

The Analysis of Broadband Economy : The Opportunity Cost Concept and The Input-Output Model

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Weakness of broadband economy current studies: No opportunity cost

- MICUS; ITIF; Criterion economics; Lehr et al, and other studies provide benefit measurements of broadband expansion, but without an explicit opportunity cost notion
- But there is no free lunch!

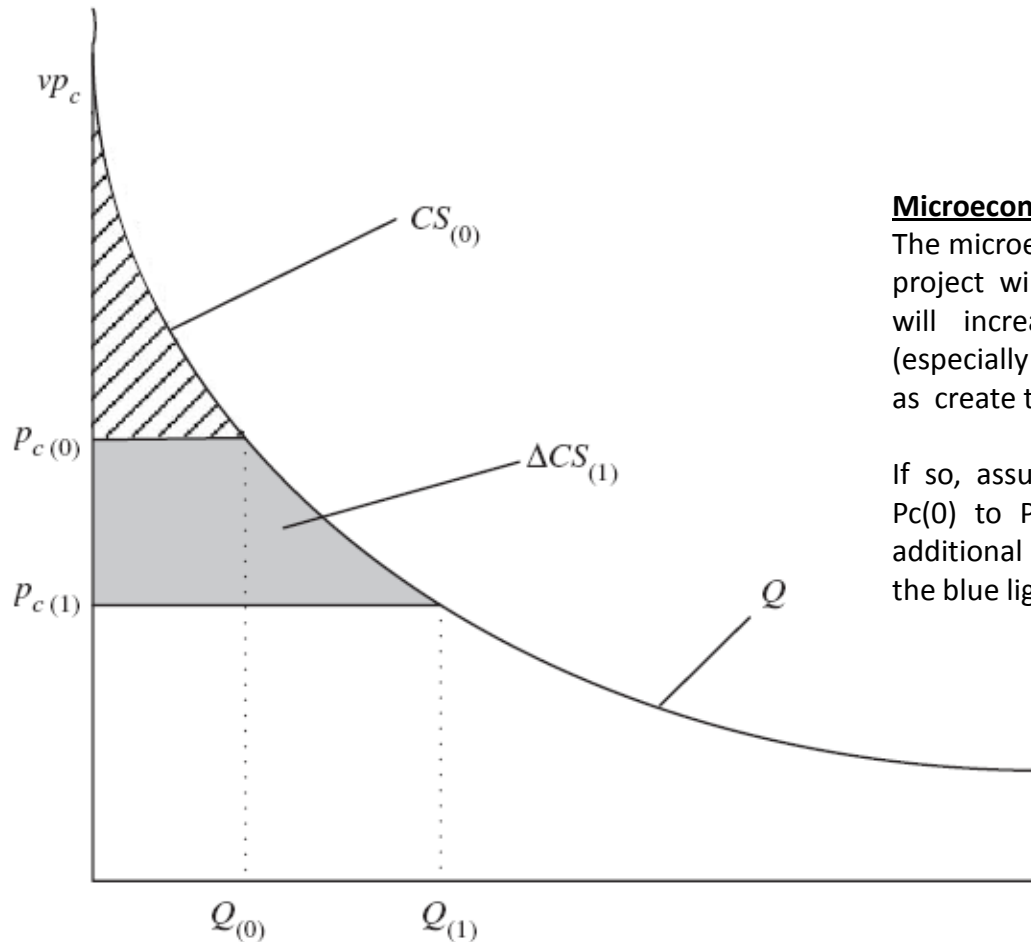
Our results

- With an input-output model, we provide an integrated approach taking into account opportunity costs
- The model is from the macro point of view
- Our results show that government support for broadband is welfare improving
- There are a number of cautions of course
 - methodology, data, results just finished...

The Opportunity cost concept

- **Opportunity cost** or **economic opportunity loss** is the value of the next best alternative foregone as the result of making a decision.
- The next best thing that a person can engage in is referred to as the opportunity cost of doing the best thing and ignoring the next best thing to be done.
- Opportunity cost is the way economist evaluate the feasibility of a particular project considering other alternatives. This cost commonly not be included in the conventional financial approach of broadband economy.

Microeconomic approach



Microeconomics View

The microeconomic approach of the broadband project will depend on whether this project will increase the access of non-subscriber (especially in the remote and rural area) as well as create the lower price of services.

