

The effects of high speed broadband on digital inequality: The case of Netherlands

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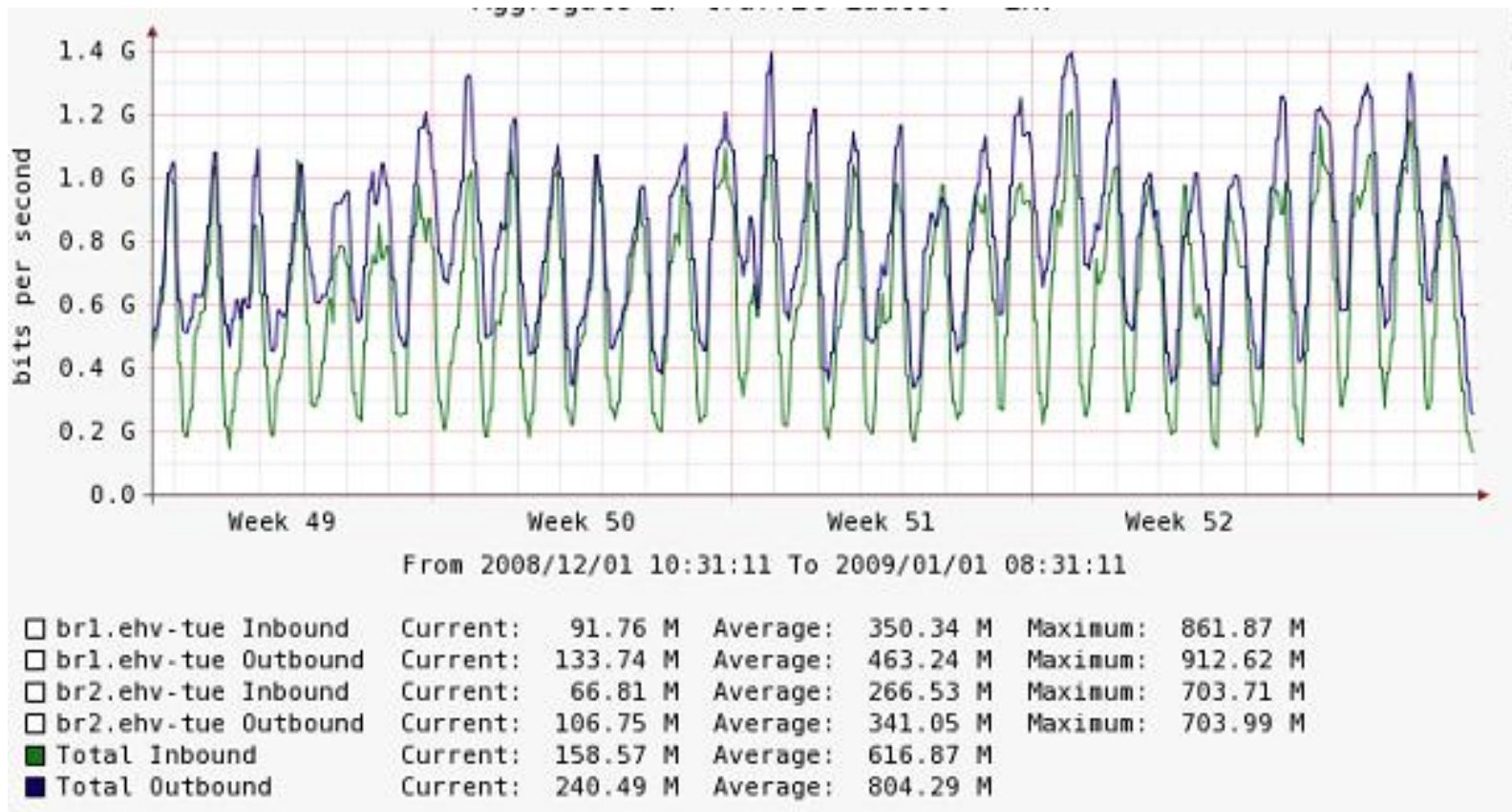
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Where innovation starts

What is the real question about broadband?



