομικής εγκυρότητας μιας ηλεκτρονικής συναλλαγής, όπως:

  - **Χρονική σήμανση** (time stamping): ημερομηνία και ώρα σε ένα ηλεκτρονικό έγγραφο, που αποδεικνύουν ότι το έγγραφο υπήρχε σε μια δεδομένη χρονική στιγμή και ότι δεν έχει τροποποιηθεί έκτοτε
  - **Ηλεκτρονική σφραγίδα:** ηλεκτρονικό ισοδύναμο της σφραγίδας πάνω σε ένα έγγραφο που να πιστοποιεί την προέλευση και την ακεραιότητα του
  - **Ηλεκτρονική παράδοση**, δηλαδή μια υπηρεσία αντίστοιχη της συστημένης επιστολής στον φυσικό κόσμο
  - **Νομική και θεσμική αποδοχή** των ηλεκτρονικών εγγράφων που θα διασφαλίζει τη γνησιότητα και την ακεραιότητα τους
  - **Πιστοποίηση αυθεντικότητας ιστοσελίδας**, πχ αξιόπιστη πληροφόρηση για τον ιστότοπο (βλπ πιστοποιητικό) η οποία θα επιτρέπει στους χρήστες να επιβεβαιώσουν τη γνησιότητα της ιστοσελίδας και τη σύνδεση της με το άτομο/οργανισμό που κατέχει την ιστοσελίδα

Βασικές υποθέσεις για ποσοτικοποίηση επίδρασης χρήσης ψηφιακών υπογραφών στο Δημόσιο

Υπάλληλοι δημοσίου τομέα (2013)	600.000 άτομα
Αριθμός υπογραφόντων	65% των υπαλλήλων του δημοσίου τομέα (2013) εκτυπώνει και υπογράφει έγγραφα
Μικτός μισθός των υπαλλήλων χαμηλής εκπαίδευσης που εκτελούν την αποστολή φαξ, έκδοση αντιτύπων κ.λ.π.	2.200 ευρώ/μήνα
Αριθμός εργάσιμων ημερών το χρόνο	220
Κόστος εκτύπωσης ανά σελίδα	Με βάση τις πραγματικές δαπάνες του δημοσίου σε χαρτί και μελάνι (Δημόσια Σύμβαση 2009) προσαρμοσμένη για το έτος 2013
Κόστος για αποστολή φαξ, σκανάρισμα και αρχειοθέτηση ανά έγγραφο	Εκτιμώμενο πραγματικό κόστος βασιζόμενο στον χρόνο που απαιτείται και στον μικτό μισθό των υπαλλήλων χαμηλής εκπαίδευσης που εκτελούν αυτές τις ενέργειες
ΕΛΤΑ 3 μέρες παράδοση, κόστος ανά έγγραφο	0,830 €
Courier παράδοση σε μια μέρα, κόστος αποστολής ανά έγγραφο	5 €
Χρόνος για αποστολή φαξ, σκανάρισμα, και αρχειοθέτησης ανά έγγραφο	3 λεπτά
Χρόνος ανάκτησης εγγράφου, ανά έγγραφο	30 λεπτά
Χρόνος αντικατάστασης χαμένων εγγράφων ανά έγγραφο	60 λεπτά

Συμπληρωματικές υποθέσεις για ποσοτικοποίηση επίδρασης χρήσης ψηφιακών υπογραφών στο Δημόσιο

			Βάση
	Γενικά	Αριθμός εγγράφων ανά υπογράφοντα ανά εργάσιμη μέρα	*6*
		Αριθμός σελίδων ανά υπογεγραμμένο έγγραφο	*3.5*
		Αριθμός υπογραφών ανά υπογεγραμμένο έγγραφο	*2*
	Σκανάρισμα	% εγγράφων που σκανάρονται	*1%*
	Αρχειοθέτηση	% εγγράφων που αρχειοθετούνται	*50%*
Εξωτερική	**Αποστολή φαξ**	% εγγράφων που αποστέλλονται με φαξ	*1%*
	Αποστολή την ίδια μέρα	% εγγράφων που αποστέλλονται	*5%*
	Αποστολή την επόμενη μέρα	% εγγράφων που αποστέλλονται	*3%*
		% ανάκτησης χαμένων εγγράφων	50%
		% αντικατάστασης χαμένων εγγράφων	30%

Αποτελέσματα μοντέλου υπολογισμού επίδρασης χρήσης ψηφιακών υπογραφών στο δημόσιο

