Broadband and e-Government Services in South East Europe: Comparative Analysis, Impact and Policy Recommendations

Konstantinos Antonis, Technological Institute of Central Greece, Greece

Christos Bouras, Computer Technology Institute & Press "Diophantus", Patras, Greece & Computer Engineering and Informatics Department, University of Patras, Patras, Greece

Fabrizio D'Elia, Molise Region, Italy

Annalisa Di Vincenzo, Molise Region, Italy

Georgios Diles, Computer Technology Institute & Press "Diophantus", Patras, Greece & Computer Engineering and Informatics Department, University of Patras, Patras, Greece

Vasileios Kokkinos, Computer Engineering and Informatics Department, University of Patras, Patras, Greece

Andreas Koskeris, Computer Technology Institute & Press "Diophantus", Patras, Greece

ABSTRACT

The European Commission acknowledging the significance of broadband for the improvement of citizen welfare and its economic benefits, has put in place targets for the diffusion of broadband to all citizens and businesses in the European Union. This manuscript comparatively assesses the current state of affairs in broadband and digital public services in selected South East Europe (SEE) countries in order to identify weaknesses and highlight strengths, and attempts to measure the impact and effectiveness of broadband on the economy. To this direction, the authors focus on evaluating the correlation between broadband and growth and employment. They also estimate the savings achieved by the usage of e-services and the potential savings that will follow their increased utilization over the next years. The analysis is followed by a number of recommendations that aim to support informed decision making. The manuscript builds on four surveys that took place during the second quarter of 2013.

Keywords: Broadband, Cost savings, Digital public services, Employment, Growth, Strategy planning

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INTRODUCTION

Access to information, broadband connectivity and financing of virtual accessibility are key components necessary for the development, adoption and use of Information and Communication Technologies (ICT) in the economy and society (Chapman et al., 2003). Inadequacies in the telecommunication infrastructure and accessibility to services among the individual countries and regions of the South East Europe (SEE) area hamper significantly competitiveness and cohesion in SEE countries. Market mechanisms fail to address adequately the low population density and/or rural and remote areas. These problems have been widely acknowledged at European and national level. Member states and regions in the SEE area have adopted virtual accessibility strategies, but further work needs to be done particularly in elaborating comprehensive operational plans and implementing measures to achieve the objectives set regarding the broadband connectivity and accessibility of services.

However, in order to examine and promote policies to tackle the digital gap between SEE areas and the rest of Europe, and among SEE areas as well, large investments are required for infrastructures, operational costs and other subsequent expenditures. This raises the question if there is a repayment and how much this is, in terms of local economy development, employment increase and other cost savings that will justify the significant initial investments.

Unfortunately, measuring the impact of broadband is a quite difficult task. Broadband is a general purpose technology, which means there is no specific output, that it would be easy to measure. Instead, it affects multiple aspects of our professional and personal lives, in multiple ways. Moreover, in the countries under investigation, broadband large-scale penetration is recent or even expected in the near future. This means that the actual effects have not been either expressed or documented. Another consequence of the general purpose nature of broadband, is that the effects become visible a long period of time after its ignition cause. This means that investments in infrastructure or a significant increase in broadband penetration may influence the economy of the area the next two or three years making the identification of the correlation difficult. Changes in employment are also difficult to trace since demand in one area may create a migration (or outsourcing) trend from other areas, or vice-versa.

The purpose of this paper is to provide a comprehensive overview of the current state of affairs regarding broadband and e-Government services in seven SEE countries (Austria, Bulgaria, Greece, Italy, Slovenia, Former Yugoslav Republic of Macedonia - FYROM, Montenegro). In addition, we investigate the impact of broadband on the growth and employment in these countries by specifying the macroeconomic evidence required for the analysis. We then enforce regression analysis on data collected by the respective countries in order to find the correlation between broadband, growth and employment. The period of the examination was set to be from 2001 to 2011 in order to obtain an extended amount of data, and take into account possible influences on the results by the economic crisis and the subsequent recession of the last years in the area. We also estimate the cost savings to companies and the state by the usage of broadband-based e-government services. We then forecast these benefits to 2015 when the respective countries are expected to have reached the e-government usage level which is set by the European digital agenda (European Commission, 2014a). The paper also provides useful and usable information that could lead to suggestions for improvements and joint actions for policy makers that will, in turn, help improve the related policies in the SEE region.

The inception of this paper is attributed to project SIVA. Project SIVA stands for "South East Europe improved virtual accessibility through joint initiatives facilitating the roll-out of broadband networks". The SIVA partnership consists of 20 partners from the SEE countries listed above. The project aims to contribute to the improvement of the accessibility of SEE territories through broadband services, as substitute for and supplementing physical

accessibility and thus to narrowing the digital gap in SEE.

The structure of the paper is as follows: In the following section the related work regarding the impact of broadband is presented. The next section describes the methodology followed in our research and specifically the regression analysis' parameters and the methodology to calculate cost savings. In the following sections we present the results of our analysis as far as broadband is concerned and regarding e-Government services. In the sixth section the findings of our analysis are presented and discussed. Then, we provide some policy recommendations based on the analysis and in the last two sections we conclude the paper and we make suggestions for future work.

RELATED WORK

Several research works have focused on providing an overview of the current state, on highlighting the role, trends and challenges regarding broadband that would reveal its effects (Bouras et al., 2009; Cossiavelou et al., 2011; Cossiavelou & Bantimaroudis, 2009; Dwivedi et al., 2008; Yates & Weiss, 2010). Meisel et al. (2014) analyze key economic arguments involving the development of the broadband plan by United States Federal Communications Commission, addressing open network and competition issues, to make recommendations to the Commission in its formulation of federal policy. Dwivedi et al. (2011) examine the factors affecting the adoption of broadband Internet in a developing country context by focusing on Malaysia. Fan (2013) stresses the importance of broadband for the social and economic development and provides an in-depth analysis of the impact of policy issues on broadband Internet access in Australia. This research indicates that the state of broadband Internet access is closely related to the Government's policy and regulatory framework.

