Internet Use and Social Capital: The Strength of Virtual Ties

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Abstract

This paper aims to understand how Internet users may improve their social capital by investing in online social activities. We argue that the Internet can be a convenient and efficient means of maintaining existing social ties and/or of creating new ties. We seek to identify the determinants of online investments in social capital and the nature of the interaction with traditional forms of investment in social capital. Using a Luxembourg household survey, the econometric results reveal a significant positive impact of volunteer activities and trust (two measures of social capital) on online investments to maintain social capital, but more ambiguous results are found between online investments and face-to-face contacts with friends. By contrast, online investments to create new ties are poorly related to the Internet users' existing social capital, but depend on the opportunity cost of time.

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Introduction

Sending and receiving e-mails is the most frequent use of the Internet. Internet users, via e-mail, Instant Messaging or social network platforms communicate not only with their family, friends or colleagues, but also with anonymous people. The Internet is actually a new means of communication and socialization that can supplement face-to-face or telephone contacts. But the Internet may isolate individuals and reduce the time spent participating in social activities, especially if Internet users are mainly engaged in solitary usage (web-surfing, news reading, etc.). For example, Paul Attewell, Belkis Suazo-Garcia and Juan Battle (2003) showed that adolescents with a home computer spend less time practicing sports or playing outside. Moreover, virtual sociability is not really equivalent to traditional sociability: face-to-face interactions are typically richer than virtual interactions by e-mail, chat or instant messaging.

Whether Internet use increases or decreases sociability has important consequences for the building and maintenance of social capital. Social capital refers to the individual's collection of social ties that provides access to resources, information or assistance and from which one can derive market and non-market benefits (better social status, better educational and professional achievement, more happiness…). This article aims to understand how Internet users may enhance their social capital by investing in online social activities. Several studies have examined the influence of social capital and social support on Internet usage (Agarwal, Animesh and Prasad 2005; Goldfarb 2006; DiMaggio et al. 2004). Austan Goolsbee and Jonathan Zittrain (1999), for example, find that people are more likely to shop online if much of their social network (friends and family) does likewise. This article is not intended to measure the impact of social capital on Internet usage, but rather how Internet use can affect the building and maintenance of social capital. In particular, we want to understand whether investing online in social capital is a substitute or a complement to traditional investments in social capital (face-to-face contacts and volunteer activities).

This issue is critical because if online and traditional investments are complementary, then Internet users could accumulate more social capital than non-users. As Internet users tend to have higher social capital than non-users, the digital divide may increase the inequalities in social capital (Quan-Haase and Wellman 2004, Di Maggio et al. 2004, Katz and Rice 2003; Hargittai 2002).

Moreover, Internet use may also modify the nature of an individual's social capital and enable the accumulation of virtual social capital. Following Mark Granovetter (1973), it is possible to distinguish two forms of online social activity. Firstly, the Internet may serve to maintain or intensify existing social ties with close friends and family (*strong-tie investments*). Secondly, the Internet can be used to maintain ties with acquaintances or create new ties with virtual acquaintances (*weak-tie investments*). In other terms, computer-mediated communication can be used to strengthen strong ties, but also to expand weak ties (Resnick 2001, Riphagen and Kanfer 1997). Consequently, it may modify the composition of social capital if the Internet is more favorable to either weak-tie investments or strong-tie investments. By changing the proportion of strong and weak ties in Internet users' social capital, it may affect their ability to obtain support and emotional aid (provided by strong ties) and to access new ideas, scarce resources or job opportunities (provided by weak ties) (Granovetter 1973, 1983, 2005; Friedkin 1982).[1]

Finally, changing social capital at the individual level may lead to some changes in social capital at the country level, with direct social and economic consequences. Indeed, more collective social capital tends to improve trust, cooperation and social cohesion, and increases the global performance of the economy and society by reducing transaction costs and enhancing the capacity of innovation and adaptation. Many empirical studies have found that social capital is positively associated with economic growth (Knack and Keefer 1997; Quentin Grafton et al. 2004; Beugelsdijk and Schaik 2005), as well as with international trade, macroeconomic stability, political and civic involvement, crime prevention, health and happiness (Bjornskov 2003; Berggren and Jordahl 2006). Much of the debate is about whether the Internet enhances or reduces social capital at the individual and group levels (DiMaggio et al. 2001).

This question has been partially addressed by Axel Franzen (2003), who examines the effect of Internet use on peoples' social network, measured by the number of close friends and the amount of time spent with them. Based on a Swiss panel of 700 individuals surveyed in 1998 and 2001, he shows that Internet use does not increase or decrease the number of friends and the time spent with them, but reduces the time spent watching television. Robert Kraut et al. (2002) show that Internet use increases social interactions with friends and kin, but only for people rich in social capital.[2] Irina Shklovski, Sara Kiesler and Robert Kraut (2006) review 16 surveys between 1995 and 2003 that examine how Internet use can affect social interaction. They show that Internet use has a slight positive impact on sociability in longitudinal studies. But the impact tends to be negative in cross-sectional studies such as in

Norman H. Nie, Sunshine Hillygus and Lutz Erbing. (2002) who give evidence of substitution effects between the daily time spent online and in face-to-face interactions.

Following Robert D. Putnam (2000), Barry Wellman et al. (2001) distinguish three forms of social capital: *network capital* (informal relations among friends, neighbors and colleagues), *participatory capital* (involvement in politics and voluntary organizations), and *community commitment* (trust and engagement toward the community). Using U.S. data, they find that Internet use supplements network capital and increases participatory capital, yet undermines community commitment.[3] Liesbet Zoonen et al. (2003) also report contrasting effects of Internet use on individual social capital, finding no correlation with participatory capital (involvement in voluntary organizations), but a limited negative correlation with community commitment (volunteer work, religious activities, charities). Similarly, James E. Katz, Ronald Rice and Philip Apsden (2001) conclude that Internet users are more heavily involved in voluntary organizations. Moreover, longstanding Internet users have larger social networks than either non-Internet users or more recent users.

Most of the aforementioned studies indicate the existence of interaction between Internet use and social capital, although causation is often ambiguous. In the remainder of this article, we focus on online investments in social capital and attempt to understand empirically the determinants of such social activities. For this purpose, we use data from a Luxembourg household survey and estimate several probit models (discrete choice models) to find the drivers of online investments in social capital. The dataset has several advantages. First, the survey is part of the European Social survey, funded by the European Commission and has close similarities with the US Generalized Social Survey. It thus provides detailed and accurate measures of sociability and social capital (Reeskens and Hooghe 2008).[4] Second, Luxembourg is a small, highly-developed European country that is well-representative of Northern Europe's population.[5] The penetration of the Internet in Luxembourg is among the highest in Europe and is comparable to the levels observed in the United States.[6] Third, the survey was conducted face-to-face and collected high quality and reliable responses. Finally, data enable us to distinguish between the two main motivations for investing in social capital online: maintaining existing ties and creating new ties.

