

ICT Economy in the European countries

(work in progress, preliminary)

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Contents

- Background
- Purposes of study
- **Research questions**
- Methodology
- On-going results
- Conclusions

Research questions

- What is the impact of ICT the sectors on the EU countries during 1990-2005?
- How can the structural change of economy due to the role of the ICT sectors be measured in the European countries during 1990-2005?

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Methodology

- This study mainly utilizes quantitative methodology
 - Input-Output method
 - Some comparative analysis using econometrics investigation are also presented (panel data, simultaneous equation model, etc)

Input-Output Model

- Table that depicts transaction flow across sector. It is assumed that each sector produces a particular output and consumes as well from other sectors.
- IO Table

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

1st quadrant describes a certain year interaction between sectors in production process.

2nd quadrant describes the final demand for each sector.

3rd quadrant is primary sector block (wages of labor, rent of land, interest of capital, etc).

Consider structural change applying the IO methods:

Sikhanwita.R, Tuhin.D, and Dabes.C, “*A study on the Indian Information sector: an experiment with Input-Output techniques*”, Economic System Research, Vol 14, No 2, 2002.

Toh. M.H, and Sandre M.T, “*Singapore Information sector: A study using Input-Output table*”, Singapore Center for Applied and Policy Economics Working paper Series, No 2006/15-November 2006.

Both studies investigate the impact of ICT sectors on Indian and Singaporean economy respectively which implement an analysis of causative matrix on the Input-Output data.

Multiplier

- Defined as the ratio of output changes in equilibrium as the impact of change of independent variables. Change of output will be larger than change of independent variables due to interaction of sectors in economy.
- In the case of expenditure approach, the multiplier explains the additional output generated in the economy (all sector) by additional final demand of a particular sector.

$$\text{Multiplier} = \frac{1}{1 - [MPC(1 - T) - MPI]}$$

Final Demand

Data analysis

- Secondary data analysis based on European 59-Input Output table
- Source of data are : Eurostat, The World Bank, OECD, and country statistical bureau

Austria
Belgium
Bulgaria
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg

Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden
United Kingdom

sample



No	Country
1	Portugal
2	Spain
3	United Kingdom
4	Austria
5	Sweden
6	Belgium
7	France
8	Germany
9	Italy
10	Finland
11	Ireland
12	Poland
13	Netherland
14	Denmark

The ICT sectors

Table 1: The Category of ICT Sectors

No	SITC	Definition
1	30	Manufacture of office, accounting and computing machinery
2	3130	Manufacture of wire and cable
3	3210	Manufacture of Electronic valves and tubes and other components
4	3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraph
5	3230	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods
6	3312	Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment
7	3313	Manufacture of industrial process control equipment
8	5150	Wholesaling of machinery, equipment and supplies (if possible only the wholesaling of ICT goods should be included);
9	7123	Renting of office machinery and equipment (including computers);
10	6420	Telecommunications;
11	72	Computer and related activities

Source: OECD (2002) revision in 2008

IO table availability

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

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ICT sector multiplier (2000)

- Descriptive analysis on the OECD data : simple multiplier (direct+indirect impact). *)

