The Economic Impact of IPTV Deployment in the European Countries:

An Input-Output Approach

Ibrahim Kholilul Rohman, Erik Bohlin
Division of Technology and Society
Department of Technology, Management and Economics,
Chalmers University of Technology, Gothenburg, Sweden
ibrahim.rohman@chalmers.se, erik.bohlin@chalmers.se

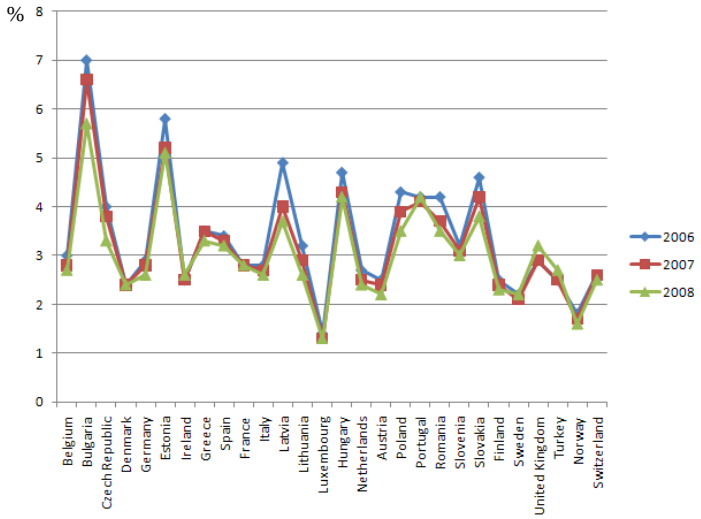
Abstract*-- A double-edged sword phenomenon is illustrated by the consequences of the rapid penetration rate of information and communication technology (ICT) devices. Besides the success story of these devices becoming ubiquitous, there is also a visible decline in performance of the ICT industry in financial respects. Due to more intense competition and market saturation, the players in this industry are now facing limited revenue sources. Among other things, traditional TV industry offering broadcasting services is suffering a significant drop in viewers and advertising revenue because of the massive substitution effect of the vast penetration rate of Internet and broadband. It is then important to see how the innovation of ICT devices can create possible alternative sources of revenue. Vibrant ICT devices, which combine television (video), telecommunication (audio) and data (Internet) in so-called triple play may enable operators to obtain additional revenue. IPTV (the TV which is transmitted to the Internet protocol) is seen as a strong new triple-play device which can support ICT as well as being a precursor of further economic impact, especially in driving output multipliers and Gross Domestic Product (GDP). This study is aimed at investigating the economic impact of IPTV deployment in the European countries, using the Input-Output table. The method enables us to estimate the economic multiplier for each Euro investment in IPTV deployment as well as to estimate the contribution to the GDP from two main sources: the production phase, when the deployment is implemented by installing fiber and network to the household, and the diffusion phase, where the consumption of IPTV services increases after the completion of the investment project. Among fourteen European countries investigated, the study reveals that Sweden is the country which enjoys the highest level of impact due to the construction activities, while Austria gets the larger portion of the multiplier from the diffusion side.

Keywords- IPTV; investment; input-output

I. INTRODUCTION

There is evidence that the ICT industries have been facing very difficult conditions in the last couple of years, especially in plain old traditional services. For instance, British Telecom (BT) retail revenue from traditional services decreased by 3% in 2008. In cellular industry, the Belgian incumbent operator, Belgacom, suffered similarly when its revenue from voice subscription dropped by 2% in 2007, with another loss of about 11% from voice traffic. In most Organization for Economic Co-operation and Development (OECD) countries, the market maturity and fall in retail price are seen as the drivers for this situation [1].

The gradual decline of communication consumption also indicates why this recession afflicts most of the ICT industry in OECD countries. The annual data on the ratio of expenditure on communication to GDP shows that the ratio has been declining gradually. Even though the ratio dropped only slightly from 3% (2006) to 2.9% (2008) throughout the EU (15 countries) as shown in the following Fig. 1, it has dropped substantially for major and leading ICT countries like Germany, the Netherlands, Italy, Norway and Finland. For instance, Germany dropped from 2.9% (2006) to 2.6% (2008), and the Netherlands has continued declining from 2.7% (2006) to 2.4% (2008).

