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**Social Capital and the Internet:
Evidence from Swiss Panel Data**

Axel Franzen*

I. INTRODUCTION

It is a well known fact that technological innovations are important determinants for economic productivity, growth and a society's standard of living. The benefit of the diffusion of a new technology of course depends crucially on the usefulness of the technology itself. If the innovation turns out to be beneficial – like for instance tetracycline – then the faster the diffusion the better for physicians and patients. Thus, investigations about the advantages and disadvantages of innovations are of crucial concern.

In the last decade, the diffusion of new information technologies, e.g. personal computers and the Internet, has raised discussions about their benefits and consequences. Most theorists as well as the empirical evidence highlight the productivity enhancing effects of the diffusion of PCs to the labor market of an economy. Positive effects are also associated with the Internet since it enhances international trade, reduces transaction costs and increases international competition. Both technologies are also seen as valuable tools with respect to human capital. In particular, the Internet has the potential to contribute to the rapid diffusion of knowledge by linking companies as well as private households to libraries, journals and other sources of information.

However, there are also critical voices with respect to the diffusion of the Internet. In particular, some social scientists suspect that the use of the Internet could have harmful effects for people's social capital. Two reasons nurture this concern. First, using the Internet is predominantly an individual activity as are watching TV or reading newspapers and books. The more time people spend using the Internet during leisure time, the more they will have to cut down on other activities. Thus, if users substitute the time they spend on social activities (e.g., communicating with friends, family members or neighbors) with the time

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using the Internet it could reduce social capital. This shift in time allocation could be called the privatization of leisure time.

Second, the Internet allows conducting many daily transactions such as shopping or banking online from a home based computer. Therefore, these transactions no longer require leaving the home and might reduce individuals' face-to-face communication. This effect can be called the privatization of transactions. Both effects, and most likely the privatization of leisure time is more consequential than the privatization of transactions, could lead to a reduction in social relations. There is abundant empirical evidence that shows how important social relations are with respect to individuals' psychological well-being (e.g., Kadushin 1982, Umberson et al. 1996), children's success in school (e.g., Parcel and Dufur 2001), peoples' ability to find adequate jobs (e.g., Granovetter 1973, 1995) and build careers (Burt 1999). Furthermore, much of the literature concerned with the provision and maintenance of public goods – such as protecting the environment, participation in political elections or providing community services (e.g., Putnam 1995) – argues that cooperative behavior depends crucially on the social embeddedness of individuals. Thus, social relations, or social capital, to use a term coined by Coleman (1988, 1990) and Bourdieu (1983), is a crucial element for the well-being of individuals and the functioning of society as a whole. Putnam (2000) has recently assembled an impressive array of evidence which suggests that social capital has seriously declined in the US. These results have at least partly been confirmed by Costa and Kahn (2003) analyzing ten different US surveys. The concern of some social researchers is that the Internet might lead to a further reduction of social capital.

Of course there are also several arguments for why the Internet could lead to an increase in social contact (see for instance Wellman 2001). Most importantly, the Internet enables electronic mail, which is a fast and cost efficient communication tool. Thus, it can also be used to maintain geographically disperse social networks. In theory, new social contacts can also be initiated through the Internet and possibly even lead to face-to-face communications. Furthermore, the Internet increases the feasibility in some professions (e.g., for journalists, researchers, computer programmers) of working primarily from a home based office. Hence, it could increase time flexibility, which might have positive effects for social networks.

To summarize, there are different theoretical expectations of how the diffusion of Internet access affects peoples' social lives. The concern of some social scientists is that the Internet contributes to the individualization of leisure time and reduces the time spent socializing with friends and family members. In such a case, the Internet could have the unintended effect of reducing peoples'

social networks, which could be harmful for individuals as well as for society as a whole.