The econometric results suggest that people characterized by a high level of *participatory capital* (memberships and volunteer activities) and *community commitment* (trust in others) are more likely to use the Internet to maintain existing ties with friends and family. By contrast, online investments to create new ties are poorly related to the Internet user's social capital stock, but depend more on her opportunity cost of time and IT skills.

Finally, people with geographically dispersed families tend to maintain existing ties by means of the Internet. Computer-mediated communication actually serves to relax cognitive, spatial and temporal constraints that people face in building and maintaining their social networks.

In the next section, we clarify the concept of social capital and then propose a theoretical framework for analyzing the potential effects of Internet use on individual social capital. Section 3 presents the database and the econometric models used to test our hypotheses. Section 4 discusses the econometric results. Section 5 concludes.

The conceptual framework

Social capital as an individual attribute

The concept of social capital was initially developed by sociologists (Bourdieu 1980; Coleman 1988, Burt 1992) and has since been extended to other social sciences, especially economics.[7] Actually, social capital is a multiform concept without a consensus definition among social scientists (Durlauf 2002; Manski 2000). First, social capital can be defined as a community-level feature. Each group or community is characterized by a level of social capital that tends to be correlated with the degree of trust among community members (Bowles and Gintis 2002). According to Francis Fukuyama (1999), "social capital can be defined simply as an instantiated set of informal values or norms shared among members of a group that permits them to co-operate with one another. If members of the group come to expect that others will behave reliably and honestly, then they will come to trust one another. Trust acts like a lubricant that makes any group or organization run more efficiently".[8]

By contrast, an individual level approach to social capital assumes that each individual is characterized by the number of trusting relationships and social ties "in which she is involved and where she has access" (Laumann and Sandefur 1998). Social capital is an individual attribute that enables people to draw on resources from other members of the networks to which they belong and to obtain greater monetary and non monetary benefits from social interactions with others, such as valuable information, better working and living conditions, better social status, happiness or self-esteem (Glaeser et al. 2002). The individual will accumulate social capital thanks to her intrinsic aptitudes (charisma, leadership abilities…), and by investing to maintain and expand her social network. Such investments are costly in terms of time, effort and monetary resources; they can consist of joining an association, a club, a political party, or simply meeting friends, or organizing a dinner party.[9]

These investments foster social ties with helpful or influential persons. We focus here on this individual approach to social capital.

Research hypotheses

From a microeconomic perspective, the decision to invest in social capital is a trade-off between the expected benefits and costs. As in the case with physical capital (Becker 1964), the individual will continue to allocate resources to such social activities as long as the marginal benefits exceed the marginal cost.

Two types of online investments can be considered: investments to maintain social capital and investments to create new social capital. The maintenance of existing social capital consists in avoiding the depreciation of social capital. Indeed, as with physical capital, social capital tends to depreciate over time if the individual does not manage her social capital, even if the depreciation rate is much lower than for physical capital (Sobel 2002).

The expected cost of building and maintaining social capital largely depends on the individual's skills and intrinsic abilities. For online investments in social capital, the cost should decrease with the individual's experience using information technology (computer and Internet skills). Indeed, IT-skilled people have lower cost barriers in adopting Internet applications to communicate and manage social ties (Hargittai 2002). These arguments lead to the following hypothesis:

Hypothesis 1: IT-skilled people are more likely to use the Internet to maintain and expand their social capital

An important parameter that may affect the cost of online investment in social capital is the opportunity cost of time. This cost is generally measured by the wage or income that the individual can expect from working instead of using the Internet. This depends on occupational status. A high opportunity cost of time favors investing online because the Internet is a time saving technology for interacting with one's social network. For example, e-mail can efficiently replace time-consuming meetings. Moreover, the Internet enables one to send the same message to many friends or to all the members of an organization and provides greater ability to manage her social network through social platforms such as Facebook (Boyd and Ellison 2007). In other terms, the Internet increases the productivity of many social activities. With the same amount of resources and time, people can be involved in more

organizations and maintain more social ties, even if the quality and the expected return of such investments is lower than with face-to-face investments.

Hypothesis 2: People with a high opportunity cost of time are more likely to use the Internet to maintain their social capital.

Whereas a high opportunity cost of time creates incentives to maintain existing ties using the Internet, it may also have negative effects on the creation of new virtual ties. Avi Goldfarb and Jeff Prince (2008) have found that time-consuming Internet activities (like chat or online games) are used less frequently as the opportunity cost of leisure time increases. And several studies have shown how meeting new people online is a time-consuming activity (Smoreda and Thomas 2001; Lenhart, Rainie and Lewis 2001; Parks and Floyd 1996).

Hypothesis 3: Individuals that have a low opportunity cost of time are more likely to use the Internet to create new social capital.

The second dimension playing a role in social capital investments is the expected benefit. These benefits are positively linked to the amount of social capital owned by the individual. If an individual has a lot of friends and acquaintances or belongs to many organizations, she will have to spend a lot of time and resources to preserve her existing social ties (Glaeser, Laibson and Sacerdote 2002). The expected benefits or returns from the Internet are larger for this individual than for an individual who has a weaker social network. The latter can use traditional means of communication (face-to-face or phone) to maintain her network and will gain little from using the Internet. But an individual that has dense social capital can save a lot of time and resources if she uses Internet technologies.

Hypothesis 4: Individuals characterized by large social capital stocks are more likely to use the Internet to maintain their social capital.

The latter hypothesis highlights the fact that the Internet may be a convenient and efficient means of enhancing individual social capital that supplements face-to-face investments for those who are rich in social capital (Kraut et al. 2002; Zhao 2006).

Internet use can also become essential in cases of geographical mobility. A main source of depreciation for social capital is when people move to another city or quit an

organization. Geographic mobility tends to weaken social ties with friends, neighbors or colleagues. The Internet can limit this depreciation by facilitating contacts with geographically dispersed friends or acquaintances. Thanks to the Internet, it is possible to maintain strong and weak ties across long distances (Cummings, Lee and Kraut 2006; Wellman et al. 2001). But the Internet also can be a convenient means of meeting new acquaintances and recreating (virtual) sociability for people who have moved to a place where they have no friends or family. From this point of view, the Internet should modify the mix of social capital investments for those who have experienced mobility in the past. Their social capital should be more virtual with many computer-based social interactions with their relatives and new "virtual" friends. For such people, online investments tend to be a substitute for offline investments, because the time spent on the Internet can reduce face-to-face sociability and involvement in local organizations.

Hypothesis 5: People who have experienced geographical mobility in the past are more likely to use the Internet to maintain and renew their social capital.

In the next sections, we test the hypotheses that an Internet user has a higher propensity to improve her social capital by means of the Internet if she has IT-skills and a rich collection of social ties or has experienced geographical mobility in the past. We estimate the determinants of online investments for a representative sample of Internet users living in Luxembourg. We start by presenting the data, the methodology and the variables used in the econometric models.