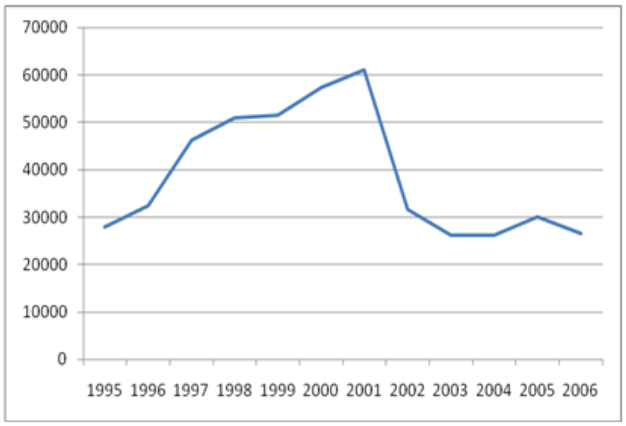


Source: Eurostat

Figure 1. Communication expenditure as a percentage of GDP (%)

As a result, it is not surprising that investment in this sector is also affected by the recession. From the data comprising 33 European countries, the average annual growth of telecommunication investment during 2000-2006 was -6% compared to 16.2% during the period 1995-2000. Fig. 2 shows the decline of telecommunication investment which began massively in 2001.

 ISBN: 978-1-61208-100-7



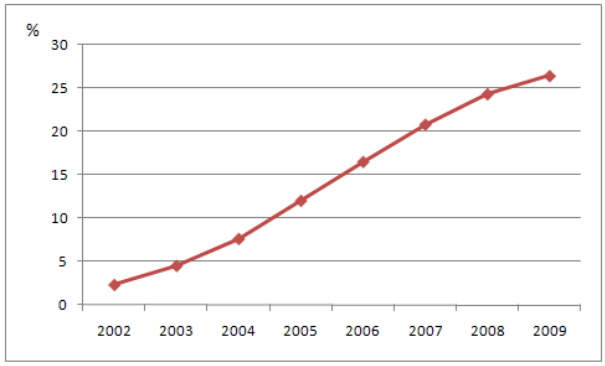
Source: Eurostat

Figure 2. Telecommunication investment in European countries (MEUR)

This situation has to be anticipated by the European countries, since the slowdown in investment in the information and communication sector may be followed by the falling in the productivity level. This is, moreover, supported by the reason that the increase of investment in ICT capital (and growth of human capital) contributed significantly to labor productivity growth in market services across all European countries and the US [2]. Therefore, a decline of investment in the ICT sector might affect the rate of productivity in the EU economy. It has been proven by the fact that since the mid-1990s, the European Union has experienced a slower growth of productivity where, at the same time, the United States is significantly boosted. The steady growth of productivity in the United States is indicated to be due to a combination of high levels of investment in a rapidly progressing ICT sector, especially during the second half of the 1990s. It is also followed by a rapid productivity growth in the market services sector during the first half of the 2000s [3].

This phenomenon, especially in the broadcasting industry, has actually been predicted before. The significant drops in advertising revenue together with the delay in the rollout of digital broadcasting are among the reasons why the industry has faced obstacles recently [4]. In the US, as a comparison, broadcasters are asking the audience to view each show "live" to ensure the audience to the advertisers and consequently get them to finance subsequent episodes of the show [5]. From the surveys conducted in some countries, it is discovered that the largest channels in each country are suffering a decline in their ratings. Although the aggregate revenue still increases across Europe during 2006-2008, the public broadcasting sector has seen a drop of more than 4 percentage points in its total market share, while the commercial sector (both radio and TV financed by advertising) has grown modestly [6]. It is also predicted that the advertising revenues of traditional channels are not likely to grow significantly over the next decade. Using two different econometric models, it is estimated that the gradual decline is around 0.2–0.5% [7].

Thus, there is a need to grasp any possibility for industry players to create new devices which synergize ICT function, especially utilizing the fast growth of current ICT penetration rate. Compared to other devices (e.g. cellular, internet), broadband is still relatively in the stage of further diffusion process in European countries where the broadcasting industry can be supported. Fig. 3 shows the impressive growth of broadband penetration in the European countries.



Source: Eurostat

Figure 3. Average European countries' broadband penetration rate per 100 inhabitants

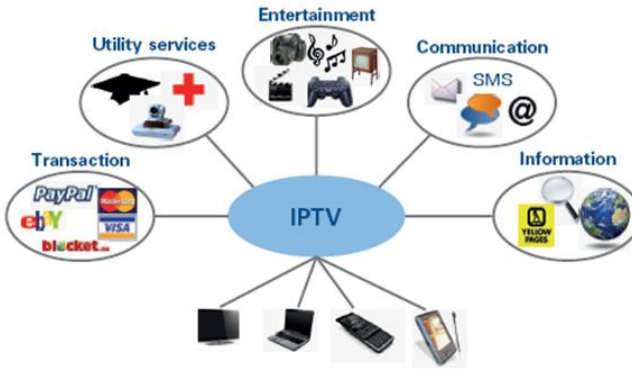
To operationalize this strategy, there are seven pillars with which broadband creates a significant impact in the economy: E-health, E-government, E-environment, E-business, E-employment, E-science and E-agriculture [8]. Thus, combining the broadband with television and telecommunication attached to these functions might generate an additional niche market in each European country. To address this issue, IPTV is seen as part of triple-play devices that might be an alternative product to provide a variety of services.