			Βάση	Ετήσιο κόστος (εκατ. €)
Γενικό		Αριθμός υπογραφόντων	***400.000***	
		Αριθμός εγγράφων ανά υπογράφοντα ανά εργάσιμη ημέρα	*6*	
		Αριθμός εγγράφων ανά υπογράφοντα ανά έτος	1.320	
		Αριθμός σελίδων ανά τυπικό υπογεγραμμένο έγγραφο	*3.5*	
		Αριθμός υπογραφών ανά τυπικό υπογραμμένο έγγραφο	*2*	
Εκτύπωση		Κόστος / Σελίδα	0,007 €	12,1 εκατ. €
Σκανάρισμα		% εγγράφων που σκανάρονται	*1%*	
		Κόστος / Έγγραφο	0,688 €	3,6 εκατ. €
Αρχειοθέτηση		% εγγράφων που αρχειοθετούνται	*50%*	
		Κόστος αρχειοθέτησης /έγγραφο	0,688 €	181,5 εκατ. €
Εξωτερική Δρομολόγηση	**Αποστολή φαξ**	% εγγράφων που αποστέλλονται με φαξ	*1%*	
		Κόστος / σελίδα φαξ	0,688 €	3,63 εκατ. €
	Αποστολή με ταχυδρομείο	% εγγράφων που αποστέλλονται ταχυδρομικά	*5%*	
		ΕΛΤΑ παράδοση σε 3 μέρες, κόστος	0,830 €	22 εκατ. €
	Παράδοση σε 2 μέρες	% εγγράφων που αποστέλλονται	*3%*	
		Courier παράδοση σε μια μέρα, κόστος	5 €	79,2εκατ. €
Χαμένα Έγγραφα		% εγγράφων που χάνονται	3%	
		% χαμένων εγγράφων που ανακτούνται	50%	
		Κόστος ανάκτησης εγγράφου	6,9 €	54,5 εκατ. €
		% χαμένων εγγράφων που αντικαταστάθηκαν	30%	
		Κόστος αντικατάστασης χαμένων εγγράφων	13,8 €	65,3 εκατ. €
Συνολικό Κόστος		**Κόστος ανά υπογεγραμμένο έγγραφο:**	**0,80 €**	**421,7 εκατ €**

Αποτελέσματα μοντέλου υπολογισμού επίδρασης χρήσης ψηφιακών υπογραφών στο δημόσιο

- Υπολογισμός κόστους υιοθέτησης μιας έτοιμης λύσης (CoSign)

Ψηφιακή Λύση (κόστος 1ο έτος)	**87.600.000 €**
Ψηφιακή Λύση S&M (ετήσιο κόστος)	17.520.000 €
Ψηφιακή Λύση ΤΠ κόστος διαχείρισης (4 χρόνια)	6.000.000 €
Συνολικό κόστος ηλεκτρισμού (4 χρόνια)	960.000 €
4 χρόνια ΣΚΚ (Συνολικό κόστος κυριότητας)	164.640.000 €

Πηγή: "How to Calculate the Return on Investment (ROI) on a Digital Signature Solution", Cosign by ARX

Ποσοτικά αποτελέσματα

Η προώθηση των ψηφιακών υπογραφών στη δημόσια διοίκηση μπορεί να οδηγήσει σε εξοικονόμηση έως και 380 εκ ευρώ, ετησίως

- Υπενθυμίζεται: η δημοσιονομική επίδραση προγραμμάτων κινητικότητας / απολύσεων 15000 ατόμων στο Δημόσιο ήταν περίπου 100 εκ € ετησίως.
- Διάδοση τέτοιων λύσεων στο δημόσιο τομέα – ακόμα και αν εφαρμοστούν εν μέρει: πολύ πιο αποτελεσματική από μειώσεις προσωπικού.
- Αν σχεδιαστεί σωστά, το έργο των ψηφιακών υπογραφών μπορεί να παρέχει στους ιθύνοντες χάραξης οικονομικής πολιτικής ένα μεγαλύτερο εύρος επιλογών κατά την εισαγωγή πολιτικών διοίκησης ανθρωπίνων πόρων στο δημόσιο τομέα.

Οικονομική Επίδραση των Ανοικτών Δεδομένων (Open data)