Method and data

Data collection

The data come from a survey conducted in Luxembourg between April and August 2002 and contain 1,554 individuals between 16 and 74 years of age (see Box 1 for details). The survey provides the demographic characteristics of respondents, their IT usage, in particular Internet usage, their leisure activities, and their values and social activities. Tables 1 and 2 (in the Appendix) list the variables used in the econometric models and provide summary statistics. Fifty-one percent of respondents claimed to have used the Internet within the three previous months. Forty-six percent of the Internet users were online daily.

Box 1. Description of "ICT Usage by Household" survey and "European Social Survey"

The "ICT Usage by Household" survey is part of the "e-Europe 2005" program and is intended to collect data relating to IT usage by households across the European Union. Consequently, each Member State of the European Union implemented this survey in accordance with a common methodology and a set of common questions. The questionnaire is made up of two parts: the first focuses on IT use by individual Luxembourg residents, and the second part, entitled "European Social Survey", deals with the opinions of individuals on various topics, such as politics, values, etc.

Technical details of these surveys

The sample was extracted from the registration file of the Inspector General of Social Security (IGSS) that covers 91% of the population living in Luxembourg. The sample selection method was implemented in two phases. First, a random stratified sample of fiscal households was selected based on three criteria: the number of household members, (1, 2, 3 or more), the professional status of the head of household and the health insurance agency where the head of household is registered. Our sample comprised of 5,033 fiscal households. The unit of observation is the fiscal household, yet individual-level data were also collected. In the second phase, the Kish method was employed to select an individual between 16 and 74 years old within the surveyed household to be the household respondent (the individual whose birthday was closest to the first of January). 1,554 respondents (representative of the Luxembourg population) were selected and surveyed face-to-face between mid-April 2002 and mid-August 2002.

Balancing the sample

The sample-balancing step was performed to reduce the bias arising from a lack of homogeneity between the population and the responses, in addition to improving the representativeness of the 1,554 respondents. The weights of each individual were determined according to the CALMAR procedure ("calibration" method at the margins). This method consists in balancing the sample using additional information or "calibration" variables (gender, age or professional status).

Our survey provides detailed information on Internet usage. In particular, Internet users were asked whether the Internet has enabled them to increase or intensify contacts with relatives (INTENSIFY), to renew contact with old friends (RE-TIE), to get to know new people (KNOW) and/or to physically meet people met online (MEET).[10] Among the 1,554 respondents, 31% acknowledged that they experienced at least one of these 4 situations. If we restrict the sample to Internet users, 61% reported that their social capital was improved by the Internet. Each situation can be analyzed as a form of online investment in social capital.

The first motive for online investment is to maintain social capital (INTENSIFY). Such investment can be interpreted as a strong-tie investment because it strengthens ties with

friends or family. RE-TIE is also a form of social capital maintenance because the Internet is used to renew ties with relatives or friends who have been out of touch.

The outcome of KNOW and MEET investments is the creation of new social capital. A large part of this social capital corresponds to weak ties, but some virtual ties can become strong ties, especially when they lead to face-to-face meetings. 51% of Internet users reported investments to maintain social capital (*i.e.* 41.1% for INTENSIFY and 31.3% for RE-TIE), and 34% of Internet users reported making investments to create new social capital (32.6% for KNOW and 19.8% for MEET).

The econometric model

The objective of our study is to understand what the drivers of online investments in social capital are. What do these investments consist of? Are they substitutes or complements to more traditional forms of investment? Our econometric analysis utilizes a probit model. For each individual $i=1, \ldots,n$, the binary dependent variable y_i {either 0 or 1} is the result of a decision-making process influenced by independent variables x_i. Here, $y_i=1$ when the individual decides to improve his social capital using the Internet and $y_i=0$ otherwise. Formally, $y_i=1$ if $y_i^*>0$ and $y_i=0$ if $y_i^*\leq 0$, with $y_i^*=x_i\beta+\varepsilon_i$ where y_i^* is the net utility from investing in social capital online, ε_i is the random error term (normally distributed), x_i is the set of independent variables that explain the investment decisions (demographics, skills, existing social capital…) and β is the vector of coefficients. Thus the probability or likelihood that an Internet user i invests online is given by $P(y_i=1)=P(x_i\beta+\varepsilon_i \succ 0)=F(x_i\beta)$ where F is the cumulative function of the normal law. And the likelihood function is given by $L=\prod_{i=1}^{n}[F(x_i\beta)]^{y_i}[1-F(x_i\beta)]^{1-y_i}$. The β coefficients are estimated by maximizing the log of the likelihood function $LogL=\sum_{i=1}^{n}[y_iF(x_i\beta)][(1-y_i)(1-F(x_i\beta))]$ (Greene, 1997).

The interpretation of estimated coefficients is straightforward. If the coefficient of a variable is significantly positive (negative), this indicates that the variable has a positive (negative) effect on the probability of investing online. But the Probit coefficients don't provide a direct quantitative measure of this effect.

We now describe the dependent and independent variables introduced in the probit model.

Dependent variables

To analyze the determinants of online investments in social capital, we estimate a probit model for each of the four online investment patterns: *i.e.* investments to strengthen ties with close friends and family (INTENSIFY), to renew contacts with friends (RE-TIE), to create new ties (KNOW), and to physically meet these new ties (MEET). These dependent variables are binary. For example, INTENSIFY is equal to 1 if the Internet user reports having intensified her ties with her relatives by means of the Internet (and 0 otherwise). We also estimate a probit model where the dependent variable (SOCIALUSE) equals 1 if the individual has already used the Internet to invest in social capital (whatever the form of investment). SOCIALUSE is equal to 0 for those who use the Internet but not for social network purposes (39% of the Internet users in our survey reported that they did use the Internet to enhance their social capital).

Independent variables

In the empirical literature on social capital, there are several methods used to measure social capital. First, social capital can be measured by the number or density of social ties with close friends (Granovetter 1973; Kraut et al. 2002; Franzen 2003). It can also be measured by the number of associations or organizations with which the individual is involved (Putnam, 2000; Glaeser, Laibson and Sacerdote 2002). Another measurement instrument is the level of trust in others or in institutions (Putnam 2000; Fukuyama 1999). These different measurements correspond to the three dimensions of social capital identified by Wellman et al. (2001): social network, participatory capital, and community commitment.

Our data provide information on these three dimensions. First, the *size or density of a social network* is measured by the frequency with which individuals spontaneously encounter friends. Three binary variables have been built: the individual spontaneously meets friends several times a day (DAY), several times a week (WEEK) and less than once a week (MONTH). We expect that those who interact more frequently with friends have a higher level of social capital and are more likely to invest online to maintain their existing social ties (INTENSIFY) as suggested in Hypothesis 4.