This study aims at investigating the economic impact of IPTV investment in the selected European countries. To answer the research question on how much will the IPTV investment contributes on the European economy, the study is presented in the following sections: Section 2 presents the nature of IPTV and variety of services offered to the customer. The mechanics of the Input-Output (IO) table as the main methodology is discussed in Section 3. Some previous analysis is presented in Section 4. The data used in this study is elaborated in Section 5. The results of the study are shown in Section 6. Section 7 concludes the paper.

II. THE IPTV

The Internet Protocol TV (IPTV) is viewed over a fixed broadband connection (DSL or Fiber to the home, FTTH) with a standard telecommunication set. The services are offered over a closed content distribution network whose common services cover TV broadcasting and stored video on demand (VOD), and the personal video recorder [9]. Additionally, not only can IPTV platform support a range of digital utility services, such as e-health, e-learning, e-working and home security – in contrast to the traditional

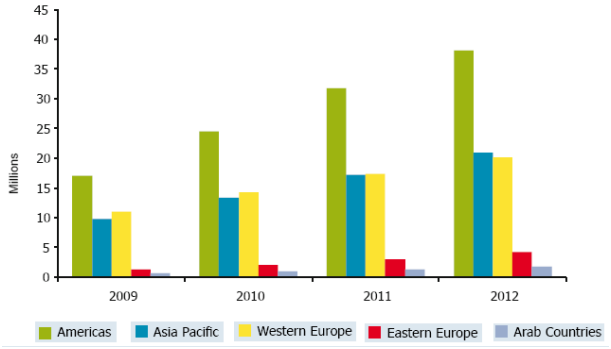
television, it also provides more control and choice for the customer [10]. Fig. 4 explains how the IPTV comprises a variety of services for the end users.



Source: Arthur D. Little (2009)

Figure 4. Variety of IPTV services

The development of IPTV in Europe shows positive growth. By the end of 2008, the total of IPTV subscribers had reached 21.7 million, which is an increase of 63% compared to the end of 2007 [11]. Additionally, it is predicted that the number of subscribers will continuously increase until the end of 2012. Even though the domination will be still in America, Western European countries are seen as a substantial market which will developed even further [12]. Fig. 5 shows the forecasted numbers of subscribers up to 2012 on major continents.



Source: ITU (2009)

Figure 5. Forecast number of IPTV subscribers

Fig. 6 forecasts there will be more than 64 million IPTV subscribers worldwide by the end of 2012, with the European market representing almost 38% of total subscribers.

III. The Input-Output Model

The input-output table depicts the transaction flow across sectors, where each sector produces a certain output and consumes input from another sector at the same time. The table consists of three main quadrants. The first quadrant describes the inter-linkage between sectors in a so-called intermediate transaction, while the quadrants II and III are the final demand and primary input respectively [13]. The table is shown in the following Fig. 6.

Intermediate transaction Intermediate demand/ Intermediate inputs I	Final Demand II	Total Output
III Primary Input Value Added		
Total Input		

Figure 6. Input-Output (IO) table

The flow of transaction in the table can be explained in the following equation (1). Assumed the economy consist of 4 sectors.

$$\begin{aligned} x_{11} + x_{12} + x_{13} + x_{14} + C_1 &= x_1 \\ x_{21} + x_{22} + x_{23} + x_{24} + C_2 &= x_2 \\ x_{31} + x_{32} + x_{33} + x_{34} + C_3 &= x_3 \\ x_{41} + x_{42} + x_{43} + x_{44} + C_4 &= x_4 \end{aligned} \quad (1)$$

where x_{ij} denotes the output from sector i which is used by sector j as an intermediate input (the input from sector i which is used for further production process in sector j). Moreover, c_i refers to total final demand of sector i and x_i refers to total output of sector i.

Introducing matrix notation, we can modify equation (1) to obtain the following matrix:

$$\boldsymbol{x} = \begin{pmatrix} x_1 \\ \vdots \\ x_4 \end{pmatrix}; \boldsymbol{c} = \begin{pmatrix} c_1 \\ \vdots \\ c_4 \end{pmatrix} \quad (2)$$

Equation (2) is the matrix form of equation (1), where x denotes the column matrix for output and c is the column matrix for the final demand.

$$\boldsymbol{I} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}; \boldsymbol{A} = \begin{bmatrix} a_{11} & \cdots & a_{14} \\ \vdots & \ddots & \vdots \\ a_{41} & \cdots & a_{44} \end{bmatrix} \quad (3)$$

Matrix (3) consists of two parts; the left-hand side is the identity matrix, a diagonal matrix whose off-diagonals are zero. Whereas A is the technology matrix which consists of the ratio of the intermediate demand to the total output, $\frac{x_{ij}}{x}$.