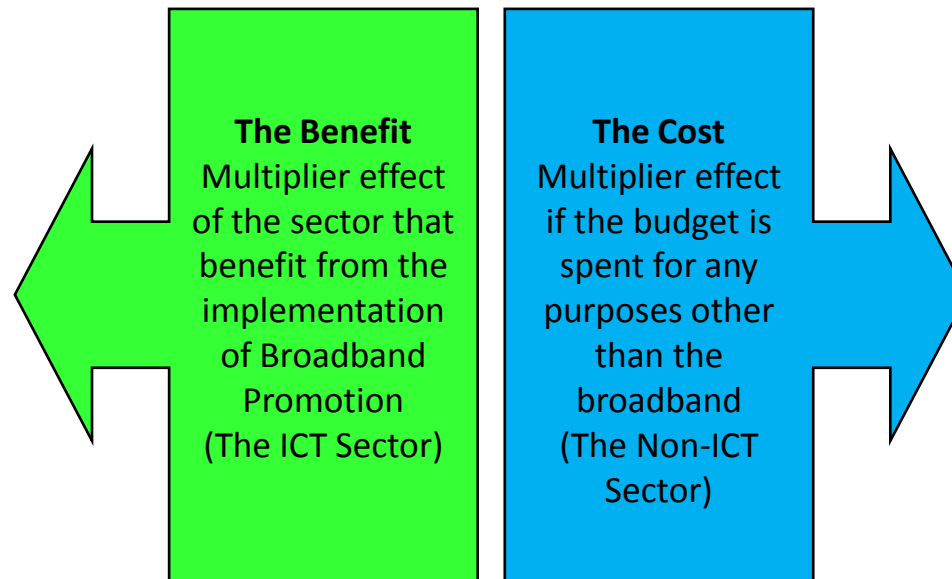
If so, assuming that price will decrease from $P_c(0)$ to $P_c(1)$, the consumer will enjoy the additional consumer surplus as it is drawn by the blue light area

But the microeconomic approach has many data needs

A simplified macro approach

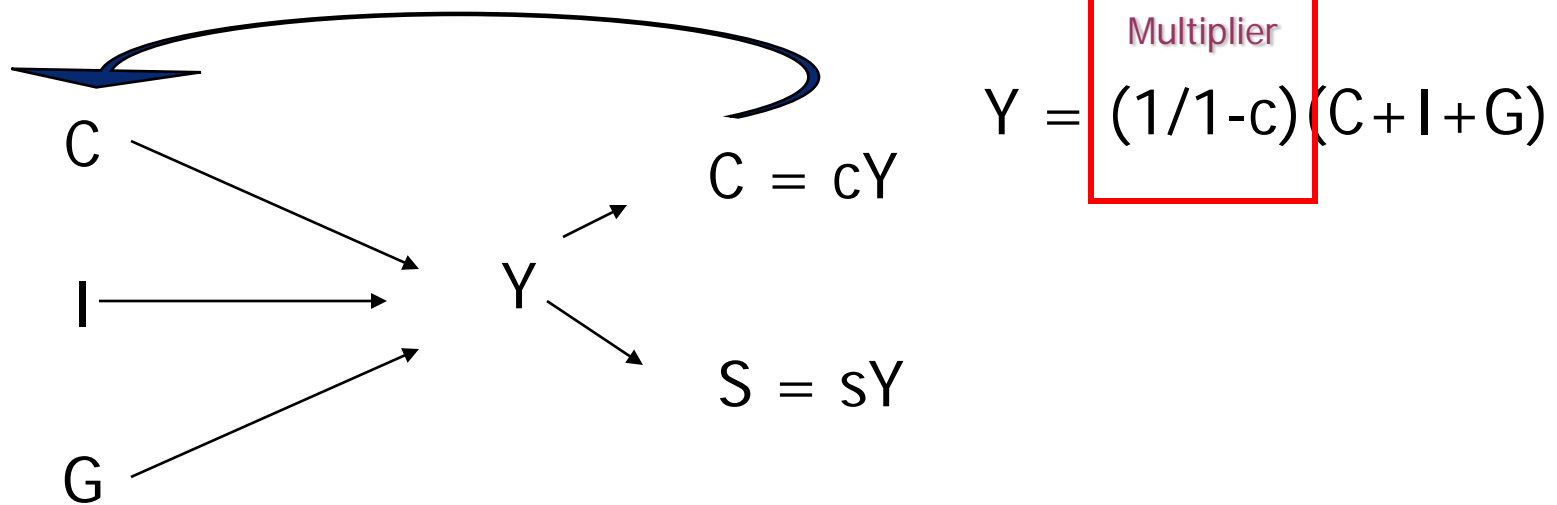
1. What is the existing gov budget spent for?
2. Does this budget expense limit other purposes?
3. Which sector will benefit from (1)?
4. Which sector will be worse off due to (2)
5. Comparison between (3) and (4)
6. Using the multiplier to evaluate