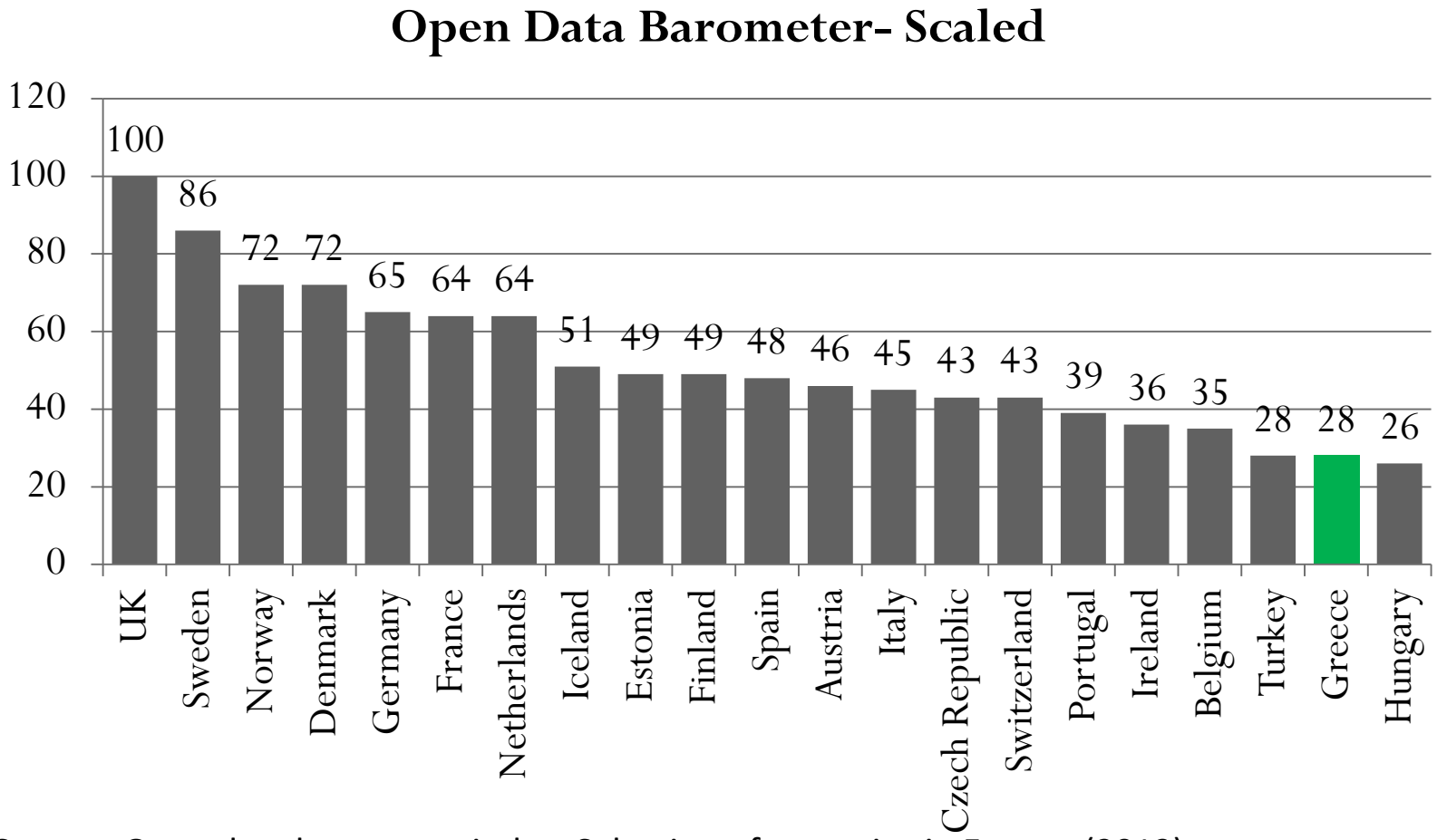
Ανοικτά δεδομένα

- Κάθε λεπτό στον κόσμο δημιουργούνται 1,7 τρισεκατ. bytes δεδομένων, (360.000 DVD).
- Περισσότερα ψηφιακά δεδομένα δημιουργήθηκαν τα τελευταία δυο χρόνια από ότι την υπόλοιπη ανθρώπινη ιστορία.
  - ''Big Data'': αύξηση με ρυθμό 40% το χρόνο. Αντίστοιχα, ο δημόσιος τομέας παράγει συνέχεια δεδομένα, σε όλες τις δραστηριότητες του και τα επίπεδα διοίκησης.
  - Ανοιχτή παροχή αυτών των πληροφοριών: ''Άνοιχτά (Κυβερνητικά) Δεδομένα'' (Open Government Data-OGD).

Ανοικτά δεδομένα: παραδείγματα

- Επιχειρηματική πληροφόρηση (Μητρώα, πληροφορίες εμπορικών σημάτων, ευρεσιτεχνιών και διαγωνισμών του δημοσίου)
- Γεωγραφικές πληροφορίες (πληροφορίες διεύθυνσης, αεροφωτογραφίες, κτίρια, κτηματολογικές πληροφορίες, γεωδαιτικά δίκτυα, γεωλογικά, υδρογραφικά στοιχεία και τοπογραφικές πληροφορίες)
- Νομικές πληροφορίες (αποφάσεις εθνικών, ξένων και διεθνών δικαστηρίων, εθνική νομοθεσία)
- Μετεωρολογικές πληροφορίες (κλιματικά δεδομένα και μοντέλα, καιρικές προβλέψεις)
- Κοινωνικά στοιχεία (στατιστικά στοιχεία στα οικονομικά, στην απασχόληση, στην υγεία, στον πληθυσμό και στη δημόσια διοίκηση)
- Πληροφορίες μεταφορών (κυκλοφοριακή συμφόρηση, τα έργα σε εξέλιξη στους δρόμους, μέσα μαζικής μεταφοράς και άδεια κυκλοφορίας των οχημάτων)

Επιδόσεις Ελλάδας



Source: Open data barometer index, Selection of countries in Europe (2013)

Ανοικτά δεδομένα: ποσοτικοποίηση

- Υπόθεση: Βελτίωση κατά 100% στο δείκτη στο βαρόμετρο ανοιχτών δεδομένων στην Ελλάδα
- Επίδραση σε:
  - Δείκτη συνολικής ανταγωνιστικότητας κατά WEF
  - Δείκτη Αντίληψης Διαφθοράς Διεθνούς Διαφάνειας
  - Δημιουργία νέων επιχειρήσεων

Επίδραση ανοικτών δεδομένων στην ανταγωνιστικότητα

Αποτελέσματα από οικονομετρικές εκτιμήσεις (συντελεστές επίδρασης) με τη μέθοδο OLS