By combining (1), (2) and (3), the equation can be modified as follows:

 ISBN: 978-1-61208-100-7

$$\boldsymbol{Ax} + \boldsymbol{c} = \boldsymbol{x} \quad (4)$$

$$(\boldsymbol{I} - \boldsymbol{A}) = \boldsymbol{c}$$

$$\boldsymbol{x} = (\boldsymbol{I} - \boldsymbol{A})^{-1}\boldsymbol{c}$$

From (4), the multiplier is defined as the inverse Leontief matrix, $(I - A)^{-1}$[13]. It measures the ratio of output changes in the equilibrium as the result of the change in the final demand. Therefore, the output multiplier measures total change throughout the economy from a unit change in final demand. The final demand itself might come from private consumption, government expenditure, investment and export. As the consequence of production linkages, a change of output will be larger than a change in the final demand. For instance, if the final demand of the ICT sector (e.g. additional purchasing of personal computers) increases by 10 EUR, the output in the economy will grow by more than 10 EUR or as much as the multiplier coefficient of this sectors. (Additional purchasing of personal computers will induce packaging services and transportation, for instance).

There is a reason that the firm level of analysis is a more appropriate approach to investigate the productivity impact from such an ICT investment. However, relying on meso studies can also lead one into the trap of a productivity paradox where the contribution of ICT is not absorbed in statistical reports or a so called Solow computer paradox [14]. Therefore, applying the Input-Output (IO) analysis in this study enables investigation at sector level, which has a direct link to firm level as well as to macro level. The intermediate transaction in quadrant I consists of the data gathered from an industry survey [13], [15], [16]. Moreover, the relation between the IO and the macro variable is very much straightforward. The primary inputs in quadrant II reflect the measurement of the Gross Domestic Product (GDP) by the income approach, comprising wages, salary, profit, etc. In addition, the final demand in quadrant II shows the calculation of the GDP as the sum of consumption, investment, government spending, and export and (minus) import [14].

Apart from that, the reason for using the IO method is also supported given the difficulties when measuring the indirect impact of ICT investment [17]. In this regards, IO has strong ability for capturing the direct and indirect impact from such an investment outlays [16]. Consequently, employing the IO method enables the estimation from both production and diffusion process of ICT sectors investment [18].

IV. PREVIOUS STUDIES

There have been vast investigations of the impact of ICT on the economy using econometrics or the IO method. Applying the panel data of US municipalities, it shows that the broadband will generate economic impact through creating employment, increasing housing rent, industrial mix and stimulating business establishment [19]. It is also estimated that the contribution of broadband to employment and productivity is visible in Latin America. Employing the IO method, it is suggested that to fulfill the increasing demand for broadband requires an additional 41% lines, which will contribute 378,000 more new jobs [20]. In the United States, the contribution of broadband to job creation is about 128,000 new jobs whereby each job will cost 50,000 US$. This result is determined from both network construction and network externalities, though the latter is less consistent due to uncertainty surrounding that impact [21]

A study in Indian economy concludes that the economics of information technology in the country is mainly supported by domestic demand. Therefore, to increase the performance of the Indian economy to be able to contribute on the GDP, it is important to boost the contribution from export; thus it requires stronger linkage between telecommunication and infrastructure facilities (power, water supply, and transportation). It is also found that private and government expenditure contributes respectively 32% and 26% while the investment contributes only 13%. In addition, among the export drivers, communication equipment and electronics equipment are the most dominant sector [22]. Similar study found a significant contribution of the ICT sector to the Singapore economy. It is estimated that each 10% increase in information input price during 1995-2000 will generate 0.84% increase in GDP growth which is twice the figure for the 5-year period before. Moreover, there was a shift from the export driver in the first half of 1990 to the domestic demand during the second half of the period [18].

Among the previous analyses using the IO method, this study is the first to investigate a comparison between several countries. It is explained that the productive use of ICTs requires organizational and working practice changes, and depends on contextual factors such as transport infrastructure, cultural values, and the routines organizing everyday life [23]. Therefore, a comparative study is a more appropriate way to see different characteristics of ICT utilization among countries.

V. THE DATA

This study will use the data of 59-Input Output Table from selected European countries. To attain the goal of the study, the analysis uses the domestic transaction of the IO table. The available years for each country are shown in the following Table 1.