The biggest problem however, in calculating accurately the effects of broadband is the severe lack of data for many countries related to broadband and inter-sector economic dependencies that would allow for reliable investigation of the subject. Few countries have the means and the motivation to collect and analyze the data needed for the task. Due to this problem, the largest portion of the bibliography has focused on high developed countries. Katz (2012) in his report that was conducted under the provision of International Telecommunication Union (ITU) and constitutes a collective presentation of the research and relevant policy issues, highlights the general conclusions of the past and ongoing research. The report discusses the parameters each study was based on, and compares the results of each study attempting to explain the diversification between the papers' results. Katz et al. (2010) investigate the macroeconomic impact of investment in broadband technology on employment and output of Germany's economy, showcasing the longer term externalities of infrastructure investments, such as accelerated innovation and new business creation, as well as their possible role as economic stimuli in times of economic crisis.

Qiang & Rossotto (2009) applied regression analysis on data collected for a period of time starting from 1980 and onwards, separating high with low income countries. The analysis concluded that the empirical findings confirm that the benefits of broadband in growth are major and robust for both developed and developing countries, although the significance is higher for the former, which have a longer track record of broadband diffusion. Similar results were obtained by Koutroumpis (2009) investigating 22 OECD countries, finding a positive correlation in growth and broadband penetration. The results also showed that the positive impact of broadband was greater when a critical mass of infrastructure was present, thus developed countries harvested the most benefits from broadband. US state-level data were used to estimate direct and indirect benefits on state Gross Domestic Product - GDP (Thompson & Garbacz, 2008). The phenomenon called "capital labour substitution" was also studied. The latter means the loss of jobs because of the efficient utilization of broadband

services. This effect varied between different locations and sectors, with the greater impact to be observed in less developed countries and sectors like accommodation. The work by Fornefeld & Delaunay (2010) showed that this effect becomes less evident in countries where innovation is encouraged, and new services are quickly embraced. This approach fosters new ideas of services, products and applications resulting in an increase in employment due to broadband which compensates for the reduction of lost jobs because of the capital labour substitution effect. Crandall et al. (2007) and Gillett et al. (2006) studied the effects on USA output and employment as well, showcasing a positive link between broadband and economy.

Studies of ITU (2012) and Bouras et al. (2013) also focus on the economic impact of broadband. Both studies conclude that broadband exhibits a higher contribution to economic growth in countries that have a higher adoption of the technology and that the economic impact of broadband is higher when promotion of the technology is combined with stimulus of innovative businesses that are tied to new applications. In addition, broadband has a stronger productivity impact in sectors with high transaction costs, such as financial services, or high labour intensity, such as tourism and lodging; while, the impact of broadband on small and medium enterprises takes longer to materialize due to the need to restructure the firms' processes and labour organization in order to gain from adopting the technology. All these factors cause a significant rise in GDP (Little et al, 2013).

METHODOLOGY

Current State of Broadband and e-Government Services

In order to obtain a comprehensive overview of the current state of affairs regarding broadband and e-Government services in the SEE region, SIVA partners created and delivered three questionnaires. The main purpose of these surveys was to identify, measure and highlight the mismatches in broadband coverage and/or penetration that lead to the digital divide by collecting relevant information. The three questionnaires were filled by all partners. To complete the questionnaires desk research was used as a first step for each partner, while each partner was free to use its own techniques: existing national/regional reports, interviews with stakeholders and questionnaires for the target groups.

Impact of Broadband

In order to investigate the impact of broadband on the growth and employment an additional questionnaire was filled in by all partners. The questionnaire was structured in a manner that allowed for the ease of data manipulation and the application of econometric equations. Due to the lack of known inter-sector dependencies that would allow calculating multipliers to measure the impact, regression analysis was considered. For our purpose, we considered linear regression for two reasons. First, the amount of data was insufficient to examine correlation with high complexity. The second reason is that based on the past research works, effects on broadband seems to saturate and are neglected for very high levels of penetration in developed countries. This situation is not representative of the SEE area that we investigate in this paper, thus the linear model was rated adequate.

The impact on growth was determined based on data collected for the period of 2001-2011 when available. The dependent variable was chosen to be the GDP per capita, and the independent the number of broadband internet subscribers per 100 people ($Broad_{pen}$). Our analysis was based on the model followed by Qiang & Rossotto (2009) and Koutroumpis (2009). Specifically, *Equation 1* was used:

$$\log\left(GDP_{pc}\right) = a_0 + a_1 * \log\left(Broad_{pen}\right) + a_2 * \log\left(Edu\right) + a_3 * \log\left(Invest\right) \quad (1)$$

where GDP_{pc} denotes the GDP per capita, *Edu* is the percentage of school enrolment in primary

education, and *Invest* is expressed through the Gross fixed capital formation (as a percentage of GDP).

Our goal is to estimate the coefficient of the "broadband internet subscribers per 100 people", i.e. the coefficient a_1. This estimation will allow us to track changes in GDP when broadband penetration changes; while the remaining parameters remain the same. Specifically, if $Broad'_{pen}$ and GDP'_{pc} are the new values of broadband penetration and GDP per capita respectively, the corresponding change in GDP would be:

$$\frac{GDP'_{pc}}{GDP_{pc}} = \left(\frac{Broad'_{pen}}{Broad_{pen}} \right)^{a_1} \quad (2)$$

To calculate the impact on employment, the dependent variable was chosen to be the total employment of the country expressed as a percentage of the total labour force (*EMP*) and the independent variable was the number of broadband internet subscribers per 100 people ($Broad_{pen}$). Our analysis was based on the model followed by Crandall et al. (2007), and is shown in the following equation:

$$EMP = b_0 + b_1 * Broad_{pen} + b_2 * Edu + b_3 * Wage + b_4 * TAX \quad (3)$$

where *Wage* denotes the average wage in the country, *TAX* expresses the taxes on income, profits and capital gains (as a percentage of revenue), and *Edu* denotes again the percentage of school enrolment in primary education.