Concerning *participatory capital*, we know the number of associations, as well as the type of associations with which the individual is involved.[11] We make a distinction between

"leisure" associations (where membership usually implies face-to-face relationships and active participation) and civic associations (where membership often takes the form of financial support without any physical contacts or meetings). Leisure type associations include sporting clubs, organizations for promoting cultural and leisure activities, social and youth clubs, retirees' associations, religious and fellowship organizations. Civic associations include trade unions, professional societies, consumer rights groups, human rights associations and Non Governmental Organizations, environmental protection organizations, peace activist groups, animal rights groups, political parties and school associations. Amongst the 796 Internet users surveyed, 71% belong to a leisure association, 57% to a civic association and 15% do not belong to any type of association. Membership, however, does not indicate the degree of involvement, *i.e.*, the intensity of investment in social capital (Glaeser, Laibson and Sacerdote 2002). For this purpose, we distinguish between the number of association membership and the number of associations in which the individual is actively engaged (i.e. volunteer work for the association). 14% of Internet users reported being a volunteer in a leisure association and 6% in a civic association.

Being involved in leisure and civic associations is often a traditional form of investment in social capital (implying face-to-face contacts). An intense participation in many associations can reduce the time available to invest in social capital online. But the Internet is becoming increasingly prevalent in voluntary associations and plays a key role in their functioning. It enables members to communicate together, to coordinate remote actions, to share information, etc. Active membership should positively affect the decision to invest online to intensify social ties, especially to strengthen ties with active members of associations in which one is involved (Hypothesis 4). By contrast, it should reduce the probability of using the Internet to get to know and meet new people (less time available for meeting new virtual acquaintances).[12]

The last measurement of social capital is trust in others. Trust is a continuous variable with values ranging from 0 to 10 (with 0 when respondents declare that they cannot trust others and 10 if they think that a majority of people behave honestly).[13] A high level of trust towards others is presumed to be a prerequisite for investing online, especially for meeting new people. Indeed, compared to face-to-face interactions that facilitate the transmission of feelings and intentions, computer-mediated interactions can be a source of misunderstanding and mistrust (Bohnet and Frey 1999).

Table 3 compares Internet and non-Internet users with respect to the three measurements of social capital. We observe that Internet users are, on average, involved in

more (civic and leisure) organizations (2.08) than non-users (1.71)[14] and declare a greater level of trust (5.35 compared to 5.08 for non users).[15] They also demonstrate higher sociability: 25% of Internet users spontaneously meet friends every day, whereas only 16% of non-users have this level of sociability. [16]

Table 3

Social capital of Internet users and nonusers

	Non-Internet users	Internet users
Membership	1.71	2.08
Trust	5.06	5.35
Spontaneous contacts with friends everyday	16%	25%

Note: Membership is the number of civic and leisure associations in which the individual is involved. Trust is the level of trust in others with values ranging from 0 (when respondents declare that they cannot trust others) to 10 (if they think that a majority of people behave honestly). Spontaneous contacts everyday is the percentage of individuals who declare to meet spontaneously friends every day.

The above measures of social capital provide an incomplete description of the individual's social network. It is also important to characterize the degree of dispersion of her social network. Hence, we introduce a binary variable that equals 1 when the individual's mother and father were both born in Luxembourg (PARENTS) and 0 otherwise. Having at least one parent born abroad implies a more geographically dispersed social network and increases the incentives to use the Internet to maintain contact with distant family. Nearly half of respondents have at least one parent born abroad, mostly from non-border countries (Portugal, Italy).

We also introduce a binary variable that indicates whether the individual has experienced a period of unemployment of three months or longer over the past five years (UNEMPLOYMENT). Many studies have found that unemployment periods can be detrimental to maintaining social capital (DiPasquale and Glaeser 1999). People who lose a job can experience a strong depreciation of their existing social capital. But the impact of this variable on online investments is unclear because unemployment tends to reduce the opportunity cost of time (positive impact on the online creation of new social capital – Hypothesis 3) and the stock of social capital (negative impact on the online enhancement of social capital – Hypothesis 4).

To test Hypothesis 5, we measure geographic mobility with a binary variable that equals 1 when the individual has resided in the Grand Duchy of Luxembourg for less than five years (MOBILITY). Internet users that have recently moved to Luxembourg (in the last five years) are more likely to invest online to maintain ties with their original community and/or to renew social ties.

Online improvement of social capital will also depend on the time spent on the Internet. Internet use intensity provides an indication of an individual's experience or skill in Information technology. We presume that IT-skilled people have low cognitive costs to use these technologies to maintain or expand social capital (Zhao 2006). Thus, heavy users are more likely to know and meet new acquaintances or to intensify their link with their friends and kin than light users (hypothesis 1). The intensity of Internet use (ONLINE) is measured by the average weekly time spent on the Internet (whatever the place – at home, at the office…).

We also introduce demographic variables as controls: gender, age, age squared (to take into account non-linear age effects), marital status (living with a partner), household size and location (living in an urban area or not). We presume that age could exert a negative impact on online social investments. Young generations are more familiar with the Internet (digital natives) and have adopted this technology to communicate and interact with their friends (network effect). By contrast, older generations are less at ease with the Internet and may have less interest in maintaining social ties by means of the Internet if most of their relatives are not connected. Being single can increase the incentives for using the Internet to make new acquaintances and meet potential partners. The Internet can be used as a worldwide dating club and the success of websites like Match.com illustrates the increased role of the Internet to match partners.

The respondents' level of education is also taken into account through three dummy variables (LOW EDUCATED, MEDIUM EDUCATED, HIGH EDUCATED) in order to measure their human capital.[17] Higher education should reduce the cognitive cost of investing online in social capital and increase the likelihood of improving social capital by means of the Internet (hypothesis 1). But a high degree of education can also be associated with high opportunity cost of time, and reduces the incentives to use the Internet to create new virtual ties (hypothesis 3). The overall impact of education is unclear.

Another measure of the opportunity cost of time is income level. Income is indirectly measured by the opinion the individual holds on her standard of living. A question in the European Social Survey indicates whether individuals feel that their current household

income allows them to live comfortably (HIGH INCOME), to make ends meet (MEDIUM INCOME) or to struggle financially (LOW INCOME).[18] An Internet user declaring better living conditions is likely to have a higher opportunity cost and is more likely to invest online to maintain her existing social ties (Hypothesis 2), but less likely to use the Internet to create new virtual ties (Hypothesis 3).

Correction for selection bias

The probit models on the different forms of online social investments are estimated on the population of Internet users. But if this population is different from the general population, estimates can be biased (selection bias). Indeed, the decision to maintain social ties and/or to meet new people by means of the Internet is conditional on the choice of using the Internet. And this decision of adopting the Internet is influenced by the amount of individual social capital which also plays a key role in online investment choices.

This bias can be corrected by applying the Heckman method (1979), which consists in first estimating the probability of Internet use and then calculating for each Internet user the inverse Mills ratio (this corresponds to the normal density function divided by the normal cumulative function). In the second step, this ratio is introduced into the probit models of social capital investment as an explanatory variable. The estimated coefficient *RHO*, associated with the inverse Mills ratio, measures the correlation in the errors of the Internet use model (selection probit) and the model of online social capital investment (Maddala 1983; Breen 1996). When this coefficient is significantly different from zero, the presence of selection bias is proven.