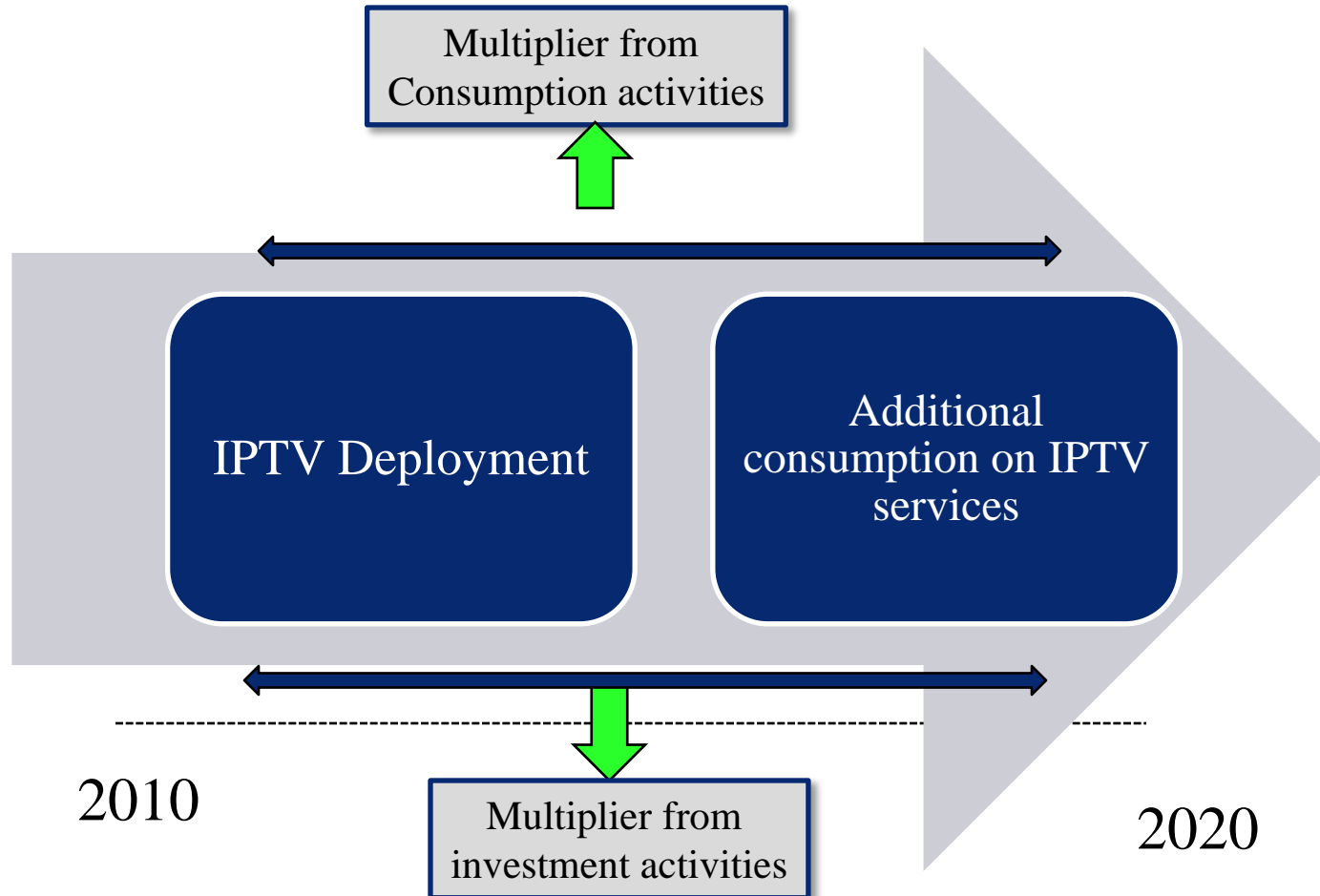
	Germany	Netherlands	France	Sweden
Multiplier of all Economy	2.084	2.161	2.24	2.115
Multiplier of ICT Sector	2.069	1.85	2.155	1.887
Multiplier of Non ICT Sector	2.087	2.217	2.255	2.156

	UK	Italy	Spain	Belgium
Multiplier of all Economy	2.086	2.094	1.997	2.269
Multiplier of ICT Sector	2.146	2.231	1.962	2.255
Multiplier of Non ICT Sector	2.075	2.069	2.003	2.271

- *) Closed and domestic IO

Case 1 : ICT device roll-out (IPTV)

Multiplier analysis



The flow of analysis

Defining what is the activities in IPTV deployment?

Matching the IPTV deployment sector with 59-sector of European Input-Output Table

Calculating the multiplier for the economy due to investment

Forecasting the future consumption

Calculating the multiplier for the conomy due to consumption

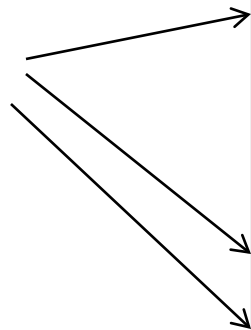
Predicting the aggregate multiplier

Matching : investment activities

Statistical Classification of Economic Activities

Complete List and correspondending ISIC-Classes

Broad IPTV rollout will require extensive investment in fiber infrastructure



F	Construction	
45	Construction	
45.1	Site preparation	451
45.11	Demolition and wrecking of buildings; earth moving	4510x
45.12	Test drilling and boring	4510x
45.2	Building of complete constructions or parts thereof; civil engineering	452
45.21	General construction of buildings and civil engineering works	4520x
45.22	Erection of roof covering and frames	4520x
45.23	Construction of motorways, roads, airfields and sport facilities	4520x
45.24	Construction of water projects	4520x
45.25	Other construction work involving special trades	4520x
45.3	Building installation	453
45.31	Installation of electrical wiring and fittings	4530x
45.32	Insulation work activities	4530x
45.33	Plumbing	4530x
45.34	Other building installation	4530x
45.4	Building completion	454
45.41	Plastering	4540x
45.42	Joinery installation	4540x