The remainder of this article is organized into four sections. In the following section the existing evidence of a few influential empirical studies on the social consequences of the Internet will be summarized. This section shows that previous evidence is inconclusive. The rest of the article will then present new empirical evidence from a longitudinal study conducted in Switzerland in 1998 and 2001. Section three describes the design and the data and discusses the measurement of social capital. Section four presents the results of the analyses of the determinants of Internet adoption as well as of the social consequences of using it. Finally, the main findings are summarized and discussed in the conclusion.

II. PREVIOUS FINDINGS

There have been several studies investigating the effects of Internet use on social behavior mainly conducted within the US¹. Much attention has been given to the longitudinal studies by Kraut et al. (1998, 2002). In their first study the authors provided an opportunity sample of 169 non-Internet users in 73 households with free Internet access and observed their social behavior over a period of two years. The study found that individuals who used the Internet more intensely communicated less with family members, had less social contact with their friends and showed more symptoms of loneliness and depression. While Kraut's et al. (1998) design is not beyond doubt (e.g., Franzen 2000, LaRose et al. 2001), its findings were puzzling and nurtured the concern that the use of the Internet reduces social contact. However, a three year follow-up survey of the same sample showed that the negative effects of Internet use dissipated (Kraut et al. 2002). Furthermore, the authors report results from a second study conducted among an opportunity sample of 406 individuals of whom two thirds had recently started to use the Internet. This time Kraut et al. (2002) found positive effects of Internet use on social communication after a period of one year. In particular, those who made more frequent use of the Internet reported larger increases of their local and distant social circle, as well as more face-to-face interaction with friends and family members.

1. Much of the existing evidence is presented in recent special editions of the *American Behavioral Scientist* ('The Internet in Everyday Life', Nov. 2001) and the *Journal of Social Issues* ('The Consequences of the Internet for Self and Society', Spring 2002).

Evidence of Internet use and social involvement also stems from large scale cross-sectional survey research (Nie 2001, Nie and Erbring 2000, Katz, Rice and Aspden 2001, Howard et al. 2001). The Stanford Institute for the Quantitative Study of Society (Nie and Erbring 2000) surveyed a national random sample of more than 4000 Americans. The authors report that

'up to a quarter of the respondents who use the Internet regularly (more than five hours a week, 36% of the whole sample) feel that it has reduced their time with friends and family members or attending events outside the home' (Nie and Erbring 2000).

The result that 25% of the regular users reported that they spent less time shopping in stores is also noteworthy. Thus, Nie and Erbring provide empirical evidence for both the individualization of leisure time and the privatization of transactions.

Katz, Rice and Aspden (2001, see also Katz and Aspden 1997) recently presented the results of four random national surveys that were conducted in 1995, 1996, 1997 and 2000. The authors compared users and non-users with respect to their involvement in leisure organizations as well as in political activity. They found no indication that users show less political activity or belonged to fewer leisure time organizations. Quite to the contrary: results from the 1995 survey with 2500 respondents, as well as from the 2000 survey with 1300 respondents, even suggest that users are more active in both types of activities. Furthermore, Katz, Rice and Aspden (2001) compared the number of friends respondents met prior to the week of the interviews. The results suggest that long-term Internet users met more friends than non-users. Positive evidence that Internet users have larger networks is also reported by Howard et al. (2001). Thus, more frequent users reported being better connected to friends and family members more often than new users.

To summarize, the empirical evidence on the issue of whether the Internet causes a reduction in peoples' social networks is still inconclusive. The opposing findings may partly be due to the fact that the studies differ in design and method. Thus, some studies use random samples, others opportunity samples. Some of the studies rely on respondents' interpretations or feelings, while others try to measure social involvement by self-reported behavior (e.g., the amount of time spent with friends in a specific period of time). Furthermore, studies that are solely based on cross-sectional data can detect associations. However, they leave us in doubt as to whether the correlation found can be interpreted causally. Thus, early adopters of the Internet are congruently found to be better educated, younger and wealthier than newbies or non-users. Hence, they may as well belong to a generally active group of individuals and their higher level of social activity may have nothing to do with the Internet. Gener-

ally, intervening variables can be taken into account, but such controls, e.g., socio-demographic variables, are often incomplete. Stronger conclusions can generally be drawn on the basis of longitudinal data. Such studies exist. However, Kraut et al. (1998, 2002) use rather small non-representative samples. Thus, it seems reasonable to investigate further the Internet's effects on peoples' social lives by using panel designs. The results of such a study will be described in the following two sections.