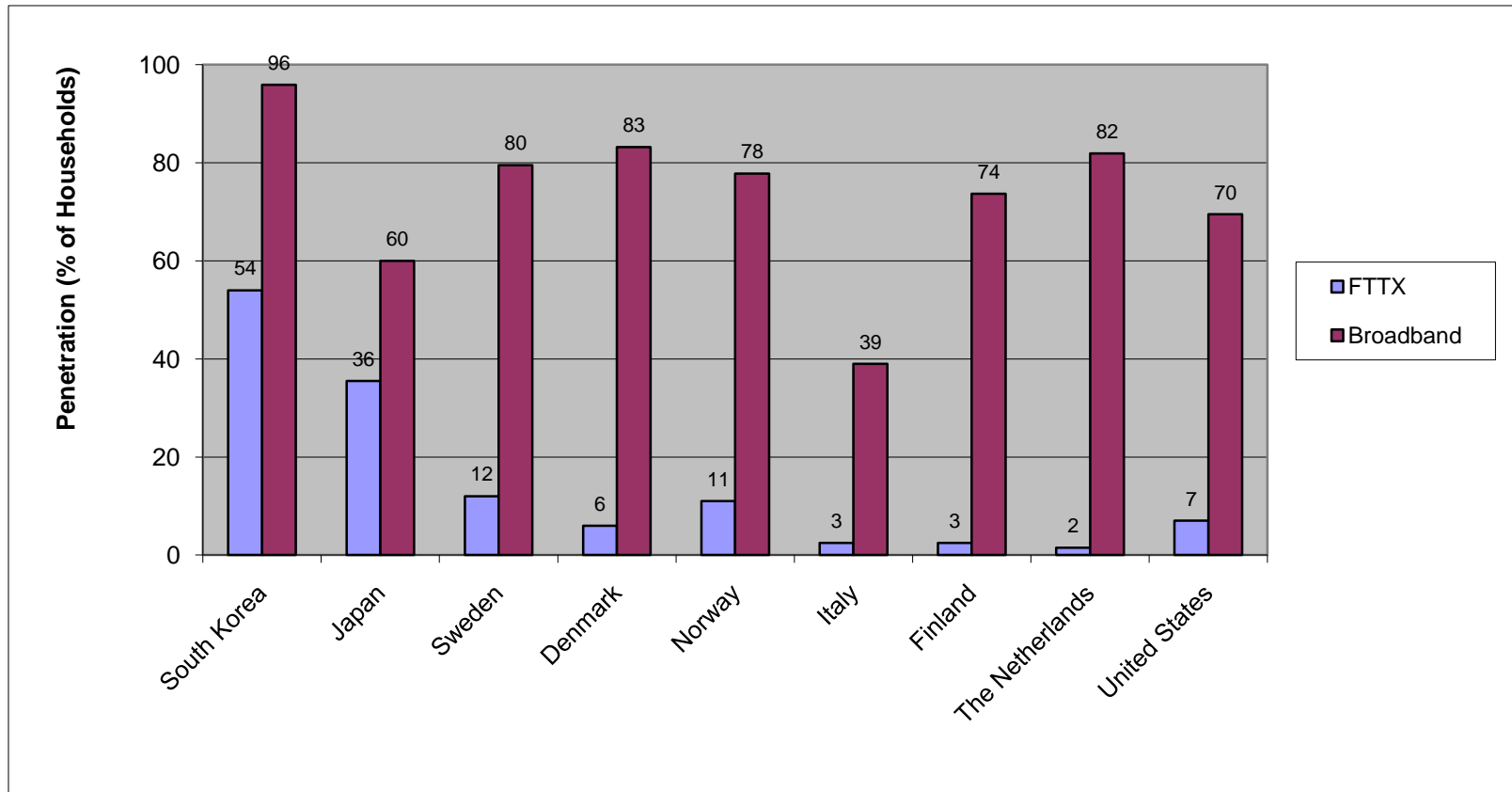
Structure

- **Research question: What are the determinants for for the adoption of high-speed broadband access by residential users and to what extent are the different compared to “traditional” broadband access?**
- **Empirics: Large-scale survey among 8,606 FttH residential users in the Netherlands (city of Eindhoven)**
- **Results: Number of “traditional” determinants still hold, at least two things are different: existing of complementary technologies and local embeddedness**