Matching : consumption activities

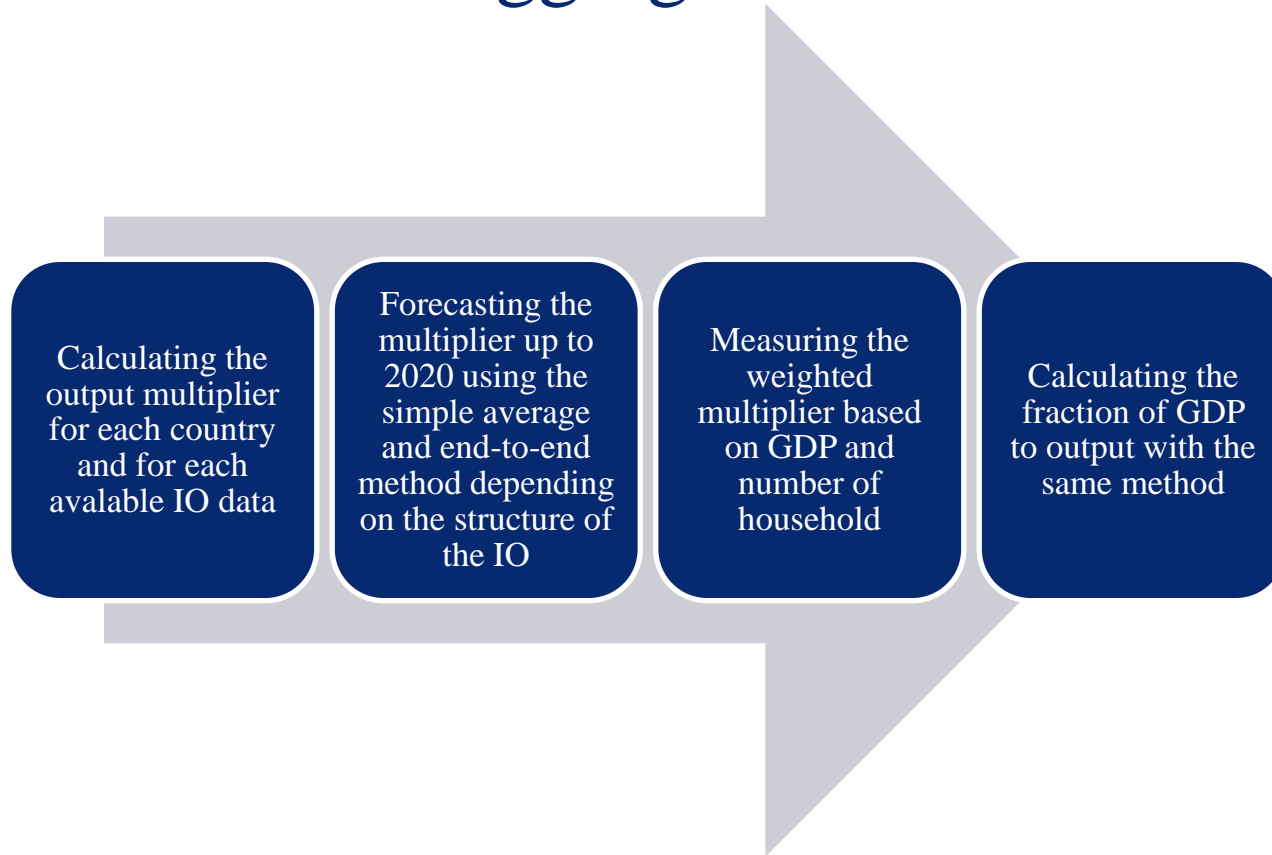
Statistical Classification of Economic Activities