The macro opportunity cost concept: Using the multiplier effect to evaluate gov't spending on broadband



Multiplier (1)

- 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 sectors interaction in economy.
- The multiplier is well-known from the Keynesian approach, as shown here



Multiplier (2)

- In this case of value added approach (Input-Output table), the multiplier explains the additional output generated in the economy (all sector) by additional final demand of a particular sector.
- The multiplier can be divided into direct effects (on that sector) and indirect effects (on the economy as a whole)
- With that in mind, the IO multiplier is as follows:

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$$\text{Multiplier} = \frac{\text{Direct Impact} + \text{Indirect Impact}}{\text{Direct Impact}}$$

• Output multiplier

• Income multiplier

• Employment multiplier

Macroeconomics approach: Input-Output model

- Table that depicts transaction flow across sector. It is assumed that each sector produce of it's certain output and consumes as well from another sector.
- IO Table is obtained

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).

The Flow of Method

Defining what the ICT sector is?

Matching the ICT sector with 59-sector of European Input-Output Table

Calculating multiplier for the entire economy

Comparing the multiplier for ICT and non-ICT sector

Determining the feasibility level

Relating the ICT multiplier with economic indicator

Matching OECDs definition of ICT economy with EU IO sectors

No	SITC	Definition
1.	30	Manufacture of office, accounting and computing machinery
2.	3130	Manufacture of insulated 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.

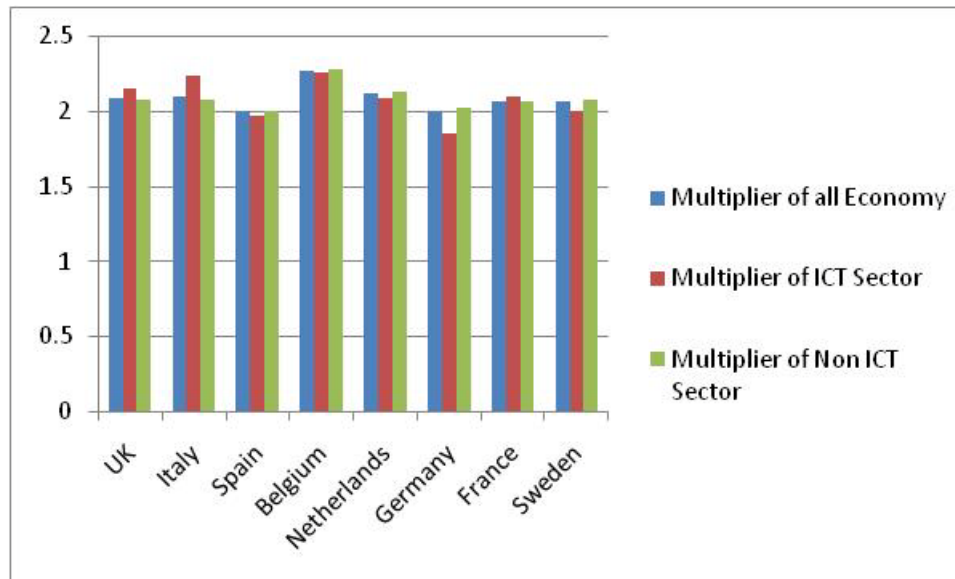


IO Sector	Definition
23	Machinery and equipment
24	Office machinery and computers
25	Electrical machinery and apparatus
26	Radio, television and communication equipment and apparatus
36	Wholesale trade and commission trade services, except of motor vehicles and motorcycles
37	Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods
43	Post and telecommunication services
48	Renting services of machinery and equipment without operator and of personal and household goods
49.	Computer and related services

Source : OECD (2002)