High speed access and NGA

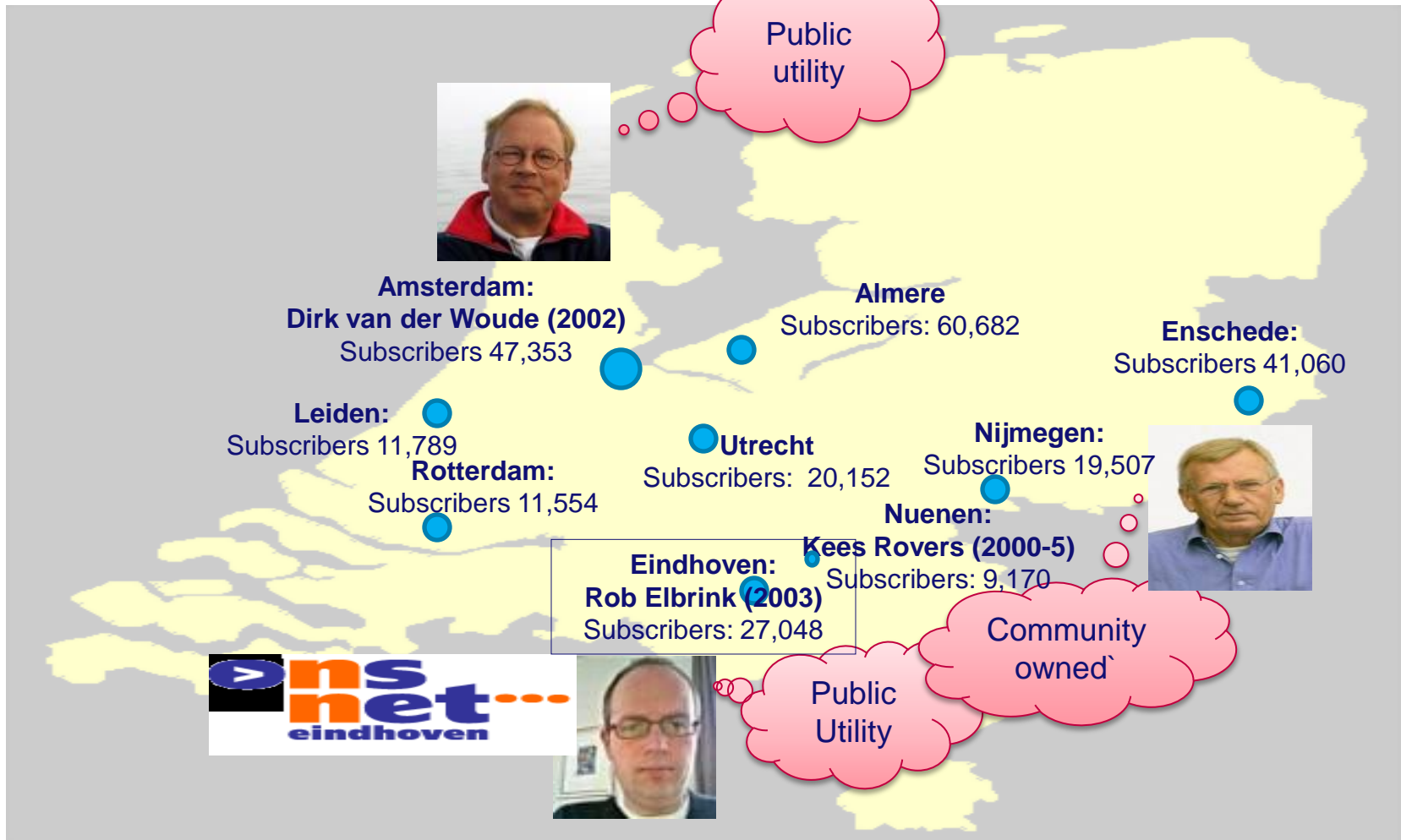
- **“Old” Definition CEU (May 2009):**
 - Fibre to existing street cabinets > downstream bandwidths 40 Mbps and upstream 15 Mbps (compared with today's downstream speeds of a maximum of 8 and 24 Mbps for ADSL and ADSL2+ access technologies);
 - Upgrading current cable networks > speeds up to and beyond 50 Mbps (against previous speed of 20 Mbps); using the new 'DOCSIS 3.0' cable modem standard;
 - Fibre connections offering services up to 100 Mbps and beyond.
 - > no copper access, no UMTS, no LTE, no satellite
- **“New” Definition CEU (September 2009):**
 - Wired access networks > consist wholly or in part of optical elements & capable of delivering broadband access services with enhanced characteristics (such as higher throughput) as compared to those provided over existing copper network