III. DATA AND METHOD

The following analysis is based on a panel study. The data was collected via a written survey conducted among a random sample of the German-speaking population in Switzerland. The first wave was conducted in 1998, the second three years later in 2001. In 1998, we randomly drew 2'500 household addresses in the German-speaking part of the country. 1'196 of those questionnaires were returned constituting a response rate of 50%². In 2001, the 1'196 participants of the first wave were contacted again via a written questionnaire which was completed and returned by 843 participants. Subtracting all participants who either died, left the country, or whose addresses were unknown in 2001 from the original number leads to a response rate of 80% for the second wave³. However, the sample size is further reduced by 68 cases due to inconsistencies in sex or date of birth between 1998 and 2001. Also, missing data problems reduced the sample size further so that we finally ended up with a panel data set of 700 valid cases.

The questionnaire contained approximately 70 questions on aspects of respondents' PC and Internet use and various socio-demographic variables. The data set also contains information on how much time participants spent on various leisure time activities (e.g., time spent on sports, watching TV or going out) in the week prior to the written interview. Furthermore, both waves contain indicators on respondents' social capital. There are different interpretations and measurements of social capital. In the literature concerned with network anal-

2. 138 of the selected addresses were invalid due to address changes and were thus excluded from the original 2'500 addresses. Random selection within the household was conducted by addressing the questionnaire to the person with the most recent birthday. A comparison of some key variables of the random sample with known distribution provided by official statistical sources is provided in *Table A1* in the Appendix. In general, the random sample matches those distributions quite well. Results from this first wave are reported in Franzen (2000).

3. Both response rates are good, particularly when compared to other random sample surveys conducted in Switzerland or in other European countries such as in Germany.

ysis social capital refers to the amount and quality of a person's social relations outside the family (see for instance Granovetter 1995, Marsden 1990, Moore 1990, Kraut et al. 1998, 2002). The size of a network is often measured by name generators in which respondents' have to name people that are important for them e.g., with whom they discuss important matters. The quality of personal relations is often measured by the time respondents spent with their contacts or by the degree of the reported closeness (see Marsden and Campbell 1984). Paxton (1999) defines social capital additionally also by the amount of trust individuals place in institutions and organizations and Putnam (2000) emphasizes that the amount of social capital depends on the degree to which people adhere to norms of reciprocity and fairness. I believe that trust or norms of reciprocity are conceptually distinct from the standard concept of social capital. I will therefore restrict myself to the two indicators used in many network studies, namely the size and the amount of time people spent with their network. Particularly, participants were asked how many people they count as close friends and how much time they spent with those friends in the week prior to the interview. Thus individuals who report that they have a large network and spend much time socializing with their friends are assumed to have more social capital than others. It might appear that the number of close friends is only a crude measurement of a person's network size since it is not exactly clear what kind of relationship respondents call 'close' as opposed to weak. However, inter-individual differences of the interpretation of the word 'close' are of less concern in a longitudinal study since the interest lies in intra-individual changes. The proportions, means and standard deviations of the variables relevant for the following analysis are displayed in *Table 1*.

Inspection of *Table 1* reveals that the sample changed very little with respect to its socio-demographic composition. Thus, there are only minor changes in the proportions of respondents that changed their marital status, employment status, experienced changes in household size or in education. There is actually only one exception to this observation: Respondents' wealth, measured by respondents' monthly household net income divided by the square root of the number of household members, increased considerably from 1998 to 2001 by nominal 14%. This increase reflects the general increase in nominal income in Switzerland, as well as the fact that the sample aged, which usually implies increased wage levels.