For the first step probit model, the dependent variable is the decision to use the Internet over the previous three months.[19] The independent variables are partly the same as in the second step. We control for demographic characteristics: gender, age, age squared, household size, marital status, location, education, and income levels. We also take into consideration the amount of social capital (frequency of spontaneous meetings, membership in leisure or civic associations, and trust). Specifically for this first step probit, we also control for the use of media other than the Internet, such as newspapers and television, since these leisure activities reduce the time available for the Internet (Attewell, Suazo-Garcia and Battle 2003; Gershuny 2003). Watching TV is measured by a continuous variable from 0 (no TV) to 7 (more than three hours per day).[20] Similarly, a continuous variable measures the time spent reading newspapers from 0 (no reading) to 7 (more than 3 hours per day). Finally, we

have introduced several additional variables about high-tech equipment (smart phone, DVD player, video games console, GPS) to control for individuals who are technology-savvy.

Results

We first comment briefly the results for the selection probit (the decision to use the Internet). Then, we discuss the results of the second step probit (the decision to invest in social capital). We also compare the determinants of investments to maintain existing ties and to create new ties.

Social capital and Internet use

Table 4 in the appendix displays the coefficients for the Probit selection model and indicates whether the coefficients are significantly different from zero at the 1%, 5% or 10% level. Our results show that the probability of using the Internet decreases with age and increases with education and income. Internet use is rather complementary with other IT equipment like a smart phone, GPS or DVD player. TV and the Internet seem to be substitutes, as the probability of using the Internet decreases with the time spent watching TV. We do not find a similar relation between the Internet and newspapers.

Social capital has a positive but limited impact on Internet use. Participation in leisure or civic associations increases the probability of adopting the Internet. We can interpret this as indirect evidence that the Internet plays a central role in the functioning of associations, providing members with an efficient means of communication and coordination. Being involved in many associations creates a need to access the Internet. However, sociability and trust have no impact on the decision to adopt the Internet.

We now analyze the determinants of on online investment in social capital (the second step). Table 5 presents the parameter estimates for the five specifications of online investments in social capital.[21] For each model, we indicate the log-likelihood, the error correlations (RHO) and the percentage of concordance.[22]

Column 1 of table 5 displays the results for online investments in any kind of social activities (SOCIALUSE). Online improvement of social capital depends on the stocks of social capital. Those who invest online tend to be more involved in leisure associations and have a higher degree of trust. They also are heavy Internet users (IT-skilled and have at least

one parent born abroad. When parents are from another country, it means that family is geographically dispersed and the Internet is as a convenient tool to maintain distant ties. Interestingly, education and income seem to have no influence on the decision to invest time online.

We now consider separately the four patterns of online investments (columns 2-5 in Table 3).

The Internet as a means of maintaining one's social capital

Column 2 of Table 5 (INTENSIFY) displays the determinants of *online* investments aimed at intensifying social ties with friends and kin. Socio-demographic characteristics are non-significant, except the nationality of parents. When at least one parent was born in another country, the Internet serves to keep in touch with friends and family still living in that country. As education, income, mobility and IT skills have no effect on the decision to maintain existing social capital by means of the Internet, we find no empirical support for Hypotheses 1, 2 and 5.

A high level of trust in others increases the probability of maintaining social capital through the Internet. We also find interesting relations between participatory capital and online investments. These results are quite consistent with hypothesis 4. Being actively involved in many associations or just a member of several leisure associations encourages individuals to use the Internet to intensify their interactions with their existing social network. Hence, complementarities exist between online and offline investments in social capital when the offline investments correspond mainly to volunteer activity or leisure organization membership. The results also suggest that people tend to invest less online when they are members of civic associations, but this effect is only significant at the 10% level.

Otherwise, people who meet friends several days a week are more likely to interact online with their friends than those who meet friends rarely (less than once a week) or very frequently (every day). This can be interpreted as weak evidence that certain Internet users tend to substitute face-to-face contacts by computer-mediated contacts with their relatives. Intensive use of the Internet to communicate with friends reduces the time or the necessity to meet them physically. But this substitution effect can also arise from the difficulty of meeting friends frequently (job constraints, transportation, etc.) and in such cases, the Internet is a convenient tool for maintain contact everyday (at anytime and anyplace).

Table 5 The determinants of different online investments in social capital

Second step Probit of the Heckman procedure: **Dependant variables: Online investments in social capital** Coefficient (standard error)					
	SOCIALUSE	INTENSIFY	RE-TIE	KNOW	MEET
GENDER	0.087 (0.102)	-0.025 (0.100)	-0.131 (0.100)	0.166 (0.109)	0.05 (0.115)
AGE	-0.032 (0.021)	-0.017 (0.020)	-0.001 (0.021)	**-0.054** **(0.025)**	**-0.062** **(0.025)**
AGE2	0.001* (0.001)	0.001 (0.001)	0.001 (0.001)	**0.001** **(0.001)**	**0.001** **(0.001)**
PARTNER	-0.175 (0.136)	-0.118 (0.133)	-0.169 (0.135)	**-0.372** **(0.144)**	-0.143 (0.155)
SIZE	-0.058 (0.039)	-0.035 (0.0394)	0.0126 (0.039)	-0.059 (0.042)	-0.050 (0.046)
URBAN	-0.005 (0.099)	-0.071 (0.100)	**0.192** **(0.100)**	-0.070 (0.105)	0.071 (0.115)
MEDIUM EDUCATED	-0.067 (0.146)	0.062 (0.150)	0.059 (0.163)	**-0.256** **(0.149)**	**-0.400** **(0.151)**
HIGH EDUCATED	0.099 (0.226)	0.296 (0.218)	0.121 (0.250)	**-0.570** **(0.229)**	**-0.375** **(0.230)**
MEDIUM INCOME	0.265 (0.265)	0.3898 (0.282)	0.005 (0.274)	0.452 (0.297)	0.122 (0.306)
HIGH INCOME	0.145 (0.289)	0.408 (0.305)	-0.115 (0.298)	0.212 (0.321)	-0.078 (0.327)
MOBILITY	-0.092 (0.216)	-0.271 (0.207)	-0.342* (0.208)	-0.017 (0.219)	0.171 (0.242)
UNEMPLOYMENT	0.264 (0.213)	**0.380** **(0.209)**	0.080 (0.210)	**0.746** **(0.215)**	0.261 (0.231)
PARENTS	**-0.280** **(0.102)**	**-0.383** **(0.105)**	-0.180* (0.105)	-0.121 (0.108)	**-0.250** **(0.118)**
ONLINE	**0.001** **(0.001)**	0.001 (0.001)	0.0001 (0.001)	**0.001** **(0.001)**	**0.001** **(0.001)**
TRUST	**0.073** **(0.024)**	**0.052** **(0.023)**	**0.060** **(0.024)**	**0.040** **(0.026)**	**0.039** **(0.027)**
VOLUNTEER	0.028 (0.077)	**0.175** **(0.078)**	-0.038 (0.080)	-0.069 (0.094)	-0.001 (0.092)
LEISURE MEMBERSHIP	**0.111** **(0.059)**	**0.109** **(0.059)**	**0.137** **(0.061)**	0.035 (0.065)	-0.011 (0.067)
CIVIC MEMBERSHIP	-0.052 (0.057)	**-0.097** **(0.057)**	-0.043 (0.060)	-0.029 (0.065)	-0.010 (0.070)
DAY	0.011 (0.139)	0.118 (0.140)	-0.041 (0.140)	0.029 (0.149)	0.064 (0.156)
WEEK	0.112 (0.114)	**0.272** **(0.116)**	-0.141 (0.120)	-0.011 (0.126)	-0.072 (0.138)
CONSTANT	0.731 (0.515)	-0.269 (0.512)	-0.222 (0.534)	0.610 (0.532)	0.538 (0.556)
Sample size	713	720	720	720	720
Log-likelihood	-1019.225	-1035.807	-1002.908	-950.8828	-892.5412
Rho	-0.460	-0.244	-0.435	-0.445	-0.392
% of concordance	63.75	62.91	60.00	75.41	80.00