High Speed Access and FttH



(Source: OECD, 2010; FTTH Council Europe, 2010)

The Dutch Spirit: The Emergence of Municipal Fibre Networks



Source: Stratix, 2010; Own Investigation

Competition important driver broadband: but also municipal FttH networks

Rank	City	Average download speed	Percentage FttH of total HH
1.	Enschede	17,95 Mbps	28.04
2 .	Tilburg	16,59 Mbps	0.00
3.	Apeldoorn	16,07 Mbps	0.00
4.	Amsterdam	15,59 Mbps	11.20
5.	Utrecht	15,48 Mbps	15.37
6.	Almere	14,92 Mbps	65.61
7.	Zoetermeer	14,50 Mbps	0.00
8.	Haarlem	13,31 Mbps	0.86
9.	Eindhoven	13,05 Mbps	14.72
10.	Rotterdam	12,57 Mbps	3.56
11.	Nijmegen	11,74 Mbps	19.89

(Source: Data IPing July 2010, Stratix 2010)

2 Cable companies highest speed above 19 Mbit/s average download speed.
(UPC, Ziggo)

From Digital Divide

Studies on digital divide and broadband adoption:

- **Hoeffler (2007):** consumers would opt for BB based on their utility (that is, income and price sensitivity);
- **Hitt & Prasanna (2007):** Broadband adoption increases usage;
- **Goldfarb & Prince (2008):** Income and education is positively related to adoption, usage is negatively correlate with these characteristics;
- **Higher access speed has a positive impact on higher usage of residential consumers as users utilize more of existing broadband services and a greater variety of new services (Goldfarb and Prince, 2008; Hitt and Prasanna, 2007)**