Here, our goal is to estimate the coefficient b_1 that will allow us to track changes in employment when broadband penetration changes; while the value of the remaining parameters stays the same. In this case, if $Broad'_{pen}$ and *EMP'* are the new values of broadband penetration and employment respectively, the corresponding change in employment would be:

$$EMP' - EMP = b_1 * \left(Broad'_{pen} - Broad_{pen} \right) \quad (4)$$

Finally, we evaluated the positive externalities derived by the utilization of broadband-based e-government services. E-government allows for effective, fast and most importantly cost-effective method of public administration and user-government and business-government interaction. To estimate the money each country may save by increased e-government, we followed the process defined by L. Frontier Economics Ltd (2010) and ITU (2012). Specifically, we evaluated the costs that are saved by each country when three of the most common transactions i.e. income tax, VAT and business registration are conducted online, instead of the traditional way. At first we estimated the total number of these transactions that were conducted in a year. Since, those statistics were not available for the countries under investigation, we used the number of transactions that were available for other European countries and adjusted the number to the population of the countries of the consortium. We multiplied the total number of transactions ($\#Trans_{tot}$) with the percentage of e-government usage of each country ($egov_{per}$), to estimate the total number of transactions that were conducted online within a year ($\#Trans_{online}$), i.e.:

$$\#Trans_{online} = egov_{per} * \#Trans_{tot} \quad (5)$$

We then calculated the total time saved using e-government services per year, by multiplying the number of online transactions within a year with the time save by each one of them (61 minutes per transaction, according to L. Frontier Economics Ltd (2010) and ITU (2012)):

$$TimeSaved(min) = 61 * \#Trans_{online} \quad (6)$$

The next step in our analysis was to express the time saved in equal working years. To this direction, we considered a working year to contain 240 working days, and each working day of 8 working hours (*Equation 7*). Finally, we evaluated the total money saved per year based on the average annual wage in the country examined and the time saved (*Equation 8*).

$$TimeSaved\left(yrs\right) = TimeSaved\left(min\right) / \left(240 * 8 * 60\right) \quad (7)$$

$$Money_{saved} = TimeSaved\left(yrs\right) * Wage_{annual} \quad (8)$$

After our evaluation, we forecast the potential savings due to e-government when the goals set by the European digital agenda on e-government services are reached. That is, 50% of the population will be using e-government services by 2015. It is noted that our estimations were based on a fraction of the total transactions possible, and our final cost reduction did not include the money saved by the reduction of travelling or postage requirements due to e-government. Thus, the estimation should be considered a conservative estimate of the resulting cost savings.

COMPARATIVE ANALYSIS FOR BROADBAND OFFERINGS IN SEE

Broadband Offerings in SEE

Geographical Coverage

Survey results show that fixed Digital Subscriber Line (xDSL) technology is the dominant technology in the SEE region. All seven countries provide adequate broadband services using xDSL to urban regions and most of them also to rural regions. Low rural coverage for xDSL is encountered in Bulgaria at 24% and in Montenegro at 30%, while the other countries exhibit coverage above 78%. Broadband offerings based on cable technologies are available only in Austria, Bulgaria and Slovenia but their geographical coverage is quite low. Another interesting result is the significant adoption of fiber technologies. Fiber-To-The-x (FTTx) technologies are the next big thing in fixed broadband and are expected to be the route toward meeting the goals of the EU Digital Agenda. As far as the gap between geographical coverage in urban and rural areas is concerned, the only safe conclusion is that rural regions are lagging behind urban regions. Despite this, most countries exhibit significant broadband geographical rural coverage.

Wireless broadband technologies are not widely available. The only technology that offers full coverage is satellite. The only other technology apart from satellite that features non-negligible geographical coverage is WiMAX (Worldwide Interoperability for Microwave Access). Broadband offerings based on other technologies, such as long-range WiFi, are not available in the region. The existence of hot-spots in the region, where WiFi is offered using a fixed connection and a wireless router lies outside the scope of this research.

Mobile broadband services are becoming more popular with the introduction of technologies that can compete with the speed of wireless and fixed broadband services. High Speed Packet Access (HSPA) and HSPA+ technologies seem to be available in four countries of the SIVA consortium. Long Term Evolution (LTE) is currently being introduced. Its current limited coverage is a result of the early stages of market maturity of the technology.

Barriers for Broadband Penetration

Survey results show that broadband deployment is mainly held back by market related reasons, and secondarily by technical reasons. The most recognized barriers are related to the high cost of capital for funding for network development, the high cost of user terminals and the lack of demand for such services. Technical barriers that also hinder deployment are the lack of existing

infrastructure and the lack of power supply to operate the required infrastructure. These two classes of barriers are dominant in all countries of the SIVA consortium. Additional barriers also exist. For example, in Slovenia there seems to be a lack of strategy from the government and unwillingness of local authorities to cooperate with broadband vendors. Greece has identified the lack of skilled personnel for the construction, maintenance and operation of the network infrastructure as a barrier.

Profile of Broadband Users

Broadband penetration in citizens who have completed elementary school is low in countries such as FYROM, Montenegro, Greece and Bulgaria. In Austria and Slovenia the percentage exceeds 50% and can be considered adequate. Penetration in citizens who have completed secondary education, on the other hand, may be deemed satisfactory in all countries except Bulgaria. More than half of citizens of this class use broadband services, presumably more will be using the internet and other digital services though narrowband connections. Generally, the percentage of broadband users increases as citizens become more educated.

In the survey questionnaire broadband internet usage was classified under five discrete activities: communication, finding information, fun, work and other. Communication and finding information seem to be the most popular activities. Most reported information is well above 60% for these activities. This is well motivated as this type of services has been available for some time and users are accustomed to them. One surprising finding is the percentage of broadband users who use the internet for work. With the exception of Slovenia, all other countries have reported percentages ranging from 8 to 30%. It is not clear whether this is due to the lack of need for internet for work-related purposes or whether individuals who need to access the internet for work have other means to do so. Slovenia reports a percentage of 80% on the other hand, which is quite high.