Remarks : * coef. significant at a threshold of 10%, ** coef. significant at a threshold of 5%, *** coef. at a threshold of 1%.

This substitution effect is only true for those who have a rather intense sociability (those who meet their friends several days a week tend to use the Internet more to communicate with them than those who meet their friends daily). But Internet users who don't have a large social network (i.e. who rarely meet friends spontaneously) also tend to make less use of the Internet to communicate with their friends.

Finally, an unemployment experience increases the probability that the Internet will be used to maintain existing ties with friends and family.

Column 3 of Table 5 (RETIE) shows similar effects for trust and leisure membership. Moreover, individuals who live in an urban area tend to use the Internet to establish contact with relatives again.

The Internet as a means of creating new social capital

Investments via the Internet to diversify or renew social capital (columns 4 and 5 of Table 5) are strongly correlated with age, education and marital status. Meeting new acquaintances through the Internet is more frequent for younger, lower-educated people and those living alone[23]. These results are quite consistent with the hypothesis 3 of a negative relationship between the opportunity cost of time (measured by the level of education) and the likelihood to create new virtual ties. The Internet is a powerful means of creating weak ties and accumulating virtual social capital. But such investments require spending a lot of time connected to the Internet and can explain why people with low opportunity cost of time have a higher probability of creating new social ties online (*i.e.*, the unemployment variable also has a significant positive effect). Other socio-demographic characteristics have no influence.

Similarly, the amount of social capital (sociability and membership) has no impact on the possibility to meet new people online. Trust has a weak positive impact (only significant at 10%). Trust seems to matter more for maintaining ties with friends and kin than for creating new ties, because it is probably more difficult to place trust in anonymous persons met on the Internet (Markey and Wells 2002).

Heavy Internet users (IT-skilled users) are more likely to meet new acquaintances. This is consistent with our hypothesis 1. Finally, having parents born abroad increases the probability of using the Internet to diversify one's social network.

Discussion and conclusion

Our article has examined how Internet use can affect the formation and maintenance of social capital. Our conceptual framework highlights the importance of costs and benefits when deciding to invest in social capital. From this perspective, the Internet can decrease the cost of investing in social capital and soften the depreciation rate of social capital. Computer-mediated communication enables to abolish distance and facilitates many-to-many interactions. People who have a high level of social capital or who experienced mobility in the past should have higher incentives to invest in social capital online, mostly to maintain it.

To test these predictions, we have used the European Social Survey on Luxembourg households conducted in 2002. Table 6 summarizes our hypotheses and our results. Our results point quite consistently to the conclusion that a rich social capital environment fosters Internet use to maintain one's social capital. We find complementarities between online investments to strengthen existing ties and active participation in associations (especially leisure associations in which face-to-face contacts are important).

Table 6 Hypotheses and summary of results

Hypotheses	**Variables used**	**Predicted effects**	**Observed effects**	**Conclusion**
H1: IT skills, cognitive cost	1. Weekly time spent online	Positive effect on maintaining existing ties	Not significant	Rejected
		Positive effect on creating new ties	Positive	Supported
H2 –H3: Opportunity cost of time	1. Income 2. Education.	Positive effect on maintaining existing ties	Not significant	Rejected
		Negative effect on creating new ties	Negative	Supported
H4 : Social capital stock	1. Sociability 2. Memberships and volunteer, 3. Trust in others.	Positive effect on maintaining existing ties	Positive effect for memberships, volunteer and trust	Supported
H5 : Mobility	1. Has lived in Luxembourg for less than 5 years	Positive effect on maintaining existing ties and creating new ties	Not significant	Rejected

However, our results show no impact of geographic mobility on the decision to invest in social capital online. We only find weak evidence of geographic effects when one or both parents were born in another country. One explanation could be that our measure of mobility is rough and partial. We only know whether people have been living in the country for more or less than five years. But we do not take into account geographic mobility inside the country or professional mobility that can also affect social capital.[24] Further investigation needs to be undertaken to test the idea that the widespread diffusion of the Internet could stimulate individual mobility by reducing one of the main obstacles – the fear of depreciating one's individual social capital.

Our results suggest that income and education levels have no or little influence on online investments in social capital. These investments seem to be driven mostly by the stock of social capital and age, with significant differences between young and old generations. Meeting new people online seems to be quite specific to young generations. Consequently, young people could have social capital composed of more weak ties (a more sparsely-knit social network). This may attenuate social support and aid that they could obtain from strong ties, but they may gain access to more information and ideas according to the strength of weak ties theory (Granovetter 1973).

These results illustrate the vital role played by the Internet in the formation of social capital, even though the links between strong-tie and weak-tie investments or between online and face-to-face investments are extremely complex and require further study. The use of panel data, instead of cross-sectional data, could certainly improve the analysis of causation between face-to-face investments and online investments in social capital. Panel data could allow us to more accurately measure the consequences of online investments for the composition and stock of social capital.

Another improvement would be to collect more precise data on the nature of online investments (type of Internet usage, time spent on each social online activity, number of virtual friends…). The success of social network platforms like Facebook has probably modified the forms of social online activities in recent years. A final aspect of our research that deserves further investigation is how online investments in social capital pass into collective social capital and whether all forms of individual online investments yield positive externalities for society. In other words, as social capital is increasingly composed of virtual social capital, does society become more or less innovative and reactive, and more or less cohesive and cooperative?