Εξαρτημένη Μεταβλητή: Ανταγωνιστικότητα	Υπόδειγμα 1	Υπόδειγμα 2	Υπόδειγμα 3
Ανοικτά δεδομένα	0,145	0,121	0,097
Κατά Κεφαλήν ΑΕΠ	-	0,025	0,016
Δημοσιεύσεις	-	-	0,016
Σταθερός όρος	1,004	1,012	1,06
R^2	0,549	0,572	0,585

Μια 100% **αύξηση στη διάχυση των ανοικτών δεδομένων στην Ελλάδα μπορεί δυνητικά να βελτιώσει τη θέση της χώρας στο δείκτη ανταγωνιστικότητας κατά 25 περίπου θέσεις εφόσον όλοι οι υπόλοιποι παράγοντες παραμείνουν σταθεροί**

Επεξήγηση: Θετική επίδραση | Αρνητική επίδραση | Στατιστικά ασήμαντη επίδραση

Θετική επίδραση των ανοικτών δεδομένων στη διαφάνεια

Αποτελέσματα από οικονομετρικές εκτιμήσεις (συντελεστές επίδρασης) με τη μέθοδο OLS

Εξαρτημένη Μεταβλητή: Διαφάνεια	Υπόδειγμα 4	Υπόδειγμα 5	Υπόδειγμα 6
Ανοικτά δεδομένα	0,362	0,300	0,215
Κατά κεφαλήν ΑΕΠ	-	0,065	0,091
Χρόνος προετοιμασίας και πληρωμής φόρων	-	-	-0,223
Σταθερός όρος	2,694	2,714	4,099
R^2	0,480	0,505	0,644

Μια 100% αύξηση στη διάχυση των ανοικτών δεδομένων στην Ελλάδα μπορεί δυνητικά να βελτιώσει τη θέση της χώρας στο δείκτη διαφάνειας κατά 25 περίπου θέσεις εφόσον όλοι οι υπόλοιποι παράγοντες παραμείνουν σταθεροί

Επεξήγηση:

Θετική επίδραση	Αρνητική επίδραση	Στατιστικά ασήμαντη επίδραση

Θετική επίδραση των ανοικτών δεδομένων στη δημιουργία νέων επιχειρήσεων

Αποτελέσματα από οικονομετρικές εκτιμήσεις (συντελεστές επίδρασης) με τη μέθοδο OLS

Εξαρτημένη Μεταβλητή: Πυκνότητα Νέων Επιχειρήσεων	Υπόδειγμα 7	Υπόδειγμα 8	Υπόδειγμα 9
Ανοικτά δεδομένα	1,102	0,703	0,572
Κατά κεφαλήν ΑΕΠ	-	0,411	0,423
Χρόνος προετοιμασίας και πληρωμής φόρων	-	-	-0,390
Σταθερός όρος	-3,245	-3,083	-0,62
R^2	0,334	0,414	0,452

Μια 100% αύξηση στη διάχυση των ανοικτών δεδομένων στην Ελλάδα μπορεί δυνητικά να έχει ως αποτέλεσμα τη δημιουργία 6000 περίπου νέων επιχειρήσεων, εφόσον όλοι οι άλλοι παράγοντες παραμείνουν σταθεροί

Επεξήγηση: Θετική επίδραση | Αρνητική επίδραση | Στατιστικά ασήμαντη επίδραση

Ανοικτά δεδομένα: οφέλη

- Μια αύξηση κατά 100% στη διάδοση των ανοιχτών δεδομένων στην Ελλάδα μπορεί να οδηγήσει ceteris paribus σε:
  - σημαντική βελτίωση κατάταξης χώρας σε όρους ανταγωνιστικότητας κατά 25 θέσεις,
  - σημαντική βελτίωση κατάταξής της σε όρους διαφάνειας κατά 33 θέσεις (από την 80η στη 47η).
  - στη δημιουργία πάνω από 6.000 νέων επιχειρήσεων