Complete List and correspondending ISIC-Classes

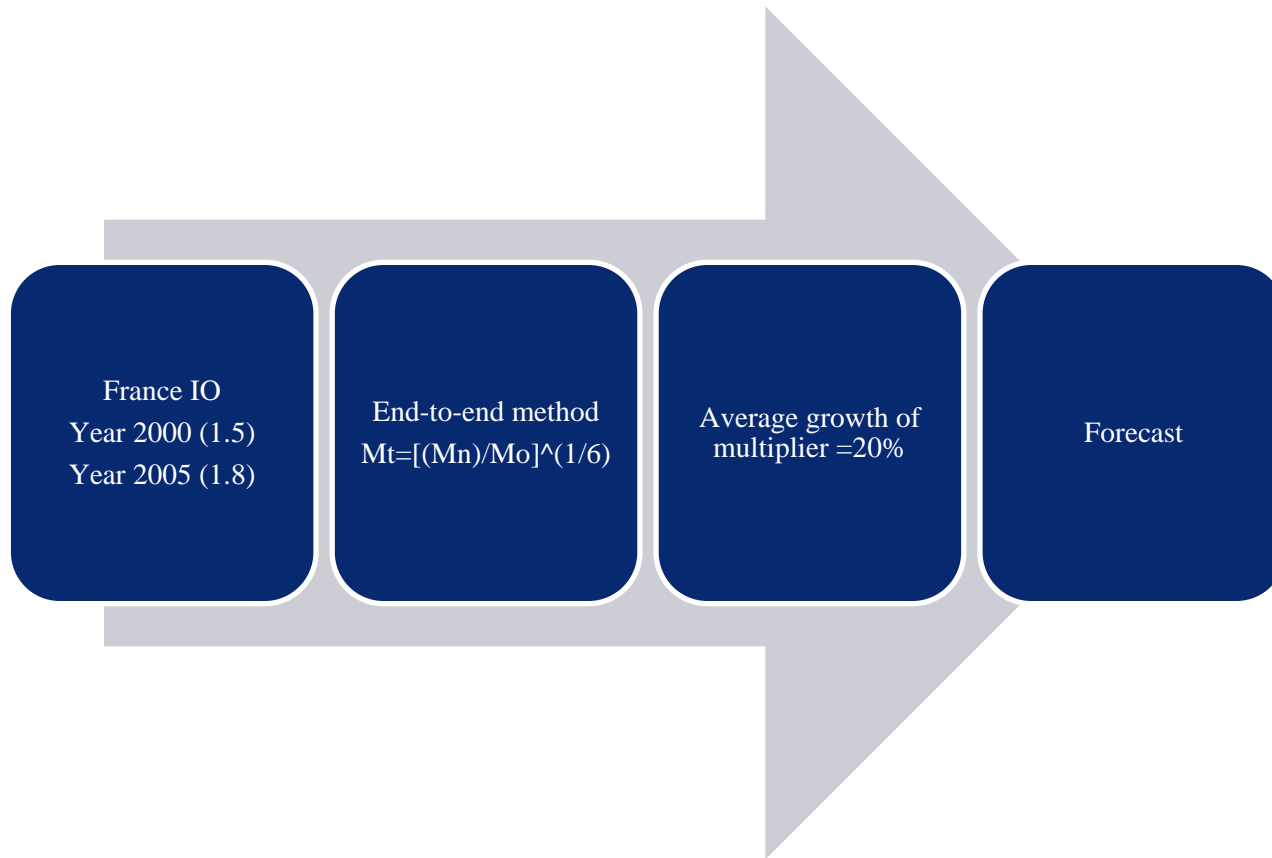
Broad IPTV additional consumption
after the deployment

Level	Code	Description	Definition	This item includes	This item also includes	This item excludes	Reference to isic rev. 3.1
5	64.20	Telecommunications		This class includes: – transmission of sound, images, data or other information via cables, broadcasting, relay or satellite: • telephone, telegraph and telex communication • maintenance of the network • transmission (transport) of radio and television programmes • internet access provision		This class excludes: – production of radio and television programmes even if in connection with broadcast, see 92.20	6420