Another finding is that gender is not an important parameter in determining whether individuals will purchase goods or services online. The percentages for males and females are almost identical in both cases.

COMPARATIVE ANALYSIS OF E-GOVERNMENT SERVICES

The five-stage maturity model classifies how businesses and citizens can interact with the public authorities into five discrete levels (Budinoski & Trajkovik, 2012). Governments' service delivery processes are described according to the following stages: 1) information, 2) one-way interaction, 3) two-way interaction, 4) transaction, and finally 5) targetization. Sophistication stages are depicted in *Table 1*. Until 2007 each elementary service was graded on a scale from zero to four. In 2007, the EC introduced a new 5th stage, which refers to the personalisation of services.

The third and the fourth levels, two-way interaction and transaction, have become a standard for many countries: electronic forms are available for many services; the transactional approach (also known as full electronic case handling), where the user applies for and receives the service online, without any additional paper work, is increasingly becoming mainstream. The fifth level provides an indication of the extent by which front and back offices are integrated, data is reused and services are delivered proactively. The fourth and fifth levels are jointly referred to as "full online availability".

Using this model, the basic public services are being monitored on behalf of the EC in order to establish the progress of e-Government in different countries. These services have been defined and monitored according to the suggestions explained in Capgemini, Rand Europe, IDC, Sogeti, & DTi (2009, 2010a, 2010b). Most of the basic services focus on the interaction between the state administration and citizens, while some of them aim at facilitating the

Table 1. Level of sophistication of e-government services

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Information	**One-Way Interaction (Downloadable Forms)**	**Two-Way Interaction (Electronic Forms)**	**Transaction (Full Electronic Case Handling)**	**TARGETIZATION (pro-active and automated)**
0-20%	20-40%	40-60%	60-80%	80-100%
The information necessary to start the procedure and obtain a public service is available online.	The publicly accessible website offers the possibility to obtain in a non-electronic way (by downloading forms) to start the procedure and obtain this service.	The publicly accessible website offers the possibility of an electronic intake with an official electronic form to start the procedure and obtain this service.	The publicly accessible website offers the possibility to completely treat the public service via the website, including decision and delivery.	The government proactively performs actions to enhance the service delivery quality. Data is reused. No need for the user to request the service.

communication between government institutions and the business community.

Table 2 presents the current level of sophistication of the government-to-citizens services offered in the SIVA countries according to the five-stage maturity model. It is important to mention that some of these services are actually irrelevant in certain countries. For instance, a service for the reimbursement of medical costs to citizens may not be relevant when citizens receive free medical treatment. The sophistication level of the digital public services offered to businesses in the SIVA countries is illustrated in *Table 3*.

Finally, *Table 4* illustrates the combined sophistication of the e-Government services offered to both citizens and businesses across the SIVA countries. This score is calculated as the average level of relevant services in the country, based on the numbers in *Tables 2* and *3* per country. Obviously the higher this number is the more sophisticated the digital public services in the country are, on average. The rows with normalized percentages, normalizes the average sophistication scores to a percentage according to the guidelines of *Table 1*. The maximum (100%) would correspond to all relevant services being offered at the targetization level (5).

This single indicator per country helps us compare the progress of the different countries using a common benchmark that has been agreed on. The conclusion from *Table 4* is that Austria has by far the most advanced e-Government services for its citizens among the SIVA countries, while Italy, Slovenia and Greece offer a certain level of digital services that goes, on average, beyond pure online information availability. Bulgaria, FYROM and Montenegro have to make a significant effort to develop services for their citizens and catch up.

Figure 1 provides a clear comparative depiction of the situation is each country. It can easily been seen that Italy has the most advanced e-Government services for its businesses, while Austria, Greece and Slovenia follow with slightly less scores. In this case too, Bulgaria, FYROM and Montenegro present the lowest levels of sophistication of the government-to-businesses services. Especially Bulgaria that is an EU member state should invest heavily on such services in order to come to par with the standard of other member states. A comparison between citizens and businesses levels reveals that on average digital public services for businesses are more sophisticated than those for citizens.

IMPACT OF BROADBAND ON SEE COUNTRIES' ECONOMY

In this section, we present the results obtained by the regression analysis and the empirical

Table 2. Sophistication level graded according to the five-stage maturity model for e-government services to citizens. (Source: epractice.eu, SIVA survey on digital public services in SEE (2013)).

Service		Austria	Bulgaria	FYROM	Greece	Italy	Montenegro	Slovenia
Income taxes: declaration, notification of assessment		4	2	0	4	4	2	4
Job search services by labour offices			3	3	3	1	0	1
Social security benefits	Unemployment benefits	1	1	0	2	2	0	2
	Child allowances	2	1	0	1		0	2
	Medical costs		1	0			0	
	Student grants	4	1	2	1	1	0	1
Personal	Passport	2	1	1	1	1	0	1
documents	Driver's licence		1	0	2	1	0	2
Car registration			1	0	2		0	2
Application for building permission		3	1	0	1		0	3
Declaration to the police		2	1	0	1	2	0	2
Public libraries		1	1	0	3	1	0	1
Certificates: request and delivery			1	1	3		0	4
Enrolment in higher education/ university		3	1	0	1	3	0	2
Announcement of moving		2	1	0		1	0	2
Health related services			1	0	1	3	0	3

method for transactions savings based on the models of section "Methodology".

Impact on Growth

In this section we present the findings of the regression analysis, regarding the impact of broadband on the countries' GDP. The analysis yielded the dependencies depicted in *Table 5*. The positive link between broadband and growth is reflected through the broadband coefficient a_1 which was found positive for all countries. Parameter R^2 denotes how well the calculated line by the regression fits the measured data. Values of R^2 close to 1, as is the case in our results, show very good fitting.