Both waves contained detailed questions on how many hours respondents spent during the week prior to the interview on various leisure time activities such as reading books and newspapers, playing sports, going out (e.g., to restaurants or movies), spending time on outdoor activities and with their families. There are only minor changes observable in the average number of hours spent

Table 1
Means and Standard Deviations of the Random Panel Survey 1998 and 2001

	1998		2001	
	Mean	S.D.	Mean	S.D.
Age in years	44.4	15.50	47.4	15.54
Gender (0 = male, 1 = female)	0.43	0.49	0.43	0.49
Marital status (0 = unmarried, 1 = married)	0.55	0.50	0.57	0.50
Size of household	2.68	1.36	2.58	1.32
Monthly income per household member†	4 489.59**	2 238	5 123.31**	2 887
Education (years of schooling)	11.89	2.46	12.02	2.39
Place of living (0 = village, 1 = city)	0.48	0.50	0.45	0.50
Employee (0/1)	0.77	0.42	0.74	0.44
Time spent on sports (hours per week)	2.33	3.80	2.26	3.80
T. spent reading books (hours per week)	1.61*	2.56	1.89*	3.34
T. spent reading newspaper (hours per week)	2.95	2.99	2.75	2.99
T. spent with family (hours per week)	13.29*	23.29	11.36*	18.07
T. spent going out (hours per week)	2.43	3.79	2.32	3.65
T. spent on outdoor activities (hours per week)	2.08	3.88	2.22	3.62
T. spent watching TV (on day before the interview in hours)	1.55	1.42	1.56	1.43
Regular users of Internet (0 = no, 1 = yes)	0.12	0.32	0.33	0.47
Occasional users of Internet (0 = no, 1 = yes)	0.15	0.35	0.28	0.45
Internet access from home (0 = no, 1 = yes)	0.22	0.41	0.50	0.50
Number of friends	10.82	8.06	10.98	8.01
Amount of time spent with friends (hours per week)	3.59	4.37	3.25	3.67
N	700		700	

Notes: * denotes significant differences for $\alpha = 0.05$ and ** for $\alpha = 0.01$ for paired t-tests. †) The monthly income per household member refers to the so called equivalent income which is defined as the sum of the monthly net income of all household members divided by the square root of the number of household members.

on those activities. Paired t-tests reveal only two significant differences. Respondents reported spending more time reading books in 2001 than in 1998 (16 minutes per week) and less time with their family (2 hours per week). All of those leisure time activities show medium correlations between the measurement in 1998 and 2001 varying from 0.3 for the time spent with friends to 0.65 for network size⁴.

Internet users have more than doubled during the last three years. In 1998, 12% of the respondents reported using the Internet regularly. The proportion of regular users increased to 33% in 2001. A similar shift can be observed in the proportion stating that they are occasional users, which increased from 15% to 28% in 2001. Thus, overall 61% of our random sample reported using the Internet at least occasionally in 2001 as compared to 27% in 1998.

Finally, let us turn to the two indicators of social involvement or social capital. The average number of friends reported is almost 11 in both waves⁵. Respondents spent on average 3.6 hours a week with their friends in 1998 and somewhat less (3.3 hours) in 2001 (difference is not significant).

IV. EMPIRICAL RESULTS

Before looking at the consequences of Internet use on social capital I will first investigate the determinants of the adoption of the Internet. It is well known from empirical research about the diffusion of new technologies that they are earlier adopted by individuals with relatively high financial, human and social capital (see Rogers 1995 for a review). The rationale behind these findings is that new products can more easily be bought by individuals with higher income. Since using the Internet presupposes some equipment such as a personal computer and a modem as well as access costs, this argument should also apply to the adoption of Internet use. Less trivial is the hypothesis concerning human capital. Individuals with a higher level of education should be more skilled in using new technologies and should also be more able to anticipate the benefi-