 ISBN: 978-1-61208-100-7

TABLE I. IO TABLE FOR SELECTED EUROPEAN COUNTRIES

No	Country	IO availability
1	Austria	1995, 2000, 2005
2	Belgium	1995, 2000, 2001
3	Denmark	2001, 2002, 2003, 2004, 2005
4	France	2001, 2002, 2003, 2004, 2005, 2006
5	Germany	2001, 2002, 2003, 2004, 2005, 2006
6	Ireland	1998, 2000, 2005
7	Italy	2000, 2005
8	Netherland	2000, 2001, 2002, 2003, 2004, 2006
9	Poland	1995, 2002, 2003, 2004, 2005, 2006
10	Portugal	1995, 1999, 2005
11	Spain	1995, 2000, 2005
12	Sweden	1995, 2000, 2005
13	United Kingdom	1995

Source of data: Eurostat

As has been discussed, the investigation of the impact of the ICT sector should be made with two sources of growth: the production and diffusion [17], [24]. The production phase refers to the investment and infrastructure development of the IPTV whereas the diffsion is investigated in relation to induce income as the consumption increases from households. Thus, the calculation of the multiplier is done as shown in the following steps in Fig. 7.

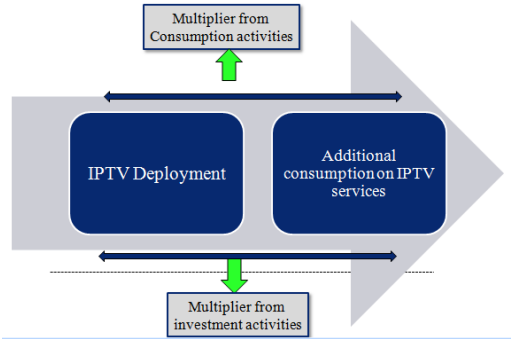


Figure 7. Two sources of output multiplier

The next important question to be addressed is how to define and match the IPTV deployment with the existing IO table. The following flow chart explains how this study is conducted.

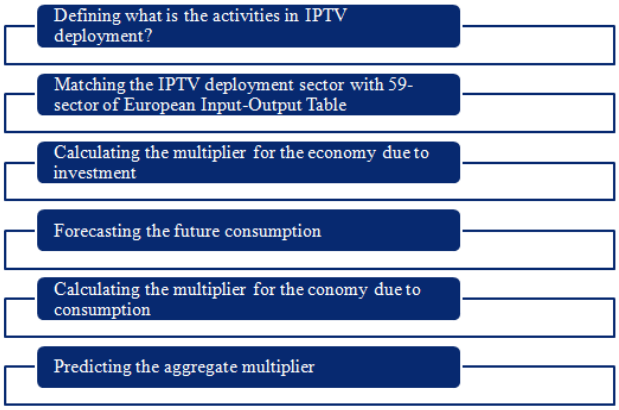


Figure 8. Flow of studies

The IPTV investment is established especially to enable consumers to use HDTV and ultimately 3DTV; hence it requires an advanced penetration of infrastructure. A high-speed large-scale rollout of fiber networks is to be connected to the households [9]. Therefore, it is assumed that assessing this criterion with the template of the IO table, the investment activities are grouped into sector number 34 (Construction). In addition, based on the Statistical Classification of Economics Activities (SCEA), the appropriate sub-sector for the investment activities is the installation of electrical wiring and fitting (SCEA code 45.31). Moreover, the diffusion impact which is measured from consumption after the finishing of investment activities is grouped into the telecommunication sector (sector number 43).

Furthermore, the value of investment in this study follows the assumptions as follows [9]:

(i) Investment is implemented throughout European countries to enable people to access the IPTV services.

(ii) The annual investment is 10 BEUR yearly for all European countries. The budget for each household is around 1150-1700 EUR/household.

(iii) Investment cost is assumed to decrease by 2% per year due to more efficient fiber rollout techniques.

(iv) Investment for each country is proportionally distributed, based on the number of households.

Applying these scenarios, the value of investment for each country can be shown in the following Fig. 9.

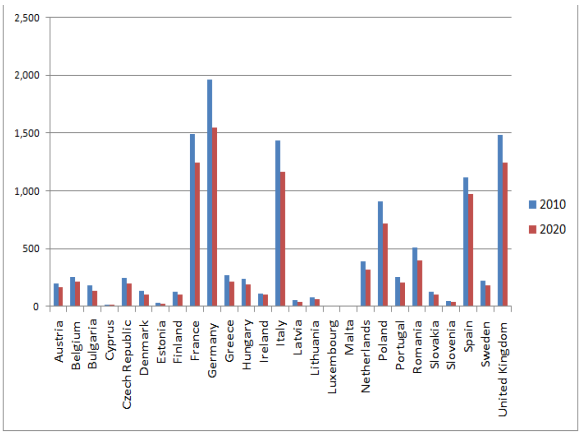


Figure 9. Value of investment in the IPTV deployment (MEUR)

Weighted by the number of households, the four countries which have the largest investment in the IPTV deployment are Germany, France, the UK and Italy.

VI. RESULTS

The first analysis in this study is explaining the multiplier effect of IPTV investment on economy. Using equation (4), the results of multiplier calculation are presented in the following Table 2.