The practical meaning of the findings is depicted in *Figure 2* where we calculate the impact on growth when broadband penetration is assumed to increase by 10% (and all other parameters are assumed constant). The impact ranges from 0.2 to almost 1.9% increase in GDP and GDP per capita. Slovenia exhibits the greatest benefit of all countries. It also has the biggest penetration, which implies that there may indeed be a link between the level of penetration and the severity of broadband impact. However, several other parameters play their role, since FYROM being the second in growth impact, has a penetration rate of just 8.5%.

Using *Equation 2* to depict GDP growth versus broadband penetration when all other variables are considered constant, results to *Figure 3*. In the figure we show the % increase of growth for different percentage increase in broadband penetration. The slope of the curves correspond to the $(Broad_{incr})^{a1}$ value for each

Table 3. Sophistication level for e-government services to businesses across the Siva Consortium countries. (Source: epractice.eu, SIVA survey on digital public services in SEE (2013)).

Service	Austria	Bulgaria	FYROM	Greece	Italy	Montenegro	Slovenia
Social contributions for employees	4	2	1	2	3	0	4
Corporate tax: declaration, notification	4	2	2	4	3	0	2
VAT: declaration, notification	2	2	0	4	3	0	2
Regstration of a new company	1	1	2	2	3	2	2
Subission of data to statistical offices	2	2	0	2	2	0	2
Cusoms declarations		2	4	4	4	0	4
Envronment-related permits (incl. reporting)	4	1	0	1	1	0	3
Pubic procurement	2	1	4	1	4	0	1

Table 4. Average sophistication level of e-government services for citizens and businesses

		Austria	Bulgaria	FYROM	Greece	Italy	Montenegro	Slovenia
For citizens	**Average level**	3.43	1	0.58	1.86	1.81	0.12528	2.13
	Normalized percentage	68.6%	20%	11.6%	37.2%	36.2%	2.5%	42.6%
For businesses	**Average level**	2.71	1.63	1.63	2.5	2.88	0.25	2.5
	Normalized percentage	54.2%	32.6%	32.6%	50%	57.6%	5%	50%

country, where $Broad_{incr}$ denotes the % increase of broadband penetration.

Besides the adequate time needed to fully reveal its impact and the complex dependencies that broadband exhibits in the economy, the positive stimulation of broadband on growth of SEE areas is evident, and it should be considered as an attractive candidate for boosting economic development.

Figure 1. Sophistication level of e-government services for citizens and businesses

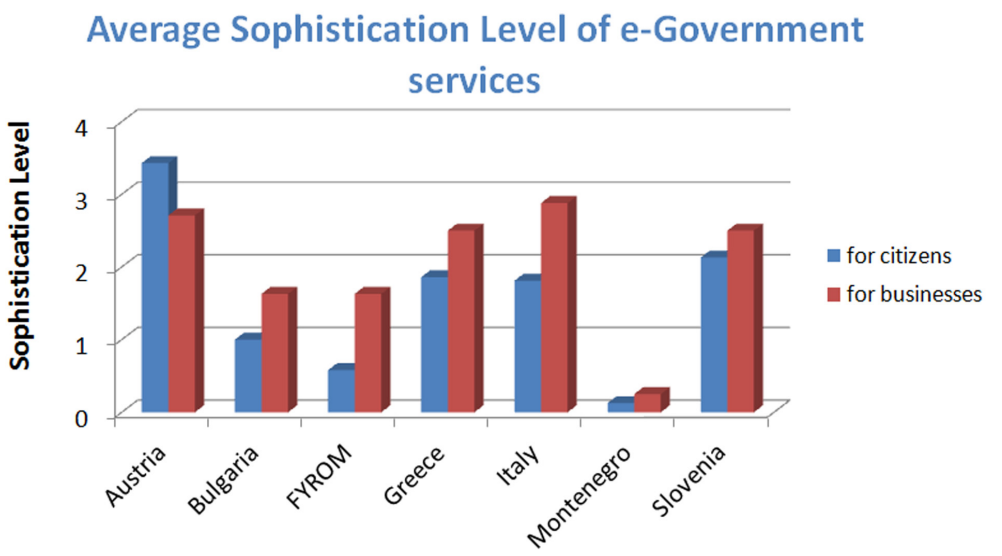


Table 5. Regression statistics on growth

Country	a_0	a_1	a_2	a_3	R^2 tat
Austria	2.5816	0.0768	0.9427	0.0123	0.8931
Bulgaria	-1.6938	0.0561	2.4604	0.0642	0.9321
FYROM	0.3753	0.1554	1.1710	0.6472	0.9848
Greece	0.3934	0.0259	1.6583	0.3084	0.9291
Montenegro	6.4629	0.0487	-1.7419	0.2815	0.9174
Slovenia	1.3640	0.1985	-0.4105	0.3836	0.8940
Italy	0.6101	0.1193	1.7306	0.2264	0.6281

Impact on Employment

In this section we present the findings yielded by the regression analysis on employment. *Table 6* shows the factors obtained by the analysis where possible. As the table suggests, the results were inconclusive. Three of seven countries examined, showed positive overall correlation between broadband and rise of employment (positive broadband penetration coefficient), though the findings and the parameters of the research (i.e. data availability) were not adequate for safe results. This is more evident in *Figure 4*, where we substitute coefficient b_1 found for each country in *Equation 4*. The figure depicts the theoretical connection between broadband increase and the corresponding change in employment, when all other variables are considered constant.