Aggregation



For instance



Countries

Austria
Belgium
Bulgaria
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg

Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden
United Kingdom

sample

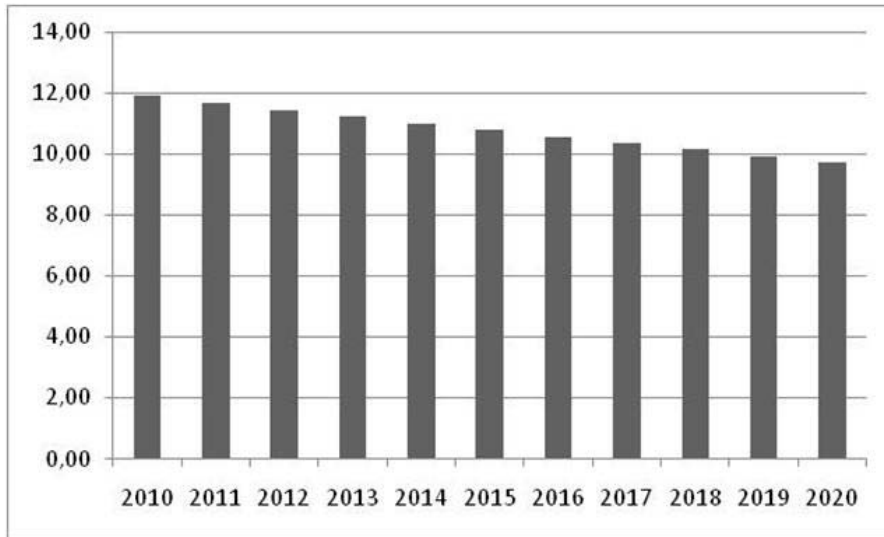


No	Country
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The IO table across EU countries

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

Additional investment

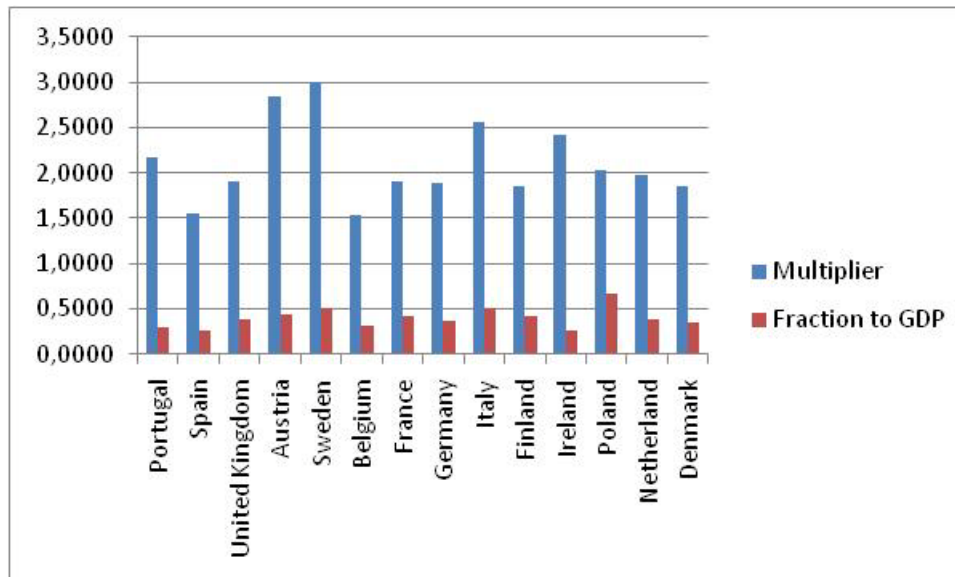


In BEUR

Assumptions

- Investments take place 2010 to 2020
- investments are done gradually so that 50% of the households have access to fiber network in 2020.
- The size of the investment is
 - 1150 EUR per household in urban areas
 - The ratio of urban-sub urban-rural =65%:30%:5%
 - Investment cost is assumed to decrease by 2% per year due to more efficient fiber rollout techniques