TABLE II. OUTPUT MULTIPLIER FROM INVESTMENT AND FRACTION TO GDP

No	Country	Multiplier	Fraction to GDP
1	Austria	2.840	0.437
2	Belgium	1.529	0.312
3	Denmark	1.854	0.349
4	Finland	1.846	0.417
5	France	1.898	0.428
6	Germany	1.887	0.366
7	Ireland	2.421	0.269
8	Italy	2.551	0.505
9	Netherland	1.977	0.388
10	Poland	2.023	0.669
11	Portugal	2.175	0.303
12	Spain	1.552	0.269
13	Sweden	3.010	0.510
14	United Kingdom	1.898	0.385

Table 2 shows that Sweden, Austria and Italy are the European countries which have the highest output multiplier. Additionally, the fraction of GDP is measured by taking the ratio of Net Value Added to Total Output. In this regard, Sweden and Poland are the two countries which have the highest fraction of GDP over output.

Furthermore, the multiplier from the diffusion (consumption) of IPTV industry is shown below:

TABLE III. OUTPUT MULTIPLIER FROM CONSUMPTION AND FRACTION TO GDP

No	Country	Multiplier	Fraction to GDP
1	Austria	2.743	0.522
2	Belgium	2.533	0.554
3	Denmark	1.791	0.388
4	Finland	1.427	0.636
5	France	1.651	0.579
6	Germany	1.505	0.582
7	Ireland	1.889	0.312
8	Italy	1.744	0.567
9	Netherland	1.762	0.484
10	Poland	1.451	0.509
11	Portugal	2.014	0.379
12	Spain	1.889	0.349
13	Sweden	2.177	0.340
14	United Kingdom	1.651	0.618

Unlike the results from investment activities, the consumption activities on table 3 show that Austria and Belgium are the countries which enjoy the highest multiplier among European countries during the diffusion process.

The next analysis is the aggregation of multiplier on the European level. It is assumed that each European country can be analyzed separately and faces the market independently. Thus, the aggregation at regional level is done by applying the scenario that the multiplier is proportional to the number of households and value of the GDP. The result can be seen in the following Fig. 10.

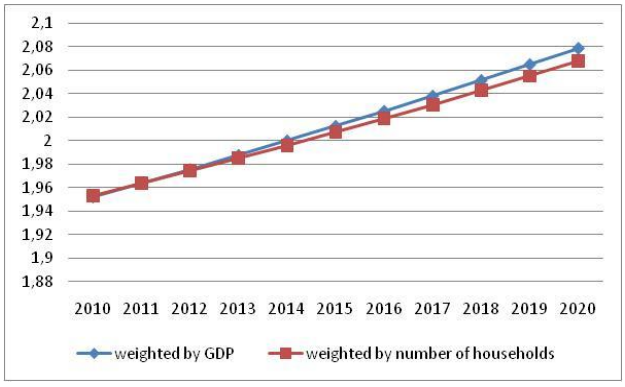


Figure 10. Aggregation of multiplier

From Fig. 10, it is quite interesting to see that both approaches come up with a similar estimate. The multiplier for European regions ranges around 1.95-2.08. It means that

 ISBN: 978-1-61208-100-7

every 1 EUR of additional investments in IPTV deployment will yield 1.95-2.08 EUR for the next 10 years.

The last step in this analysis estimates the impact of output creation from the investment cost projected in Fig. 10 and the diffusion. Having found that the multiplier ranges around 2, the impact of additional investment during the project period is forecasted in the following Fig. 12. In this study, scenario 1 is measured by using the GDP as the weighted index, while scenario 2 uses the number of households.

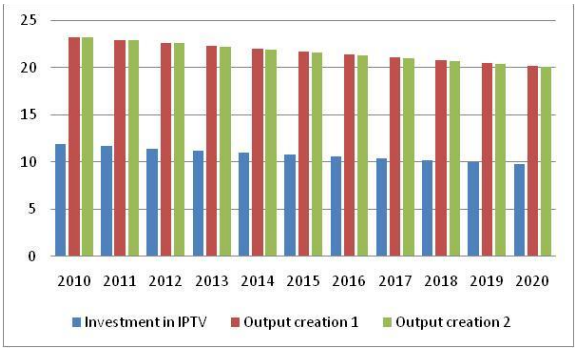


Figure 11. The output impact of IPTV deployment investment (BEUR)

From Fig. 11, it is estimated that the output impact will be smaller as a result of the decreasing value of investment over time. The impact on the GDP is shown in the following Fig. 12.