Besides the insufficient amount of data that did not allow us to cover every country, the analysis did not reveal a common trend between employment and broadband provision. Apart from the immediate creation of jobs for infrastructure building and maintenance, several phenomena such as outsourcing, tele-working

Figure 2. Percentage of GDP increase for 10% broadband penetration increase

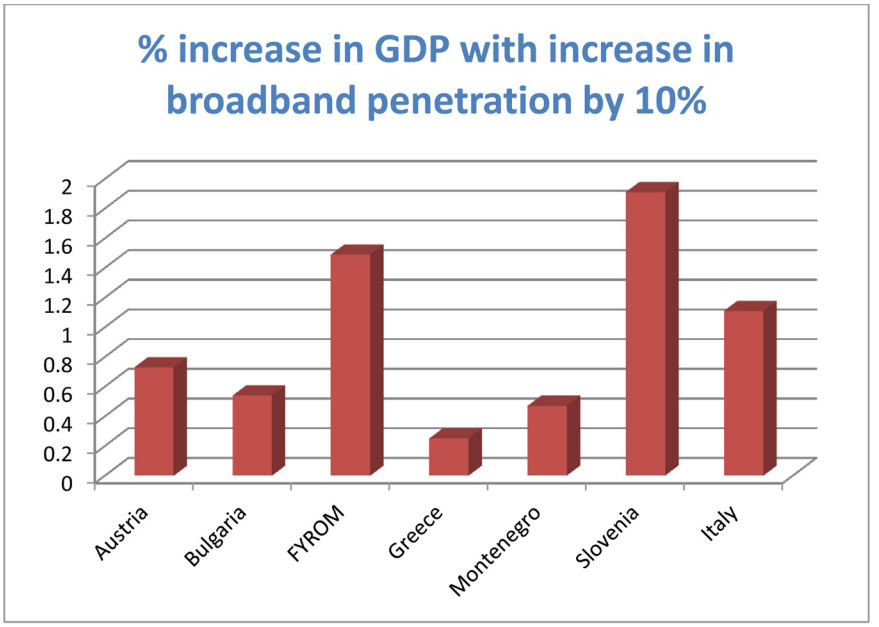


Figure 3. % increase in GDP as a result of the corresponding % increase in broadband penetration, when all the other variables are considered constant

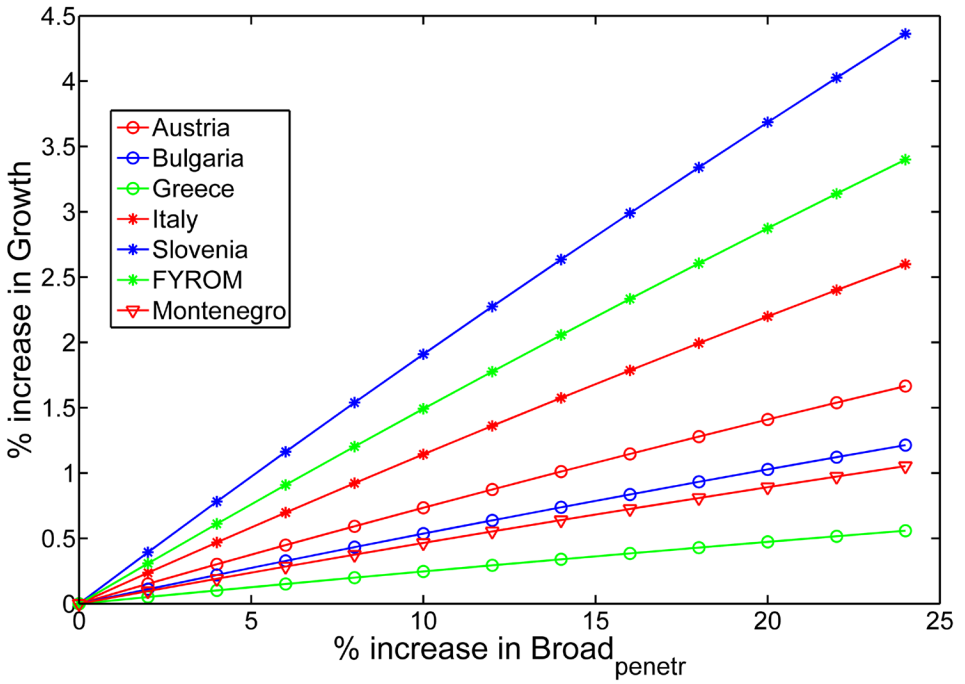
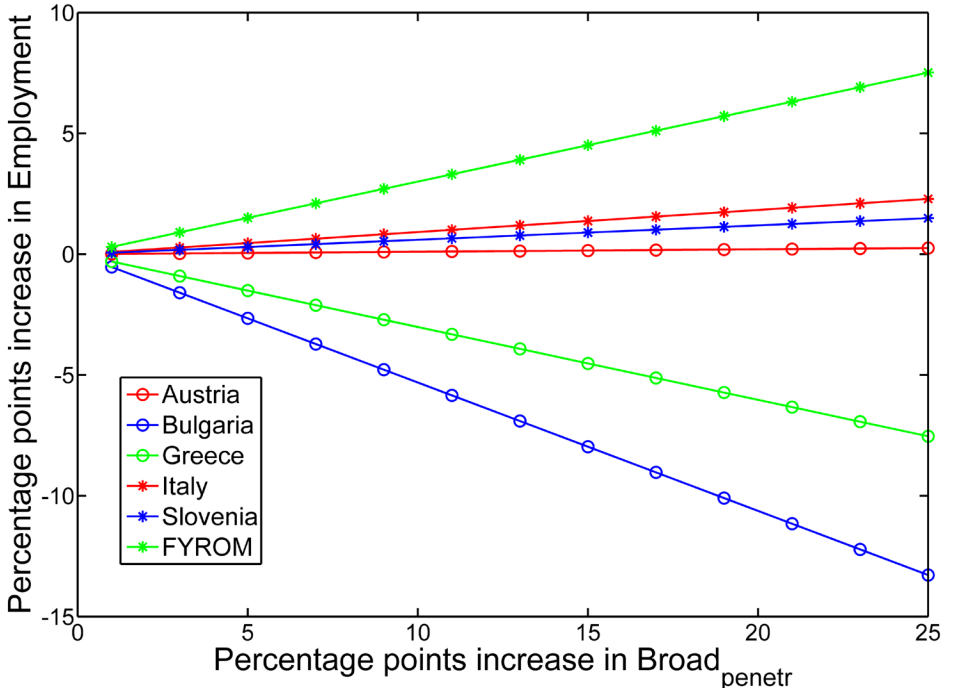


Table 6. Regression statistics on employment

Country	b_0	b_1	b_2	b_3	b_4	R^2 stat
Austria	11.5979	0.0101	-0.0371	0.0010	0.4415	0.8368
Bulgaria	100.3273	-0.5312	-0.8837	0.0022	2.0397	0.9268
FYROM	0	0.3006	0.2481	0.0004	0.4915	-
Greece	71.8160	-0.3014	-0.3982	0.0013	-0.3502	0.9842
Montenegro	-	-	-	-	-	-
Slovenia	40.3993	0.0596	0.0072	0.0004	0.3453	0.8570
Italy	76.6873	0.0915	0.3155	-0.0020	0.1341	0.6282

Figure 4. Percentage points increase in employment as a result of the corresponding percentage point's increase in broadband penetration, when all the other variables are considered constant



and the capital labour substitution effect make long-term impact on employment rather indefinite and did not allow for a safe conclusion.