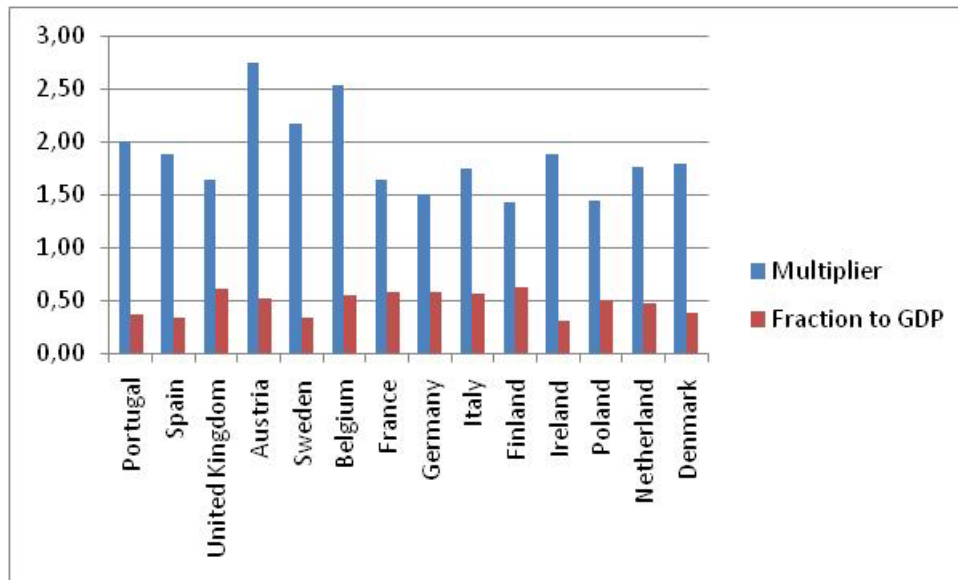
Country analysis : output multiplier from the investment



Country	Multiplier	Fraction to GDP
Portugal	2,1748	0,303
Spain	1,5517	0,269
United Kingdom	1,8984	0,385
Austria	2,8401	0,437
Sweden	3,0096	0,510
Belgium	1,5293	0,312
France	1,8984	0,428
Germany	1,8867	0,366
Italy	2,5515	0,505
Finland	1,8462	0,4168
Ireland	2,4206	0,269
Poland	2,0225	0,669
Netherland	1,9766	0,388
Denmark	1,8535	0,349

Considered as construction sector

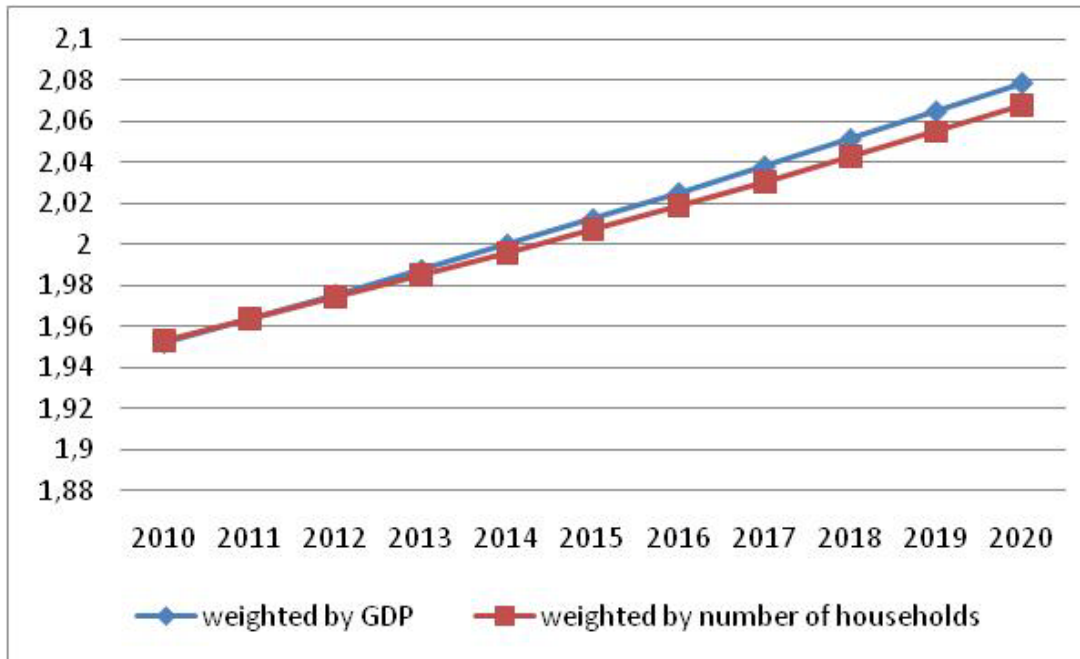
Country analysis : output multiplier from consumption