Source : Own interpretation

Calculating the multiplier: 1995

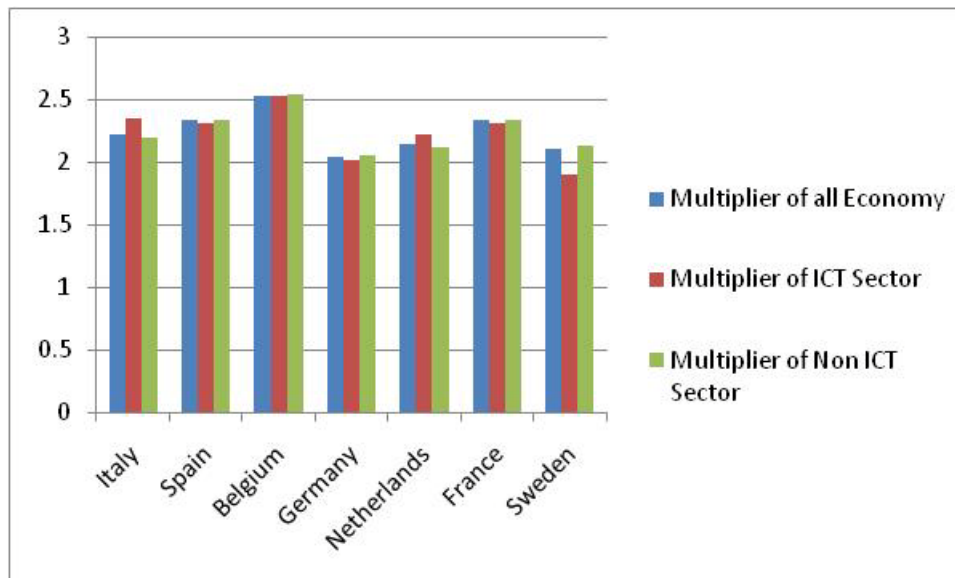


	UK	Italy	Spain	Belgium	Netherlands	Germany	France	Sweden
Multiplier of all Economy	2.086	2.094	1.997	2.269	2.115	1.994	2.067	2.063
Multiplier of ICT Sector	2.146	2.231	1.962	2.255	2.079	1.849	2.097	1.993
Multiplier of Non ICT Sector	2.075	2.069	2.003	2.271	2.121	2.02	2.062	2.076

Source : Input-Output Table **1995** (Eurostat)
Multiplier (own calculation)

Note: Choice of countries based on who were EU broadband leaders in 2002, in view of the time series 1995, 2002, 2005

Calculating the multiplier: 2000

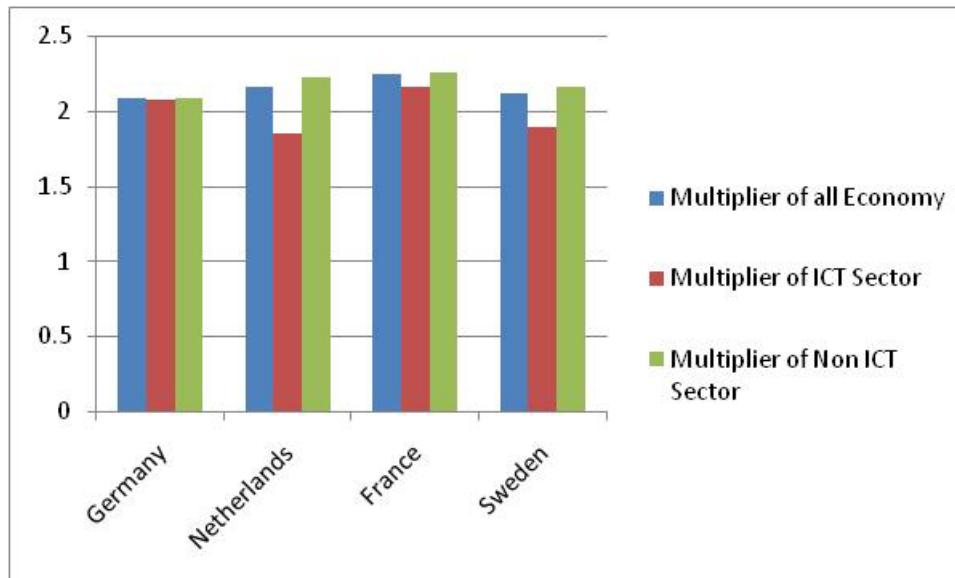


	Italy	Spain	Belgium	Germany	Netherlands	France	Sweden
Multiplier of all Economy	2.221	2.333	2.532	2.043	2.136	2.333	2.098
Multiplier of ICT Sector	2.352	2.309	2.531	2.018	2.223	2.309	1.901
Multiplier of Non ICT Sector	2.197	2.337	2.533	2.048	2.12	2.337	2.134