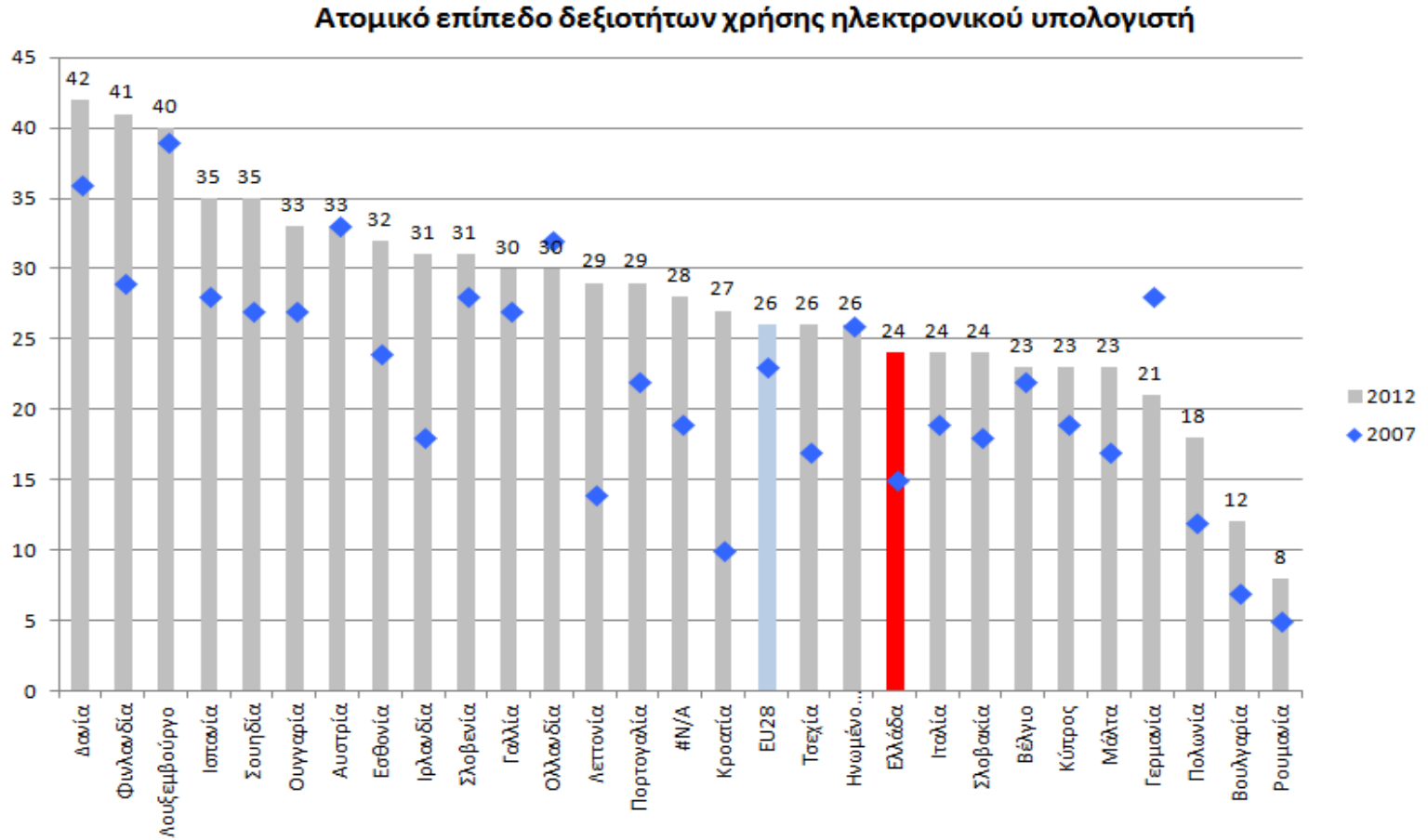
Ανοιχτά δεδομένα: μπορούν να προσφέρουν ένα νέο πεδίο ανάπτυξης υπηρεσιών για νέα επιχειρηματικότητα, νέες δραστηριότητες, προϊόντα και υπηρεσίες που μπορούν να αναπτυχθούν σε ένα ευρύ πεδίο πιθανών χρήσεων μεταδεδομένων

Οικονομική Επίδραση των Ψηφιακών Δεξιοτήτων

Ψηφιακές δεξιότητες

- Βασικό στρατηγικό εργαλείο ώστε η ευρωπαϊκή οικονομία να προσανατολιστεί προς μια δυναμική, έξυπνη, βιώσιμη και χωρίς κοινωνικούς αποκλεισμούς ανάπτυξη.
- Τα άτομα με ισχυρές ψηφιακές δεξιότητες αναμένεται να παίξουν βασικό ρόλο στην ενίσχυση της καινοτομίας και της ανταγωνιστικότητας στην ευρωπαϊκή οικονομία.
- Παρά την αυξανόμενη ζήτηση για άτομα με καλές γνώσεις στις ΤΠΕ, πολλές χώρες σε όλο τον κόσμο βρίσκονται αντιμέτωπες με ελλείψεις σε ηλεκτρονικές δεξιότητες, αλλά και με μικρό αριθμό επαρκώς καταρτισμένων επαγγελματιών ΤΠΕ για να αντιμετωπίσουν τις αυξανόμενες ανάγκες των οργανισμών

Ψηφιακές δεξιότητες: βελτίωση, αλλά σε απόσταση ακόμα



Πηγή: Eurostat

Ψηφιακές δεξιότητες: ποσοτικοποίηση

- Υπόθεση: Βελτίωση στο επίπεδο των e-skills στην Ελλάδα

- Επίδραση σε:
  - **Εξαγωγικές δραστηριότητες**
  - **Δημιουργία νέων επιχειρήσεων**

Θετική επίδραση των ψηφιακών δεξιοτήτων του ανθρώπινου δυναμικού στην εξαγωγική δραστηριότητα

Αποτελέσματα από τις οικονομετρικές εκτιμήσεις (συντελεστές επίδρασης) τη μέθοδο GLS panel random effects

Εξαρτημένη Μεταβλητή: Εξαγωγές/ΑΕΠ	Υπόδειγμα 10	Υπόδειγμα 11	Υπόδειγμα 12
Ηλεκτρονικές δεξιότητες	0,652	0,642	0,398
Μεταβολή ΑΕΠ	-	-0,043	0,059
Σταθερός όρος	0,525	0,526	0,557