Country	Multiplier	Fraction to GDP
Portugal	2,01	0,38
Spain	1,89	0,349
United Kingdom	1,65	0,618
Austria	2,74	0,522
Sweden	2,18	0,340
Belgium	2,53	0,554
France	1,65	0,579
Germany	1,50	0,582
Italy	1,74	0,567
Finland	1,43	0,64
Ireland	1,89	0,312
Poland	1,45	0,509
Netherland	1,76	0,484
Denmark	1,79	0,388

Considered as telecommunication sector

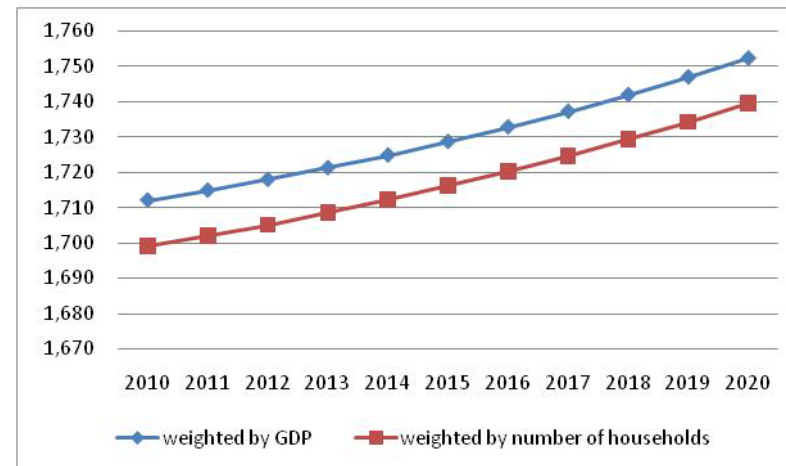
Aggregation : Output multiplier from investment



Year	by GD	by household
2010	1,952	1,953
2011	1,964	1,964
2012	1,976	1,974
2013	1,988	1,985
2014	2,000	1,996
2015	2,013	2,007
2016	2,025	2,019
2017	2,038	2,031
2018	2,052	2,043
2019	2,065	2,055
2020	2,079	2,068