Cost Savings

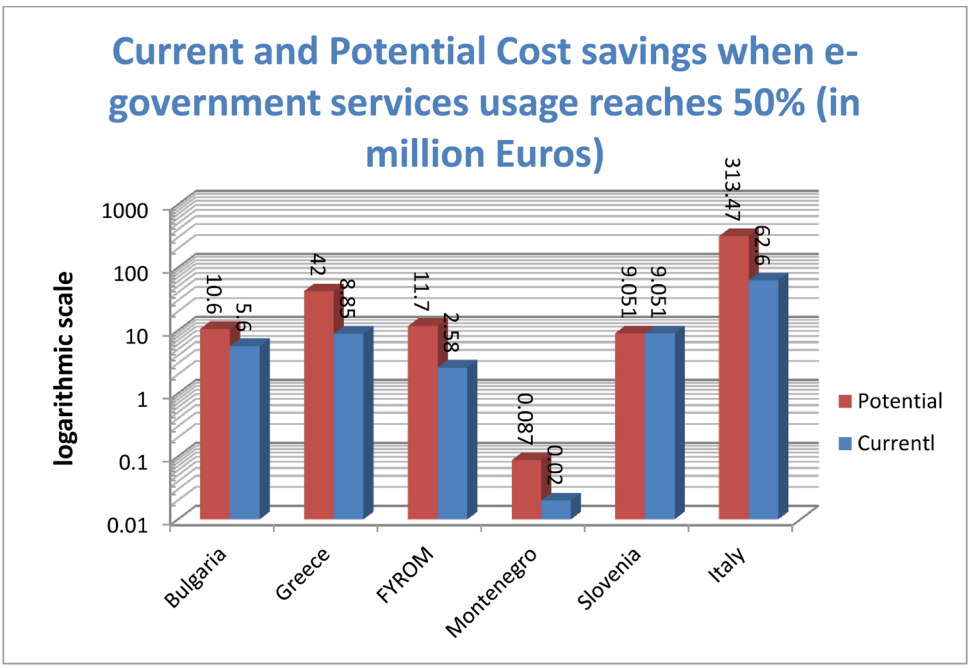
In this section we present our findings on the externalities of broadband expressed as cost-savings to the end-u4ser and to businesses, by incorporating e-government services. *Table 7* presents all the variables calculated in our analysis. As the table shows, the cost savings calculated were significant for every country, of the order of million Euros.

Figure 5 displays the current as well as the expected savings if countries reach the

Table 7. Cost savings due to e-government services

Country	Num. of transactions (thous.)	Num. of online transactions (thous.)	Time of transactions (yrs.)	Total savings (mill. euros)	Potential savings (mill. euros)
Austria	-	-	-	-	-
Bulgaria	5263	1402	742.48	5.5983	10.507
FYROM	1450	159	84.4945	2.5858	11.754
Greece	7965	820	434.452	8.878	43
Montenegro	444	52	27.5424	0.02076	0.08874
Slovenia	1435	775	410.585	9.0518	(Already reached 50% of e-government usage)
Italy	42122	4212	2230.4	62.694	313.470

Figure 5. Cost savings through e-government services if broadband penetration reaches 50% (in million Euros)



levels of e-services utilization set for 2015 by Europe's digital agenda. Further incorporation of broadband-facilitated services is shown to be highly beneficial for end-users, firms and public administration finances. In our analysis we do not take into account all transactions conducted through e-services, and we do not include the savings originating by travel or post fees reduction. Thus, we consider our estima-

tions to be conservative and the actual savings to be greater.

The theoretical connection between total savings per year and e-services usage yields to *Figure 6*. While there are deviations between the countries, the amounts relative to their GDP are significant for all.

POLICY RECOMMENDATIONS

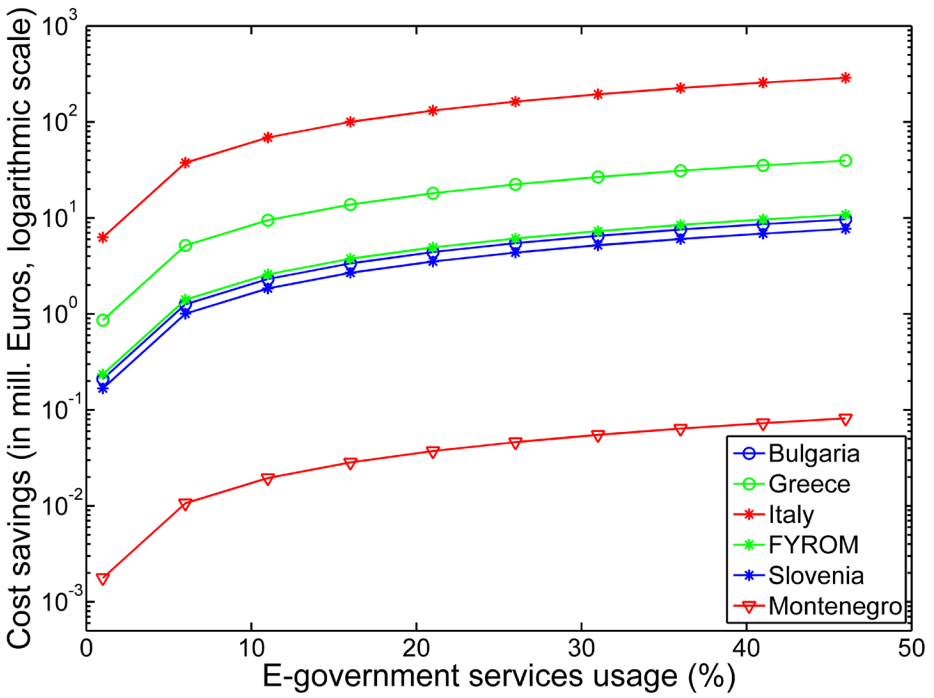
According to the Digital Agenda Scoreboard (European Commission, 2014a), all SIVA countries lag behind the EU average both in terms of broadband population coverage as well as sophistication of e-Government services . Significant progress on both fronts is urgently required in order to improve virtual accessibility of citizens and businesses. Moreover, sections "Comparative Analysis for Broadband Offerings in SEE" and "Comparative Analysis of e-Government Services" stated that the digital divide continues to exist both between urban and rural regions as well as between SEE countries. Bridging this gap will require significant and coordinated efforts from EU, national and regional authorities; it is an undertaking that cannot be handled in isolation due to its cost and complexity.