4. Considering the study's time span of three years, the correlation of $r = 0.65$ indicates decent test-retest reliability for the measure of network size.
5. In general, the average network size obtained depends very much on the survey method (see review by Marsden 1990). In Fischer's (1982) extensive survey of over 1000 adults in California respondents had to mention names of people from whom they could receive various kinds of support. The average reported network size is 18.5 or 10.7 if only non-relatives are considered. Moore (1990) analyzed the 1985 General Social Survey in which respondents had to mention names of people with whom they had discussed important matters within the last six month. The average network size obtained by this measurement is 3 (see also Campbell and Lee 1991).

cial consequences of adopting them. Thus, using the conventional measurement of human capital, which is the years an individual has spent in education (see for instance Mincer 1974), I expect that respondents with more years in schooling are more likely to adopt the Internet. Furthermore, information about the usefulness of new technologies is often communicated through peoples' personal networks. Therefore, I expect that respondents with larger networks are also more likely to adopt the Internet than individuals with smaller personal networks.

In addition to financial, human and social capital, individuals' labor market participation could also influence the adoption of the Internet. Personal computers as well as Internet access are often provided by employers at the workplace because of the productivity enhancing effect they are assumed to have. Those individuals that are able to gather experience with the Internet at the workplace might have a higher probability of also employing it in their homes for private purposes. Moreover, further socio-demographic variables might influence the adoption. Thus, it could be expected that younger individuals are more open-minded towards new technologies. Furthermore, men often hold more positive attitudes towards new technologies than women, and the same assumption holds for city dwellers as opposed to inhabitants of rural areas. Moreover, one might speculate on the effect of household size. Larger households should, *ceteris paribus*, have a higher probability of Internet adoption and the provision of Internet access in one household should increase the individual chance of using it.

I submit these hypotheses to a statistical test by conducting a logistic regression analysis whose results are presented in *Table 2*. The table displays the exponentiated coefficients on the odds that an individual is an Internet user versus a non-user. Since I am concerned with private Internet use as opposed to usage at the workplace, only those respondents are coded as users who reported that they are occasional or regular users and who have access to the Internet from their homes⁶.

As expected the odds of being an Internet user in 1998 are higher for individuals with a higher financial, higher human and more social capital (see *Table 2*, column 1). The odds of being a user increase for every additional 1 000.- Swiss Francs of the monthly equivalent income by 22% and for every

6. Unfortunately, in 1998 participants were only asked whether they have a computer at home and not whether the Internet can be accessed from their home. Therefore, I have to use the information about the availability of a computer as a proxy for Internet use at home. In 1998 22% of the sampled individuals reported to use the Internet and to have a computer at home. In 2001 50% of the sample has access to the Internet from their homes.

Table 2

Determinants of the adoption of Internet use for the random panel survey in 1998 and 2001

	Model 1 first wave in 1998 Exp (B)	Model 2 second wave in 2001 Exp (B)	Model 3 second wave in 2001 Exp (B)
Constant	0.03** (0.62)	0.04** (0.79)	0.04** (0.79)
Age (in years)	0.94** (0.009)	0.96** (0.008)	0.96** (0.008)
Sex (0 = males, 1 = females)	0.40** (0.19)	1.10 (0.20)	1.06 (0.19)
Size of household	1.14 (0.07)	1.26** (0.09)	1.26** (0.09)
Marital status (0 = unmarried, 1 = married)	0.91 (0.22)	1.01 (0.24)	1.00 (0.24)
Place of living (0 = town below 5 000, 1 = city above 5 000)	1.12 (0.18)	1.40 (0.19)	1.42 (0.19)
Employment (0 = not employed, 1 = employed)	0.74 (0.26)	1.67* (0.25)	1.60 (0.25)
Financial capital (income per member in household in 1 000 SF)	1.22** (0.04)	1.14** (0.04)	1.14** (0.04)
Human capital (years of school education)	1.29** (0.03)	1.26** (0.05)	1.27** (0.05)
Social capital (number of friends in 1998)	1.14** (0.04)	–	1.09* (0.05)
Squared term of social capital (in 1998)	0.997** (0.001)	–	0.998 (0.001)
Social capital (number of friends in 2001)	–	1.09* (0.04)	–
Squared term of social capital (in 2001)	–	0.998 (0.001)	–
Number of cases	1 019	639	621
Cox & Snell R square	0.20	0.31	0.22
Nagelkerke R square	0.30	0.43	0.29