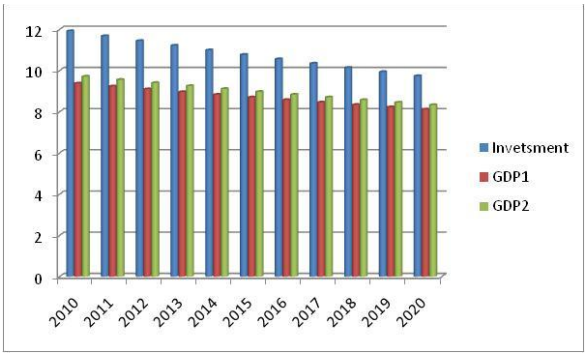


Figure 12. The impact of IPTV deployment investment on the GDP (BEUR)

As indicated by the fraction of the GDP to output, Fig. 12 shows that the impact of investment to output will be smaller. This is due to the fact that most OECD countries have an open economy, which is indicated by the large volume of trade (export and import). As a result, the fraction of GDP will be around 70% of the total investment.

TABLE IV. OUTPUT MULTIPLIER FROM CONSUMPTION TO GDP

Year	by GDP	by households
2010	1.712	1.699
2011	1.715	1.702
2012	1.718	1.705
2013	1.721	1.709
2014	1.725	1.712
2015	1.729	1.716
2016	1.733	1.720
2017	1.737	1.725
2018	1.742	1.729
2019	1.747	1.734
2020	1.752	1.739

Table 4 depicts the output multiplier from the consumption side. It is projected that each 1 EUR additional consumption of IPTV services will generate additional output around 1.7 EUR. Moreover, the contribution to GDP is explained in the following Fig. 13.

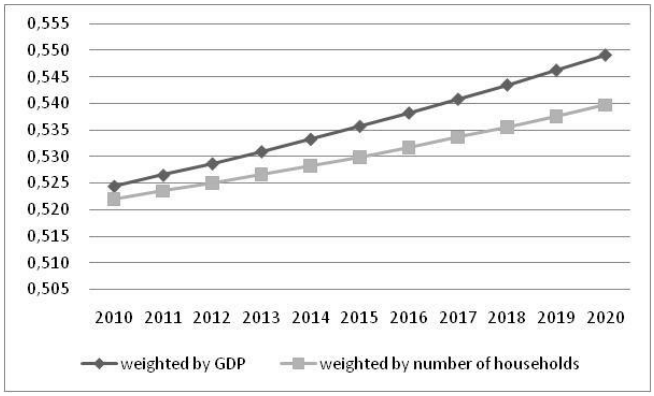


Figure 13. The fraction of IPTV consmption on the GDP (BEUR)

From Fig. 13 it can be seen that the contribution of IPTV consumption to GDP is around 0.52-0.55 from output. If the consumption of IPTV services increases by 100 EUR, it will generate output as large as the multiplier 170 EUR. Additionally, from the amount of output, 55% (about 93.5 EUR) will be directly formed as value added or GDP.

VII. CONCLUSION

The study draws the following important conclusions:

(1) The impact of IPTV deployment contributes to both investment activities and additional consumption activities (as the project ended).

(2) The contribution in generating output multiplier varies across countries. Sweden has to be considered as the largest contributor in terms of investment activities, while

 ISBN: 978-1-61208-100-7

Austria and Belgium are among the largest in terms of the output from consumption.

(3) In aggregation, the IPTV project has a multiplier of 1.9-2.1 in all the European countries. At the same time, the GDP contribution will be around 0.40-0.41. A lower or higher fraction of GDP is found in consumption activities.

It is then recommended that IPTV development has to be supported by the collaboration between the broadcasting and manufacturing industry player where both are capable of providing services to customer in the type of supply side network externalities (hardware-software relationship) [20].

The limitation of this study is related to the aggregation problem in the IO table. Two sources determine the level of aggregation: (1) the problem being considered, of whether or not it is important to distinguish the sector until the detail level; (2) computational expense and availability of the data. Consequently, when deciding that the IPTV rollout is classified as the construction sector, it might cause crude multiplier estimation since conventional construction, for instance, needs stone and cement in a higher proportion, which is not the case in fiber installation. Thus, the aggregation bias might weaken this result [13].

ACKNOWLEDGMENT

The authors are very grateful to Ericsson and Arthur D. Little for scenario data and the discussion. Needless to say that the authors are responsible for all remaining errors

References

[1] OECD, "OECD Communication Outlook 2009". OECD, 2009 Available at : www.oecd.org/sti/telecom/outlook [Accessed: July 10, 2010]

[2] R. Inklaar and M.P. Timmer, "Market services productivity across Europe and the US". Economic Policy, January 2008. Printed in Great Britain, CEPR, CES, MSH, 2008.