Multiplier from additional consumption

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

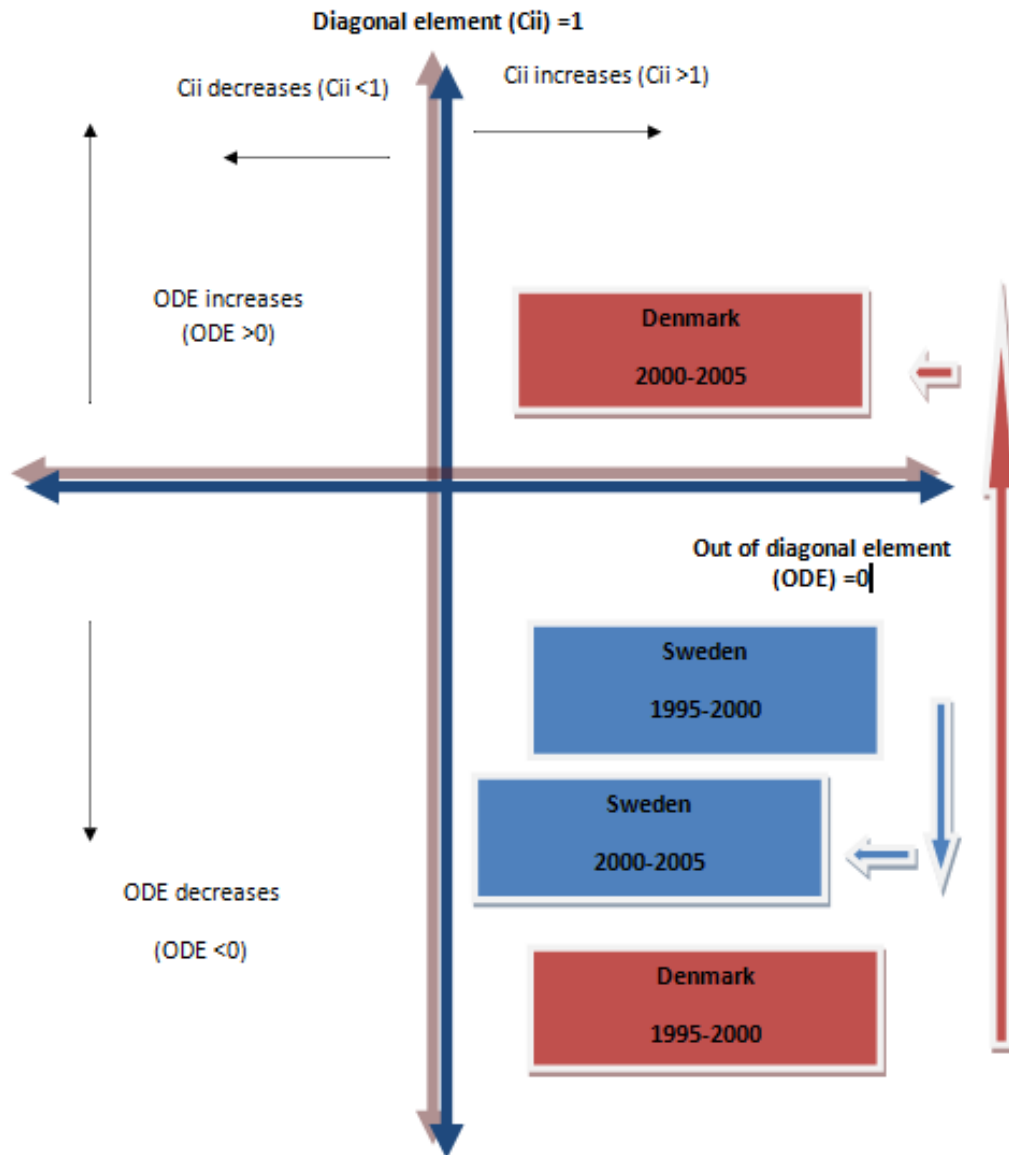


Structural Change (Sweden vs. Denmark)

- From the causative matrix due to change in the role of a particular sector (Sikhanwita, 2002) and (Toh, 2006)

$$C_0 = R_0^{-1} R_1$$

- We can define that :
 - C_{ii} is a diagonal element of causative matrix where, $c_{ii} > 1$, it represents the increase of relative endogeneization of their own final demand. In the case of ICT investigation it can be expressed that ICT sector has informatized the rest of economy in a higher level
 - Sum of Off-diagonal element (ODE), where $ODE > 0$, it denotes the increase in the relative output impact on the other sector engendered by the final demand in all other sector. A positive deviation suggests more linkage between the ICT sectors to the rest of economy.



- The countries have a tendency of lowering C_{ii} indicating that the role of ICT sectors have been becoming more externalized.
- However, the Danish economy enjoys the role of ICT sectors to the rest of economy in a larger portion indicated by the significant shift from negative ODE to the positive ODE.
- On the contrary the performance of ICT sectors to the rest of sectors are stagnant or relatively slowing down in the Swedish economy.

Summary and Suggested policy

- In dealing with the possible opportunity cost, this study try to compare the cost and benefit analysis based on the value of economic multiplier created from broadband activities using the 59-sector of Input Output Table of European Countries. The sample of study covers France, Italy, Spain, Germany, United Kingdom, the Netherlands, Belgium and Sweden. The reason of choosing these countries is based on the number current subscriber which reflects that those countries are becoming the most important market recently.
- As the basis analysis, it is presumed that any broadband policy will have significant economic impact from production side point of view. Hence promoting broadband will be directly affect to the sector which utilize broadband as the main component of it's operation. These sectors are then so called the ICT sector. This study then adopts the OECD definition related to the classification of ICT sector based on SITC.

Case study on IPTV

- The impact of IPTV deployment contribute on both investment activities and additional consumption activities
- The contribution in generating output multiplier varies across countries. Sweden has to be considered as the largest contributor in terms of investment activities while Austria and Belgium are among the largest in terms of the output from consumption
- In aggregation, the IPTV project has a multiplier of 1.9-2.1 in the whole European countries. In the same time the GDP contribution will be around 0.40-0.41. The lower but higher fraction to GDP are found in consumption activities
- The impact will be larger with the increase used of local content during the construction project

Structural change

- The results in Sweden and Denmark show the opposite structural change process
 - The ICT sectors in Denmark has evolved to a higher contribution to the economic growth. The transition from larger to smaller deviation of C_{ii} indicates the role of ICT sectors in informatizing the rest of economy (indicates by the shift from right to (more) left direction)
 - The link to the rest of economy is also progressive, indicated by the shift from lower to higher position of ODE
 - Sweden reflects the opposite direction

Thank you