Notes: The dependent variable is dichotomous, depending on whether respondents are Internet users (coded as 1) or non-Internet users (coded as 0) and can access it from their home. Displayed are the exponents of the logistic regression coefficients. Thus, a coefficient below 1 indicates a negative effect on the odds of being an Internet user and coefficients above 1 indicate a positive effect on the odds of being an Internet user. Values in brackets denote the standard errors of coefficients. * = significant for $\alpha = 0.05$ and ** significant for $\alpha = 0.01$.

additional year of schooling by 29%⁷. The effect of social capital is concave (the squared term of social capital is negative). In the beginning an additional contact (e.g., friend) in the network increases the odds of Internet adoption by 14%. Thereafter, the effect diminishes with network size. These results hold also true for the analysis of the second wave (Table 2, column 2). However, the effects of financial and social capital are weaker in 2001, which might be explained by the fact that private access to the Internet has diffused from 21% in 1989 to 48% of all households in 2001.

Furthermore, the results suggest that age and household size influence the odds of adoption as expected. The odds of Internet adoption increase for every additional household member by 26%. Younger individuals have a higher chance to belong to the group of Internet users. Every additional year in age decreases the odds by 4%. Also, employment seems to increase the odds. However, this effect is statistically not consistently significant. The effect of individuals' sex is extremely strong in 1998 but has dissipated by 2001. Thus, women had a 60% lower chance in 1998 to use the Internet. By 2001 women have caught up with men and there is no longer any sex specific 'digital divide'. The hypothesis that city dwellers are more open-minded and have a higher adoption chance is not confirmed. The effect is positive but not significant.

The interpretation that social capital increases the chance of adopting the Internet requires further scrutiny. A causal explanation suggests two possibilities: Individuals with larger networks have more information about the usefulness of the Internet and are therefore more likely to adopt it. Alternatively, individuals could have adopted the Internet because they want to communicate via electronic mail or chat options with their networks. In both cases the social network is one cause (among others) for the adoption of the Internet. However, there are also two other possibilities. One explanation could be self-selection: Internet users could have two causally unrelated characteristics in common. They might be socially more skilled and have therefore larger networks and they might be more curious about new technologies and have therefore adopted the Internet sooner than others. Alternatively, the Internet could have caused an increase in peoples' networks, because users employ it as a communicative tool. However, these two latter explanations would be implausible if the network size in 1998 is related to the subsequent adoption of the Internet in 2001. The results of such a test are displayed in model 3 of Table 2, in which the network size reported in 1998 is regressed on the odds of starting to use the Inter-

7. A respondent's equivalent income is defined as the quotient of the sum of the monthly net income of all household members divided by the square root of the number of household members.

net after the first interview (and up to 2001). The result shows that respondents with a larger network in 1998 had a higher chance of being users in 2001, which suggests that the finding can be interpreted causally.

Next I will turn to the analysis of the consequences of Internet use on individuals' social behavior. First, let us take a descriptive look on the change of network size and the time respondents spent with their network of friends the week prior to the interview. The network size of the Internet users rose slightly from an average of 11.7 in 1998 to 12.2 in 2001 and for non-users from 10.1 in 1998 to 10.4 in 2001⁸. The increase in means of 0.5 for users and 0.3 for non-users are statistically not significant. Thus, respondents' network size remained rather stable in both groups during the observation period. However, the time respondents spent with their network decreased for Internet users from 4.2 hours per week in 1998 to 3.5 hours per week in 2001 and for non-users from 3.4 to 3.2. The mean difference for users is statistically significant (two-tailed paired t-test; $t = 2.15$, $p = 0.03$), but non-significant for non-users. Thus, this first descriptive analysis suggests indeed that users reallocated their time away from social communication with their network. The crucial question now is whether the decreases in time spent socializing with friends can be attributed to the increase in time spent on the Internet.