Notes

1. Indeed, more novel information flows to individuals through weak than through strong ties because information from our close friends largely overlaps what we already know (Granovetter 2005).
2. For people poor in social capital, Internet use tends to reduce their sociability.
3. *i.e.* internet use does not increase or decrease the frequency of face-to-face and telephone contacts
4. The European social survey (ESS) is an academically-driven survey that is conducted in most of the European countries, with the support of the European Commission. It aims to measure and explain how people's social values, cultural norms and behavior patterns are distributed in each country, and the way in which they differ between countries. The questionnaire covers the following themes: Trust in institutions, Political Engagement, Socio-political, moral and social values, Social capital, Social exclusion, National, ethnic and religious identity, Well-being, health and security, Education and occupation. The questions about social capital are quite standard and refer to sociability, voluntary association memberships, and trust in others. For more information, see http://www.europeansocialsurvey.org/.
5. Luxembourg's Gross Domestic Product (GDP) per capita is the highest in Europe, but this result is little artificial because the country counts more than 40% of cross-border workers who, while contributing to GDP, are not considered part of the resident population. If we consider living conditions and social values, Luxembourg is rather similar to Northern European countries (Germany, Netherland and Scandinavian countries).
6. Source Eurostat. "Internet usage in 2008 – Households and Individuals", data in focus, Science and technology, Population and social conditions, Industry, trade and services, n°46/2008.
7. See Joel Sobel (2002) for a more in-depth discussion on the economic concept of social capital.
8. Similarly, for Robert Putnam (2000): "Social capital refers to connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them."
9. Note that these individual investments in social capital can generate positive externalities (such as when an individual joins a club), but can also have negative externalities (e.g. when a person looks for a position envied by others).
10. The latter is a sub sample of the respondents who report having made new acquaintances using the Internet, and have decided to meet their virtual friends physically. Malcom R. Parks and Kory Floyd (1996) found that many relationships initiated online resulted in face-to-face meetings.
11. However, we are unable to calculate the exact number of association memberships. Because the individual only declares whether she belongs at least to one association (for each type of associations).So we cannot discriminate between an individual who is engaged in one sport club and the one who attends several clubs.
12. Except if the individual is engaged in online associations, through which she can meet new acquaintances. Unfortunately our data does not make a distinction between online and offline associations.
13. However, Edward L. Glaeser et al. (2000) questioned the reliability of trust inferred from such declarative answers. Glaeser et al. (2000) found that responses were often imperfectly correlated with trust derived from an experimental trust game.
14. The two means are statistically different at the 1% level.
15. But the two means are not statistically different
16. The means are also statistically different at the 5% level.
17. Low education corresponds to a pre-high school level, medium education to a high school level and high education to the university level.
18. We have also checked for correlation between independent variables introduced in our econometric models. Except for Age and Partner (negatively correlated), we do not find any significant correlation. Moreover, the test of Variance Inflation Factors (VIF) has not revealed a presence of collinearity in our econometric estimations. VIF measures the inflation in the variances of the parameter estimates due to collinearity that could exist among the independent variables. Even if there is no formal criteria for deciding if a VIF is large enough to affect the predicted values, the VIF of the independent variables in our probit models can be considered as reasonably low (lower than 2).
19. We have chosen Internet use during the last three months (whatever the place) rather than Internet access at home, since individuals can also use the Internet elsewhere (at work, at school, in public places). Among survey respondents, 80% were connected to the Internet at home, 37% at work, 25% at their school/university, and 15% elsewhere (public library, association).
20. This variable is equal to 1 for watching TV less than half an hour, 2 for watching TV between half an hour and one hour, 3 for watching TV between one hour and one hour and half, etc.
21. Estimations were run in STATA 8.
22. The % of concordance is obtained by calculating the predicted values of online investments (the dependent variable) for each individual. When the predicted value is lower than 0.5, the predicted probability is equal 0, when it is higher than 0.51, the predicted probability equals 1. Then, we compare the observed and predicted probabilities to obtain the % of good prediction, called percentage of concordance.

23. It is fairly consistent with the conclusions of Parks and Roberts (1997), according to whom the majority of personal relationships on the Internet, in particular via chat-rooms (Multi-User Dimension, Object Oriented: MOO) are established with members of the opposite sex.
24. However, intra-region mobility is limited because Luxembourg is one of the smallest nations in the world with an area of 2,586 square kilometers or 998 square miles.

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Table 1 List of variables

Variable	Description
INTERNET USE	Has used the Internet along the past 3 months (binary)
SOCIALUSE	Internet use to invest in social capital whatever the form (binary)
INTENSIFY	Internet use to intensify ties with friends and kin (binary)
RE-TIE	Internet use to renew contacts with people (binary)
KNOW	Internet use to get to know new people (binary)
MEET	Internet use to meet new people physically (binary)
GENDER	Male (binary)
AGE	Age (continuous)
AGE2	Age squared (continuous)
PARTNER	Living with a partner, married or not (binary)
SIZE	Number of persons in the household
URBAN	Living in urban areas (binary)
LOW EDUCATED	Pre-high school level (binary) – reference
MEDIUM EDUCATED	High school level (binary)
HIGH EDUCATED	University level (binary)
LOW INCOME	Income insufficient to support comfortable lifestyle (binary) – reference
MEDIUM INCOME	Income just sufficient to support comfortable lifestyle (binary)
HIGH INCOME	Income more than sufficient to support comfortable lifestyle (binary)
SMARTPHONE	Having a smart phone with advanced functionalities (binary)
DVD	Having a DVD player (binary)
CONSOLE	Having a game console (binary)
GPS	Having GPS in his/her car (binary)
ONLINE	Weekly time spent using Internet for personal or professional usage (minutes)
TV	Time spent watching TV (continuous)
NEWSPAPER	Time spent reading newspaper per day (continuous)
DAY	Unplanned meetings with friends several times a day (binary)
WEEK	Unplanned meetings with friends several times a week (binary)
MONTH	Unplanned meetings with friends less than once a week (binary) - reference
LEISURE MEMBERSHIP	Membership in leisure associations (number)
CIVIC MEMBERSHIP	Membership in civic associations (number)
LEISURE VOLUNTEER	Active participation in leisure associations (number)
CIVIC VOLUNTEER	Active participation in civic associations (number)
VOLUNTEER	Active participation in associations (number)
TRUST	Trust in others (continuous)
MOBILITY	Has lived in Luxembourg for at least 5 years (binary)
PARENTS	Father and mother born in Luxembourg (binary)
UNEMPLOYMENT	Has experienced a period of unemployment of more than 3 months in the last five years (binary)

Source: European Social Survey and "ICT Usage by Household" survey in Luxembourg, 2002.