[3] B. van Ark, M. O'Mahonny, and M.P. Timmer, "The Productivity Gap between Europe and the United States: Trends and Causes**".** Journal of Economic Perspectives, Volume 22, Number 1, Winter 2008, pp. 25–44. Available at: http://pages.stern.nyu.edu/~cedmond/ge08/van%20Ark%20et%20al%20JEP.pdf [Accessed: July 10, 2010]

[4] L. van der Meulen, "Impending crisis in advert funded television calls for change in European Media Policy", European Platform of Regulatory Authorities. Available at: http://www.epra.org/content/english/news/speechcvdm.doc [Accessed: July 12, 2010]

[5] International Telecommunication Union (ITU), "Information Society: Statistical Profile Europe", 2009. Available at: http://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-RPM.EUR-2009-R1-PDF-E.pdf [Accessed: July 10, 2010]

[6] Open Society Institute, "Television across Europe: more channels, less independence, Overview". Available at: http://www.soros.org/initiatives/media/articles_publications/publications/television_20090313/2overview_20080429.pdf [Accessed: July 12, 2010]

[7] OFCOM, "Economic analysis of the TV Advertising Market". Available at: http://www.ofcom.org.uk/research/tv/reports/tvadvmarket.pdf [Accessed: July 14, 2010]

[8] S. Marine, "Broadband for Economic and Social Development", ITU Regional Workshop on "Broadband Access Technologies". Damascus, 19-20 November 2008 Available at : http://www.itu.int/ITU-D/arb/ARO_2008_work/Broadband/Documents/Doc3-roadband%20for%20Economic%20and%20Social%20Development.pdf [Accessed: July 9, 2010]

[9] Arthur D. Little, "IPTV-Socioeconomics accelerator held back: Assessing the legislative and regulatory environment for IPTV", 2009. Available at: http://www.ericsson.com/campaign/televisionary/#/regulation/contributions/b58416f2_42ae_466e_bf38_c93ab5b421a5 [Accessed: July 5, 2010]

[10] E. Prosperetti, G.Tripaldi, and V.V.Comandini, "IPTV missed expectation. Can regulation do the trick?" III Annual Conference Bocconi University Milan, November 2007. Available: http://guidotripaldi.typepad.com/documents/IPTV_missed_expectations_SIDE07.pdf [Accessed: July 13, 2010]

[11] The Broadband Forum, "IPTV subscribers top ten million", 2009. Available at: http://www.broadband-forum.org/news/download/pressreleeases/2009/YE08_Europe.pdf [Accessed: July 14, 2010]

[12] International Telecommunication Union (ITU), "IPTV-Market, Regulatory trends and policy options in Europe", October 2006. Available at: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4451697&isnumber=4451683 [Accessed: July 7, 2010]

[13] R.E. Miller and P.D. Blair, "Input Output Analysis: Foundation and Extensions", 2nd edition, Cambridge University Press, 2009, p.160.

[14] E. Brynjolfsson, "The Contribution of Information Technology to Consumer Welfare", Information Systems Research, Vol. 7(3), 1996, pp. 281-300

[15] United Nations, "Handbook of Input-Output table Compilation and Analysis", New York: United Nation, 1999.

[16] C-S. Yan, "Introduction to Input-Output Economics.", New York : Holt, Reinhart and Winston, 1968.

[17] H.C. Lucas, "Information technology and the productivity paradox", New York : Oxford University Press, 1999.

[18] T.M. Heng and S.M.Thangavelu, "Singapore Information sector: A study using Input-Output table", Singapore Center for Applied and Policy Economics Working paper Series, No. 2006, 15 November 2006. Available: http://www.fas.nus.edu.sg/ecs/pub/wp-scape/0615.pdf [Accessed: July 10, 2010]

[19] S.E. Gillet, M.A. Sirbu, "Measuring Economic Impact of Broadband Deployment", National Technical Assistance, Training, Research, and Evaluation Project #99-07-13829. http://www.eda.gov/ImageCache/EDAPublic/documents/pdfdocs2006/mitcmubbimpactreport_2epdf/v1/mitcmubbimpactreport.pdf [Accessed: July 6, 2010]

[20] R.L. Katz, "Estimating broadband demand and its economic impact in Latin America", Proceedings of the 3rd ACORN-REDECOM Conference, Mexico City, May 22-23, 2009. Available: http://www.acorn-redecom.org/papers/RaulKatz.pdf [Accessed: July 8, 2010]

[21] R.L. Katz and S. Suter, "Estimating the economic impact of the broadband stimulus plan".
Available:
http://www.elinoam.com/raulkatz/Dr_Raul_Katz_-_BB_Stimulus_Working_Paper.pdf [Accessed: July 4, 2010]

[22] S. Roy, T. Das, and D. Chakraborty, "A study on the Indian Information sector: an experiment with Input-Output techniques", Economic System Research, Vol. 14, No. 2, 2002.

[23] I.Tumomi, "Realising the productivity potential of ICTs". Institute of Perspective Technology Studies (IPTS) Report, Issue 85.

[24] H.R. Varian, J. Farrel., and C. Saphiro, "The economics of information technology: an introduction". Cambridge University Press, 2004.

 ISBN: 978-1-61208-100-7