Εάν εκπαιδευτούν 1000 άτομα για την απόκτηση ψηφιακών δεξιοτήτων, τότε δυνητικά μπορεί να προκληθεί μία αύξηση στην εξαγωγική δραστηριότητα της χώρας κατά περίπου 13 εκ. ευρώ, εφόσον όλοι οι υπόλοιποι παράγοντες παραμείνουν σταθεροί

Επεξήγηση: Θετική επίδραση | Αρνητική επίδραση | Στατιστικά ασήμαντη επίδραση

Θετική επίδραση των ηλεκτρονικών δεξιοτήτων στην επιχειρηματική δραστηριοποίηση

Αποτελέσματα από τις οικονομετρικές εκτιμήσεις (συντελεστές επίδρασης) με τη μέθοδο GLS panel random effects

Εξαρτημένη Μεταβλητή: Πυκνότητα Νέων Επιχειρήσεων	Υπόδειγμα 13	Υπόδειγμα 14	Υπόδειγμα 15
Ηλεκτρονικές δεξιότητες	0,137	0,171	0,125
Μεταβολή ΑΕΠ	-	2,851	1,933
Σταθερός όρος	1,665	1,653	1,560

Εάν περισσότερα από 1000 άτομα αποκτήσουν ψηφιακές δεξιότητες, τότε δυνητικά μπορεί να προκαλέσει τη δημιουργία 70 περίπου επιχειρήσεων, εφόσον όλοι οι υπόλοιποι παράγοντες παραμείνουν σταθεροί

Επεξήγηση: Θετική επίδραση | Αρνητική επίδραση | Στατιστικά ασήμαντη επίδραση

Ψηφιακές δεξιότητες: οφέλη

- **Για κάθε 1000 άτομα που βελτιώνουν το επίπεδο e-skills που διαθέτουν,**
  - θα μπορούσαν να **ενισχυθούν** οι **εξαγωγές** από την Ελλάδα **κατά 13,9 εκ ευρώ**
  - θα μπορούσαν να **δημιουργηθούν 72 νέες επιχειρήσεις στην Ελλάδα**

- Νέο πρότυπο ανάπτυξης στην Ελλάδα που πρέπει να επικεντρωθεί σε εξαγωγές και επενδύσεις.
- Αλλά για να γίνει αυτό πρέπει να επενδύσουμε σε ικανότητες, δεξιότητες και τεχνολογία, έτσι ώστε οι επιχειρηματικές πρακτικές να μπορούν να υποστηρίξουν αυτό το σχέδιο εξαγωγικού προσανατολισμού.
- Η ενίσχυση των ψηφιακών δεξιοτήτων (e-skills) μπορεί να έχει σημαντικό αντίκτυπο σε αυτή τη διαδικασία, καθώς οικοδομούν εκείνες τις δυναμικές ικανότητες που είναι απαραίτητες για να αποκτήσουν ευρείες ομάδες του πληθυσμού επαρκή εικόνα για πιθανές αγορές, πελάτες, αλλά και τους ανταγωνιστές

Οικονομική Επίδραση ψηφιακής επιχειρηματικότητας και καινοτομίας στις ΜΜΕ

Ψηφιακή επιχειρηματικότητα (Digital Entepreneurship)

- Βασικός άξονας της ευρωπαϊκής πολιτικής για την επιχειρηματικότητα 2020

- Στόχος: ανάδειξη νέων ευκαιριών για επιχειρηματίες και επιχειρήσεις μέσω της διείσδυσης και διάδοσης νέων ψηφιακών τεχνολογιών ώστε να τονωθεί η είσοδος νέων επιχειρήσεων, η επιβίωση υφιστάμενων, με δημιουργία ποιοτικών θέσεων εργασίας.

Ψηφιακή Επιχειρηματικότητα: οφέλη

Οφέλη για Δημόσιο τομέα	Οφέλη για επιχειρήσεις	Οφέλη για κοινωνία / πολίτες
Ενθάρρυνση συνεργασιών μεταξύ δημοσίου τομέα-επιχειρήσεων - πανεπιστημίων	Διευκόλυνση της εισόδου στην αγορά των νέων και δυναμικών παικτών	Δημιουργία θέσεων εργασίας
Ενίσχυση της μεταφοράς τεχνολογίας	Ενίσχυση επιχειρησιακών δικτύων ανάμεσα στις μικρομεσαίες και τις μεγάλες επιχειρήσεις	Μείωση ποσοστών ανεργίας
Αύξηση και διασφάλιση των φορολογικών δηλώσεων	Είναι δυνατόν οι ΜΜΕ να γίνουν πλήρως ολοκληρωμένοι διεθνείς επιχειρηματικοί εταίροι	Διάχυση γνώσης ανάμεσα στις περιφέρειες
Αύξηση του ΑΕΠ και βελτίωση της παραγωγικότητας και ανταγωνιστικότητας της οικονομίας	Εξορθολογισμός επιχειρηματικών διαδικασιών	Βελτίωση ικανοτήτων ανθρώπινου κεφαλαίου
	Αυξημένες αποδόσεις των επενδύσεων σε ΤΠΕ	
	Βελτίωση επιχειρηματικών συναλλαγών	
	Μείωση διοικητικού κόστους και λαθών	