Table 2 Statistical description of the variables used in the econometric models

	All the population		Internet users			
	N	Average (standard deviation)	N	Average (standard deviation)	Min	Max
INTERNET USE	1554	0.512 (0.500)	796	1		
SOCIALUSE	/	/	795	0.616 (0.486)	0	1
INENSIFY	/	/	795	0.411 (0.492)	0	1
RE-TIE	/	/	795	0.313 (0.464)	0	1
KNOW	/	/	795	0.325 (0.468)	0	1
MEET	/	/	795	0.197 (0.398)	0	1
GENDER	1554	0.473 (0.499)	796	0.518 (0.499)	0	1
AGE	1554	42.169 (18.548)	796	32.185 (14.020)	13	101
PARTNER	1524	0.599 (0.490)	778	0.505 (0.500)	0	1
SIZE	1554	3.2413 (1.487)	796	3.536 (1.407)	1	10
URBAN	1523	0.468 (0.499)	783	0.448 (0.497)	0	1
LOW EDUCATED	1554	0.350 (0.477)	796	0.228 (0.420)	0	1
MEDIUM EDUCATED	1554	0.399 (0.489)	796	0.456 (0.498)	0	1
HIGH EDUCATED	1554	0.190 (0.392)	796	0.285 (0.451)	0	1
LOW INCOME	1524	0.099 (0.299)	773	0.046 (0.210)	0	1
MEDIUM INCOME	1524	0.354 (0.478)	773	0.297 (0.457)	0	1
HIGH INCOME	1524	0.545 (0.498)	773	0.655 (0.475)	0	1
ONLINE	/	/	781	376.371 (573.911)	3	2400
SMARTPHONE	1554	0.313 (0.464)	796	0.417 (0.493)	0	1
DVD	1554	0.413 (0.492)	796	0.570 (0.495)	0	1
CONSOLE	1554	0.381 (0.485)	796	0.502 (0.500)	0	1
GPS	1554	0.060 (0.238)	796	0.092 (0.290)	0	1
TV	1547	4.361 (2.133)	793	3.958 (2.092)	0	7
NEWSPAPER	1549	1.579 (1.525)	795	1.405 (1.343)	0	7
DAY	1554	0.207 (0.405)	796	0.252 (0.434)	0	1
WEEK	1554	0.446 (0.497)	796	0.296 (0.456)	0	1
MONTH	1554	0.339 (0.473)	796	0.160 (0.367)	0	1
VOLUNTEER	1552	0.206 (0.585)	796	0.257 (0.663)	0	5
LEISURE MEMBERSHIP	1552	0.731 (0.903)	796	0.837 (0.933)	0	4
CIVIC MEMBERSHIP	1552	0.655 (0.928)	796	0.722 (1.015)	0	5
LEISURE VOLUNTEER	1552	0.143 (0.437)	796	0.180 (0.491)	0	3
CIVIC VOLUNTEER	1552	0.062 (0.281)	796	0.076 (0.325)	0	3
TRUST	1533	5.213 (2.298)	787	5.355 (2.191)	0	10
MOBILITY	1545	0.946 (0.224)	790	0.939 (0.239)	0	1
PARENTS	1554	0.503 (0.500)	796	0.527 (0.499)	0	1
UNEMPLOYMENT	1554	0.053 (0.224)	796	0.059 (0.235)	0	1

Table 4 The determinants of having used the Internet

Selection probit of the Heckman procedure: **Dependant variables: Having used the Internet over the past three months** Coefficient (standard error)					
	Model for SOCIALUSE	Model for INTENSIFY	Model for RE-TIE	Model for KNOW	Model for MEET
GENDER	0.087 (0.083)	0.088 (0.083)	0.089 (0.083)	0.092 (0.084)	0.087 (0.083)
AGE	**-0.065***** **(0.019)**	**-0.065***** **(0.019)**	**-0.067***** **(0.019)**	**-0.063***** **(0.020)**	**-0.064***** **(0.019)**
AGE2	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
PARTNER	-0.172* (0.114)	-0.179* (0.114)	-0.164 (0.116)	**-0.189*** **(0.115)**	**-0.173*** **(0.114)**
SIZE	-0.012 (0.035)	-0.013 (0.035)	-0.008 (0.036)	-0.011 (0.035)	-0.014 (0.034)
URBAN	-0.047 (0.087)	-0.045 (0.087)	-0.038 (0.088)	-0.047 (0.087)	-0.040 (0.087)
MEDIUM EDUCATED	**0.611***** **(0.097)**	**0.599***** **(0.097)**	**0.605***** **(0.097)**	**0.610***** **(0.097)**	**0.606***** **(0.097)**
HIGH EDUCATED	**1.146***** **(0.129)**	**1.131***** **(0.128)**	**1.130***** **(0.127)**	**1.170***** **(0.137)**	**1.148**** **(0.131)**
MEDIUM INCOME	**0.414***** **(0.162)**	**0.406***** **(0.161)**	**0.408***** **(0.162)**	**0.419***** **(0.161)**	**0.411***** **(0.160)**
HIGH INCOME	**0.769***** **(0.160)**	**0.770***** **(0.160)**	**0.767***** **(0.160)**	**0.791***** **(0.162)**	**0.778***** **(0.160)**
SMARTPHONE	**0.269***** **(0.093)**	**0.277***** **(0.093)**	**0.271***** **(0.092)**	**0.273***** **(0.092)**	**0.276***** **(0.092)**
DVD	**0.458***** **(0.089)**	**0.444***** **(0.090)**	**0.460***** **(0.090)**	**0.424***** **(0.090)**	**0.429***** **(0.089)**
CONSOLE	0.067 (0.107)	0.103 (0.099)	0.066 (0.112)	0.104 (0.097)	0.132 (0.095)
GPS	**0.577***** **(0.204)**	**0.609***** **(0.197)**	**0.593***** **(0.201)**	**0.581***** **(0.210)**	**0.596***** **(0.202)**
TV	**-0.035*** **(0.020)**	**-0.037**** **(0.020)**	**-0.037**** **(0.020)**	-0.028 (0.024)	**-0.033*** **(0.001)**
NEWSPAPER	0.017 (0.029)	0.018 (0.029)	0.026 (0.031)	0.014 (0.029)	0.021 (0.029)
DAY	-0.011 (0.121)	-0.008 (0.121)	-0.025 (0.123)	0.009 (0.123)	0.009 (0.122)
WEEK	-0.032 (0.094)	-0.038 (0.094)	-0.0396632 (0.0940588)	-0.045 (0.094)	-0.046 (0.094)
LEISURE MEMBERSHIP	**0.101**** **(0.052)**	**0.102**** **(0.052)**	**0.101**** **(0.052)**	**0.099**** **(0.052)**	**0.097**** **(0.052)**
CIVIC MEMBERSHIP	**0.098**** **(0.055)**	**0.097*** **(0.056)**	**0.099*** **(0.056)**	**0.100**** **(0.056)**	**0.100**** **(0.056)**
LEISURE VOLUNTEER	0.032 (0.144)	0.044 (0.148)	0.025 (0.140)	0.035 (0.146)	0.048 (0.146)
CIVIC VOLUNTEER	**0.175*** **(0.102)**	**0.163*** **(0.104)**	**0.164*** **(0.101)**	**0.183*** **(0.104)**	**0.165*** **(0.104)**
TRUST	0.023 (0.018)	0.023 (0.018)	0.023 (0.018)	0.023 (0.018)	0.023 (0.018)
CONSTANT	**0.950**** **(0.449)**	**0.955**** **(0.453)**	**0.970**** **(0.451)**	**0.868**** **(0.475)**	**0.900**** **(0.463)**
Sample size	713	720	720	720	720
Log-likelihood	-1019.225	-1035.807	-1002.908	-950.8828	-892.5412

Remarks : * coef. significant at a threshold of 10%, ** coef. significant at a threshold of 5%, *** coef. at a threshold of 1%.