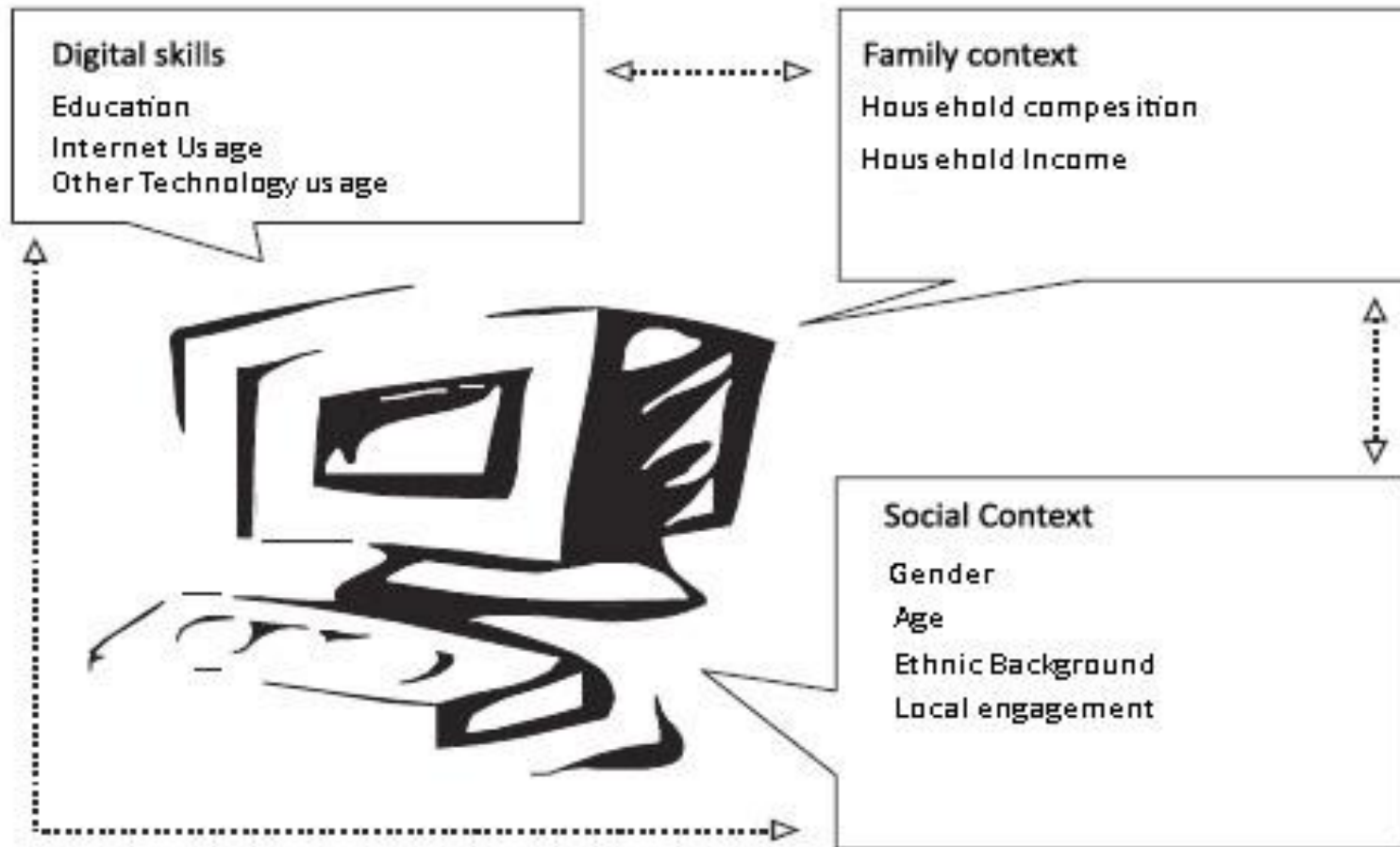
To digital inequality

- **DiMaggio & Hargittai (2001) Digital Abilities > Use of Internet related to abilities of users to navigate through the Internet, exchange information among users, to use new Internet technologies;**
- **Sadowski, et. al (2008): FttH networks can have positive effect on social capital if related to social objectives; Users with lower income & lower education benefit over-proportional from social media;**

To User involvement

- **Users getting involved in innovation due to a different knowledge base than producers (see von Hippel, 1994):**
 - **Knowledge is local by nature (difficult to transfer) and is different for the so-called lead users (those who expect benefits coming sooner compared to the mainstream users);**
 - **Knowledge can be complementary**

The conceptual model



Based on: Korupp and Szydlik, 2005

Hypotheses

H 1: *Individuals who adopt high-speed Internet access are more likely to use other advanced services (e.g. digital TV) and devices (e.g. smart phones with unlimited mobile data plan, PDA).*

H 2: *Individuals who attach more importance to local engagement are more likely to have high-speed Internet.*

The sample

Characteristic	Sample	Eindhoven	The Netherlands
Dutch origin	84.4	72.5	80.0
(in percent)			
Average age	55.6	39.4	39.9
(in years)			
College education	43.4	--	31.0
(in percent)			
Male	69.8	50.6	49.4
(in percent)			
Mean net household Income	36.614	34.200	33.500
(in Euro)			
Average household size	1.96	2.24	2.24
In labor force	55.9	67.6	64.5*