Source : Input-Output Table **2000** (Eurostat)
Multiplier (own calculation)

Note: Choice of countries based on who were EU broadband leaders in 2002, in view of the time series 1995, 2002, 2005

Calculating the multiplier: 2005



	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

Source : Input-Output Table **2005** (Eurostat)
Multiplier (own calculation)

Note: Choice of countries based on who were EU broadband leaders in 2002, in view of the time series 1995, 2002, 2005

Decision Making

Definition of the Status*
Very Feasible, If the value of multiplier effect on ICT sector always bigger than any other economic sector overtime
Feasible If, (i) the value of multiplier effect on ICT sector has either bigger or lower in different time of observation, or, (ii) (ii) multiplier effect of ICT sector is at least the same compared to non ICT, thus the opportunity cost of spending in broadband project is as big as any other purposes
Less Feasible if the value of multiplier effect on ICT sector is less than any other economic sector overtime

Note :

*) considering the possibility of underestimating the ICT multiplier and overestimating the non-ICT multiplier

Decision Making

Country	Very Feasible	Feasible	Less Feasible
United Kingdom	V		
Italy		V	
Spain			V
Belgium		V	
Germany			V
Netherland		V	
France		V	
Sweden			V

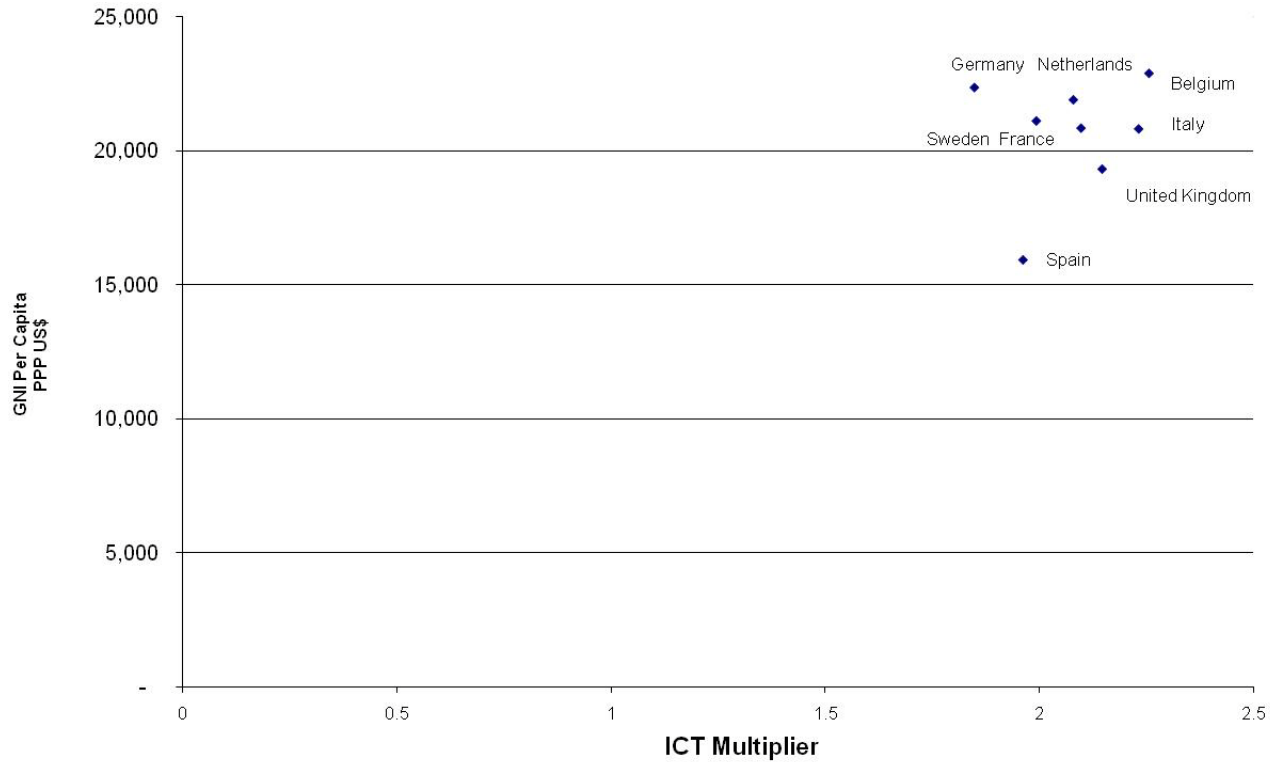
Note :

*) bear in mind the possibility of underestimating the ICT multiplier and overestimating the non-ICT multiplier

Will the enhanced sector performance benefits improve consumer welfare?