At the policy level, two main areas of intervention will unlock improvements in broadband penetration rates and boost the economy and social inclusion of inhabitants of digitally underprivileged areas. The first area concerns the stimulation of supply of broadband services to citizens and business and the second involves the stimulation of demand.

Area 1: Provide Resources and Foster the Environment for Deployment of Next Generation Networks (NGA) Infrastructure

Most public broadband infrastructure investments are funded using EU resources from the social, development and cohesion funds.

Figure 6. Expected total savings per year vs. the e-government services usage



Extending the infrastructure to fully cover rural areas is very costly and national budgets cannot fund it on their own (Hätönen, 2011). It is apparent that a wide deployment of broadband, and especially NGA networks, relies on the will of the EC to allocate significant funds toward this end.

In addition, NGAs are a very recent development and not every public administration possesses the know-how to fine-tune its regulation for the promotion of such services. Establishing a proper national regulatory framework that will stimulate competition on fair grounds is of paramount importance for the broadband market.

Finally, since, the telecom operators should expect a satisfactory return-on-investment in order to invest in a new country or territory, national authorities should provide a stable and inviting environment for broadband-related investments and service deployment through the establishment of national broadband plans, and perhaps corresponding financial incentives.

Area 2: Improve Citizens' Digital Skills

To achieve the Digital Agenda goals, broadband services should become accessible, affordable and usable by citizens throughout the EU. Accessible and affordable are mostly dependent on parameters outside the individual's influence. Usable, however, refers to the fact that citizens must possess the fundamental skill set to be able to use broadband services and take full advantage of their existence. Education, training and awareness raising actions on behalf of national authorities and the EU are necessary to improve citizens' digital skills. The results of the surveys clearly illustrate that, generally, citizens in the countries of the SIVA project are not taking advantage of the capabilities of broadband services. Novel uses, including e-commerce and e-government, are not adopted fast enough. Training the public on how to leverage these services to increase their productivity and increase their access to goods and services will stimulate demand and kick-start a virtuous circle toward the proliferation of broadband and the achievement of the Digital Agenda targets.

CONCLUSION

This report comparatively assessed the current situation in seven countries of SEE area regarding broadband availability and characteristics as well as digital public service provision by public administrations in the SEE region. A total of four suitable questionnaires were created and delivered as a tool to audit four different surveys. Survey results show that while broadband penetration and services have improved, SEE countries still lag behind when compared to NGN penetration of Europe's average, and large differences exist among these countries. They also show that broadband deployment is mainly held back by market related reasons, and secondarily by technical reasons.

Analysis revealed that significant interventions will be required for the stimulation of supply and demand of broadband services in order to expand their reach and achieve the desired benefits of social inclusion and economic boost, such as increase of investments for infrastructure deployment, improvement of the national regulation frameworks to stimulate competition, drafting of national/regional broadband strategies and improvement of citizen's digital skills.

Concerning the offer of e-governmental services, survey results show that Austria provides by far the most advanced e-Government services for its citizens among the SIVA countries. A comparison between citizens' and businesses' service utilization reveals that on average digital public services for businesses are more sophisticated than those for citizens.

Regarding the impact on growth, it was found to range from 0.2 to almost 1.9% increase in GDP and GDP per capita when broadband penetration is assumed to increase by 10%; while the country that exhibits the greatest benefit is Slovenia. Concerning the impact on employment the results were inconclusive. Finally, regarding cost saving conclusions due to public digital services, the current savings of all countries and average potential savings were significantly high, even though we consider our estimations to be conservative and the actual savings to be greater.

In times of economic crisis and recession in many areas of SEE, development of broadband and e-services is proven to be a significant potential stimulus for economic and societal development.

FUTURE WORK

As a future step, our intention is to use this information and to further explore the policy landscape in order to propose potential amendments, provide tools and information systems that will aid public administration in bridging the gap in the South East Europe regions.

Specifically, a tool is currently under construction by the partners of the SIVA project, which will be used to assess the quality of existing services, to identify areas where better services are desired and to assess the appropriate technologies which could be used in these areas. This tool will help regional authorities to discuss methods with operators and regulators for the improvement of broadband accessibility of citizens and businesses. The existence of such a tool will help us to make more specific policy recommendations to the corresponding public authorities.

Moreover, we plan to develop a cost reduction assessment tool based on evidence and scenarios from selected SEE areas. Specifically, the data collected by the tool described above will be analysed through this cost reduction assessment tool. This analysis will result to a set of evidence on the coverage percentage that could be achieved in the selected areas based only on the existing local access and passive infrastructures, as well as on calculations of the costs needed for expanding the broadband networks through the sharing of existing and / or common development of new infrastructures.

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