Some Descriptives

Characteristic	2 MB Internet	100 MB Internet	The Netherlands
Number of subscribers (in percent)	25,1	74,9	-
Dutch origin (in percent)	85,4	89,9	80.0
Average age (in years)	59,6	54,1	39.9
Home owner (in percent)	54,8	66,9	54,5
Mean net household income (in Euro)	23.591	29.183	33.500
Male (in percent)	58,2	72,2	72,2
Average household size	1,88	2,37	2.24
College education (in percent)	35,2	45,0	31.0
In labor force (in percent)	37,6	59,1	64.5*

Data set

Survey (SURF, 2009) conducted on-line from the area of Eindhoven (area Tongelre and Woensel) in July 2009

- **From the 8,606 people approached via email, 2,682 responded. From the group of non-respondents, 313 people started with the survey but did not finish it (response rate of 31.2 %);**
- **443 people had a 2 Mbit/s Internet connection, 1290 used a 100 Mbit/s Internet connection.**

The results

Predictor	Basic model						Extended model					
	β	SE β	Wald's χ^2	df	p	e^{β} (odds ratio)	β	SE β	Wald's χ^2	df	p	e^{β} (odds ratio)
Constant	-2.834627	.6749719	-4.20	1	0.000	NA	-2.948851	.7787957	-3.79	1	0.000	NA
Income	.0003245	.0000817	3.97	1	0.000	1.000325	.0003553	.0000865	4.11	1	0.000	1.000355
ChildInHousehold	.3324572	.0862416	3.85	1	0.000	1.39439	.3404436	.0902555	3.77	1	0.000	1.405571
ValueDownloadSpeed	.8070586	.0809048	9.98	1	0.000	2.241306	.8385497	.0866073	9.68	1	0.000	2.31301
ValLowCost	-.1704094	.0971273	-1.75	1	0.079	.8433195	-.263855	.1055277	-2.50	1	0.012	.7680849
FileDownload	.0223866	.0112363	1.99	1	0.046	1.022639	.0212809	.011068	1.92	1	0.055	1.021509
UsePrivat	.0955715	.0345935	2.76	1	0.006	1.100287	.1075011	.0364691	2.95	1	0.003	1.113492
Ethnicity	-1.952546	.7940184	-2.46	1	0.014	.1419123	-2.786971	.8774483	-3.18	1	0.001	.0616075
Male	.2411426	.1591974	1.51	1	0.130	1.272702	.1409547	.170929	0.82	1	0.410	1.151373
CollegeEducation	-.013017	.1508843	-0.09	1	0.931	.9870673	.2006346	.1630931	1.23	1	0.219	1.222178
Age	-.0172915	.0060324	-2.87	1	0.004	.9828572	-.0160701	.0066074	-2.43	1	0.015	.9840583
FOTSPhone	1.224825	.2126139	5.76	1	0.000	3.403571	1.228814	.2229877	5.51	1	0.000	3.417176
MobInternet							.5147191	.1693505	3.04	1	0.002	1.673169
HasDigitalTV							.3805728	.1929595	1.97	1	0.049	1.463122
EnvironmentImportant							-.24347	.0949574	-2.56	1	0.010	.783903
ValuesLocalEngagement							.2508412	.0748772	3.35	1	0.001	1.285106
Test			χ^2	df	p				χ^2	df	p	
Hasmer & Lemeshow			10.69	8	0.2199				5.00	8	0.7575	
Likelihood ratio test			360.20	11	0.0000				402.04	15	0.0000	
Overall model evaluation												
Log Likelihood	-654.3919						-601.70009					
Pseudo R2	0.2158						0.2504					
McFadden's R2	0.201						0.230					

Findings

- Existing literature:
 - Users with high speed Internet spend more time online
 - Household composition (i.e. having children) positively relates to adoption;
 - Educational level not significant.
- New insights:
 - People who adopt high-speed Internet access are more likely to:
 - i) use other advanced services and;
 - ii) attach more importance to local engagement
- Income still is an important factor in explaining high speed adoption

Conclusions

- **For service companies:**
 - **Interaction with residential users is vital;**
 - **Complementary and local knowledge is important**
 - **Important for marketing as well as demand aggregation.**
- **For policy makers**
 - **Triple-play services as premium services but how about other advanced broadband services**
 - **Threat that digital inequality remains.**