The question whether social behavior changed due to Internet use can empirically be investigated by regressing the change of the dependent variable on the change of the independent variables. Such a first difference equation can be written as

$$Y_2 - Y_1 = (a_2 - a_1) + b(X_2 - X_1) + e_2 - e_1 \quad (1)$$

(see Kessler and Greenberg 1981, Menard 1991, Winship and Morgan 1999) where $Y = Y_2 - Y_1$ is here the observed change in the size of respondents' networks (or the change of time they spent with the network) and $X = X_2 - X_1$ a vector of some non-constant independent variables that might also be related to a change in network size (or the time spent with the network). The independent variable of interest is the change in Internet use. I constructed a dummy variable and assigned the code 1 to all respondents who started to use the internet after the first interview in 1998. This applies to 18% of the sample⁹. If the hy-

8. Note that some of the non-users in 1998 have turned into Internet users by 2001.

9. Since I am interested in private use versus use that is done during regular working hours this group includes only individuals that have access to the Internet from their homes and who use the Internet for a substantial amount of time (e.g., more than one hour per week). The results remain unchanged if the analysis is restricted to more intensive users (more than 3 hours per week).

pothesis holds that Internet use decreases one's social network due to a reallocation of leisure time use then the group of new users on average should experience a decrease in their social networks. Besides Internet use a decrease in respondents' networks can also be caused by changes in other characteristics. Particularly, changes in family and household composition by marriage, divorce or by the moving of friends, spouses or relatives into the household should affect the network. Individuals that married during the observation period should experience an increase in the network, since at least some friends or relatives of the marriage partner should get integrated into the individual's network. A divorce should have the opposite effect and decrease the network size. Moreover, changes in the place of living or of the work place could be associated with changes of the network. Thus, moving to another city could deprive individuals of social contacts as well as a change of job which might imply another work location, which in turn is associated with a change of colleagues. Furthermore, I controlled for other socio-demographic changes such as an increase in education or a change in household income.

The results of the estimate of the differences are depicted in *Table 3*, model 1. The main finding of this analysis is that the respondents who started to use the Internet after the first interview in 1998 did not experience a decrease in their social network by 2001. The effect of Internet adoption is even positive, however insignificant. Changes in network size are only significantly related to the predicted effects of marriage and divorce. Respondents who married increased their network on average by 2.4 individuals and it decreased for those who experienced a divorce by 2.9 individuals. A job change and a change of place of living are negatively related to the network as expected, albeit insignificant. This non-finding might be due to the rather crude measurement of the two variables. Thus, respondents were asked whether they changed jobs but there is no information on whether this job change took place within the same firm or employer or whether it was related to a new location and therefore to a change of colleagues. Also, a change in place of residency was not measured in a detailed way. Thus, there is information on whether individuals moved from a village or small town to a larger city or vice versa, but changes from one city to another of similar size were not measured.

Model 2 in *Table 3* shows the result of the analysis of the change of time respondents spent with their network. Also, this analysis reveals that those who started to use the Internet did not reduce the time they spent with their network. The effect of Internet adoption is even positive, although insignificant. Changes in time spent socializing are actually only related to very few variables. Most importantly, individuals who furthered their education spent significantly less time with friends. Thus, individuals who increased their formal education by an