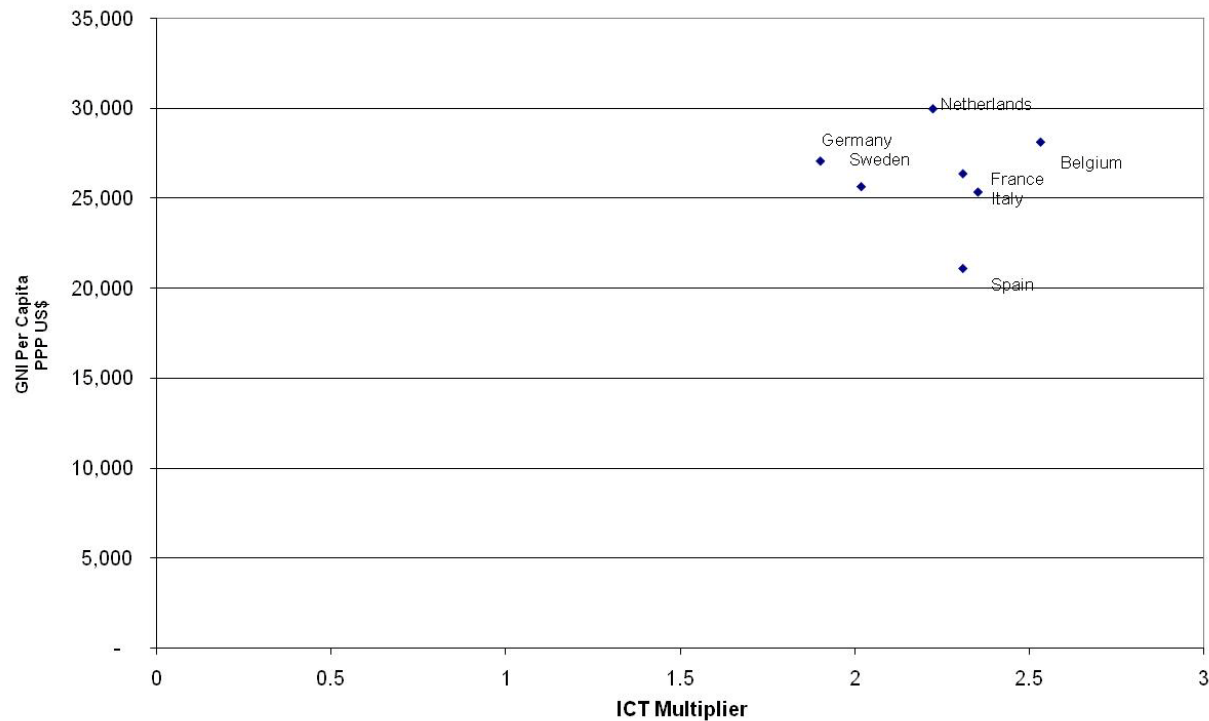
- We need to consider an indicator of improved consumer welfare, to be sure that the production-related improvements translate into benefits
- Here we propose to consider the relation between the ICT multiplier and Gross National Income (GNI)

ICT and Economic Performance (1995)



Source :
 ICT multiplier from own calculation
 GNP from the World Bank database

ICT and Economic Performance (2000)



Strong positive trend

Source :
ICT multiplier from own calculation
GNP from the World Bank database

Conclusions

1. Gov't spending on broadband is likely to be welfare improving, taking into account opportunity costs
2. Moreover, the broadband economy is likely to be understated, implying robust results
3. Understated because the ICT multiplier is an average of all ICT investment
4. Understated because only a few sectors were considered as ICT, while broadband is generic for all sectors
5. Understated because the data is from 1995-2005, and productivity has been increasing
6. However, the IO approach has some traditional economic assumptions -static, constant price, homogenous products

Further research

1. Employment effects
2. The whole EU
3. Primary data for a micro economic approach