Θετική επίδραση της υιοθέτησης ΤΠΕ από ΜΜΕ στη καινοτομικότητά τους (στοιχεία από έρευνα σε 3500 ΜΜΕ)

Αποτελέσματα από τις οικονομετρικές εκτιμήσεις (συντελεστές επίδρασης) με τη μέθοδο probit

Εξαρτημένη Μεταβλητή: Καινοτομία	Υπόδειγμα 16	Υπόδειγμα 17	Υπόδειγμα 18
Υιοθέτηση ΤΠΕ από τις ΜΜΕ	0,090	0,074	0,041
Μέγεθος επιχείρησης	-	0,172	0,115
Τοποθεσία	-	-0,040	-0,025
Οικονομική δραστηριότητα	-	0,013	0,012
E&A	-	-	0,068
Επιχειρηματική δικτύωση	-	-	0,015
Κουλτούρα και πρωτοβουλίες απασχολούμενων για ανάληψη ρίσκου	-	-	0,048

Η υιοθέτηση των ΤΠΕ από τις ΜΜΕ αυξάνει την πιθανότητα να καινοτομήσουν περίπου από 4 έως 9 ποσοστιαίες μονάδες, εφόσον όλοι οι άλλοι παράγοντες παραμείνουν σταθεροί

Επεξήγηση: Θετική επίδραση | Αρνητική επίδραση | Στατιστικά ασήμαντη επίδραση

Θετική επίδραση της υιοθέτησης ΤΠΕ από ΜΜΕ στη διεθνοποίησή τους

Αποτελέσματα από τις οικονομετρικές εκτιμήσεις (συντελεστές επίδρασης) με τη μέθοδο probit

Εξαρτημένη Μεταβλητή: Εξωστρέφεια	Υπόδειγμα 19	Υπόδειγμα 20	Υπόδειγμα 21
Υιοθέτηση ΤΠΕ από τις ΜΜΕ	0,039	0,022	0,013
Μέγεθος επιχείρησης	-	0,197	0,185
Τοποθεσία	-	0,017	0,022
Οικονομική δραστηριότητα	-	-0,006	-0,004
Επιχειρηματική δικτύωση	-	-	0,021
Σύνδεση στόχων managers με ανάπτυξη των επιχειρήσεων	-	-	0,010
Πρακτική παροχής μπόνους με παραγωγικότητα απασχολούμενων	-	-	0,008

Η υιοθέτηση των ΤΠΕ από τις ΜΜΕ αυξάνει την πιθανότητα να γίνουν εξωστρεφείς περίπου από 1,5 έως 4 ποσοστιαίες μονάδες, εφόσον όλοι οι άλλοι παράγοντες παραμείνουν σταθεροί

Επεξήγηση: Θετική επίδραση | Αρνητική επίδραση | Στατιστικά ασήμαντη επίδραση

Ψηφιακή επιχειρηματικότητα: ποσοτικά αποτελέσματα

<u>Η ευρύτερη υιοθέτηση ΤΠΕ από ελληνικές ΜΜΕ</u>

- **<u>αυξάνει την πιθανότητα να καινοτομήσουν κατά 4-9 ποσοστιαίες μονάδες.</u>**
- **<u>αυξάνει την πιθανότητα να κάνουν εξαγωγές κατά 1,5-4 ποσοστιαίες μονάδες.</u>**

- Βελτίωση προστιθέμενης αξίας προϊόντων/ υπηρεσιών από το ελληνικό παραγωγικό σύστημα: βασικό συστατικό για βελτίωση της διεθνούς ανταγωνιστικότητας.
- Η Ελλάδα δε μπορεί ούτε και πρέπει να ανταγωνιστεί τις οικονομίες χαμηλού κόστους, που εστιάζουν στην ανειδίκευτη εργασία, καθώς αυτή η στρατηγική είναι μυωπική και δεν οικοδομεί πάνω στις ικανότητες που το ανθρώπινο δυναμικό της χώρας διαθέτει.
- Προκειμένου όμως να αυξηθεί η προστιθέμενη αξίας παραγωγής, θα πρέπει να τονωθεί η καινοτομία, και η βασιζόμενη στη γνώση επιχειρηματικότητα.
- Η υιοθέτηση και διάδοση των ΤΠΕ στη παραγωγική διαδικασία μπορεί να παρέχει πλεονεκτήματα κόστους και καινοτομίας που υπερβαίνουν το κόστος εργασίας.
- Για αυτό η επένδυση σε ΤΠΕ δεν είναι πολυτελής επένδυση, ακόμα και σε καιρούς αυστηρής δημοσιονομικής κατάστασης, αλλά προϋπόθεση για ανάπτυξη που βασίζεται στην καινοτομία.

Προτάσεις πολιτικής: ψηφιακές υπογραφές

- Καθιέρωση ενός καθαρού και απλού ρυθμιστικού/ νομικού πλαισίου για ψηφιακές υπογραφές και ευρεία χρήση της ηλεκτρονικής σφραγίδας, ιδίως σε θέματα που σχετίζονται με τον τρόπο με τον οποίο διασφαλίζεται η ηλεκτρονική ταυτοποίηση των ατόμων, οι διαδικασίες ανάθεσης των προνομίων υπογραφής και η μέθοδος πιστοποίησης για ένα άτομο
- Διευκόλυνση ηλεκτρονικής επικοινωνίας ανάμεσα στο δημόσιο τομέα και τις επιχειρήσεις/ πολίτες
- Διατήρηση της ακεραιότητας του εγγράφου, αναφοράς στο οποίο χρησιμοποιήθηκε η ηλεκτρονική σφραγίδα
- Εξασφάλιση συμβατότητας με διάφορες εφαρμογές και φορείς παραγωγής περιεχομένου

Προτάσεις πολιτικής για ανάπτυξη ανοιχτών δεδομένων

- Βελτίωση της επικαιροποίησης και της πρόσβασης σε ψηφιακό υλικό
- Δημιουργία ψηφιακού υλικού δημόσιων αρχείων
- Καθιέρωση μιας ενιαίας υπηρεσίας μητρώου
- Παρακολούθηση της προόδου που έχει σημειωθεί σε σχέση με τα ανοιχτά δεδομένα για κάθε δημόσιο οργανισμό
- Υποστήριξη συνεργασιών μεταξύ του δημοσίου τομέα και ιδιωτικών κέντρων δεδομένων (datacenters)
- Δημιουργία πλατφόρμας επικοινωνίας για μέλη της Δημόσιας Διοίκησης που να διευκολύνει την ανταλλαγή ιδεών ή/ και εμπειριών στα έργα ανοιχτών δεδομένων
- Ανάπτυξη ενός οδηγού για τα μέλη της Δημόσιας Διοίκησης για την προώθηση και επαναχρησιμοποίηση των δεδομένων του Δημόσιου τομέα
- Εκπαίδευση και ενημέρωση των μελών της Δημόσιας Διοίκησης μέσω σεμιναρίων στο πως να δημοσιεύουν δημόσια δεδομένα online

Προτάσεις πολιτικής για τόνωση ψηφιακών δεξιοτήτων και δεξιοτήτων χρήσης ΤΠΕ

- Επέκταση προγραμμάτων δια βίου μάθησης των ΤΠΕ
- Ενίσχυση εκπαίδευσης των ΤΠΕ σε νέους, γυναίκες και μετανάστες
- Ανάπτυξη μαθημάτων e-learning
- Παρακολούθηση της προσφοράς και ζήτησης e-skills
- Παρακίνηση κινητικότητας επαγγελματιών ΤΠΕ σε διάφορους κλάδους της οικονομίας

Προτάσεις πολιτικής: ενδυνάμωση ψηφιακής επιχειρηματικότητας και καινοτόμων ΜΜΕ

- Εναρμόνιση σχετικών νόμων και κανονισμών με διεθνή πρότυπα, σε θέματα που σχετίζονται με διεθνοποίηση των ΜΜΕ, την εμπορική αξιοποίηση καινοτομίας και προστασία δικαιωμάτων πνευματικής ιδιοκτησίας
- Κίνητρα (π.χ. φορολογικά) για δημιουργία κοινών ερευνητικών εργαστηρίων ΤΠΕ
- Δημιουργία γραφείων μεταφοράς τεχνολογίας στα πανεπιστήμια
- Τόνωση σχημάτων συνεργασίας δημοσίου-ιδιωτικού τομέα για την προώθηση της επένδυσης και της συμμετοχής των επιχειρήσεων στην εμπορευματοποίηση και στη μεταφορά τεχνολογίας
- Διευκόλυνση πρόσβασης σε εξωτερική χρηματοδότηση για start-ups που δίνουν έμφαση στη καινοτομία π.χ. μέσω της δημιουργίας δικτύου business angels σε εθνικό και ευρωπαϊκό επίπεδο, υβριδίων δημόσιων-ιδιωτικών κεφαλαίων, του crowd-sourcing κ.α.
- Εντοπισμός και διάδοση καλών διεθνών πρακτικών για το πως να προωθηθούν οι ψηφιακοί επιχειρηματίες

Συνεπώς;

- Ανάγκη ταχύτερης προώθησης στοχευμένων πολιτικών στους τομείς αυτούς
  - Επιτυχημένο παράδειγμα: όλοι στο TAXISNET
- Με προτεραιότητες, καθώς οι πόροι είναι περιορισμένοι και υιοθέτηση της λογικής της «αγοράς υπηρεσίας» και όχι απλώς εξοπλισμού
- Παρεμβάσεις όχι στο όνομα «τεχνολογικής τέρψης», αλλά γιατί προκύπτουν απτά οφέλη που βοηθούν στη δημιουργία διατηρήσιμης μεγέθυνσης που αξιοποιεί το ανθρώπινο δυναμικό αυτής της χώρας και υπερβαίνει τη συζήτηση περί εργατικού κόστους

Ευχαριστούμε για την προσοχή σας