Table 3
Internet Use and Social Capital

	Model 1 Change in Network Size	Model 2 Change in Time Spent with Network	Model 3 Change in TV Consump- tion
Changes from 1998 to 2001:			
Constant	0.75** (2.31)	-0.13 (-0.50)	0.11 (1.49)
Change of Education	0.31 (1.35)	-0.81*** (-3.44)	-0.15** (-1.97)
Change of Household Size	-0.43* (-1.68)	-	-
Change of Household Income	-0.21* (-1.85)	0.11 (0.94)	-
Change of Place of Residency (0/1)	-0.67 (-1.45)	-	-
Change of Job (0/1)	-0.76 (-1.47)	-	-
Marriage (0/1)	2.38** (2.40)	0.99 (1.00)	-
Divorce (0/1)	-2.88* (-2.02)	2.89** (1.99)	-
New Internet Users (0/1)	0.78 (1.37)	0.61 (1.11)	-0.57** (-1.97)
Change in Network Size		0.09** (2.09)	-
Change of Time Spent with Family		-0.06 (-1.35)	-
Change of Time Spent on Sports		-0.17* (-1.74)	-0.06* (-1.83)
Change of Time Spent Going Out		-0.28*** (-3.45)	-0.04* (-1.75)
Change of Time Reading Newspapers and Magazines		-0.13 (-1.51)	-0.03 (-1.18)
N	514	403	430
Adjusted R ²	0.03	0.08	0.03

Notes: The dependent variables are the difference of the number of friends between 1998 and 2001, the difference in time respondents spent with their network and the difference in TV consumption in model 1, 2 and 3 respectively. Depicted are the unstandardized OLS-Coefficients. Numbers in brackets denote the *t*-values. * = significant for $\alpha = 0.10$, ** = significant for $\alpha = 0.05$, *** = significant for $\alpha = 0.01$.

additional year on average spent 0.8 of one hour a week (or about 48 minutes) less socializing with friends. An increase in time spent with the network can be observed for those who increased their network or who had a divorce. Every additional contact in the network increases the time spent with the network by about 5 minutes a week. Individuals that had a divorce increase the time socializing with friends by almost three hours a week.

The strong positive effect of a divorce is somewhat puzzling at first. However, a divorce should increase the need for social support and therefore should increase the time of socializing with friends if network size is controlled for. Model 2 in Table 3 also contains some other time use variables such as the time respondents spent with their family, on sports, going out or reading newspapers. Increases in all of these activities should reduce other uses of leisure time. This expectation is confirmed by the results in model 2. All of the time use variables are negatively related to the amount of time spent socializing with the friends, however, only an increase in the time spent on sports and going out are somewhat significant.

To summarize, the analyses presented so far could not detect any change in social behavior that could be attributed to the adoption of Internet use. Neither did the start of using the Internet change respondents' network size nor the time they spent socializing with the network. This raises the question what kind of leisure activity is substituted by the time spent on the Internet. Theoretically an increase in time spent on Internet use should cause a reduction in some other kinds of activities. The most plausible candidates would be the time spent on reading books or newspapers or the time individuals spent watching TV, since those types of activities are most similar to Internet use. However, I have investigated all measured changes in leisure time activities with respect to Internet use. From all these analyses only TV consumption turned out to be significantly related to Internet use. The results are displayed in Table 3, model 3. TV consumption was measured in both waves by asking people how much time they spent the day before the interview watching TV. This is a crude indicator of an individual's overall TV consumption. However, respondents' consumption of TV in 1998 shows a correlation of 0.5 with their consumption in 2001, indicating that the indicator is at least somewhat reliable. Individuals that started to use the Internet indeed showed a reduction in their TV consumption by on average of half an hour per day. This is a substantial reduction given that the sample's overall reported time of TV watching is one and a half hour per day. Because most other changes in respondents' socio-demographic characteristics or family compositions are not significantly related to changes in TV consumption, they are not reported in Table 3. However, there is one exception. Individuals that increased their education spent less time on watching TV. An addi-

tional year of formal education reduces TV consumption by almost 10 minutes per day. Also, all leisure time activity variables such as the increase of time spent on sports, going out or reading newspapers are negatively related to TV consumption. However, most of them are statistically not significant.

V. CONCLUSIONS

The study presented is inspired by the concern that the increased diffusion and use of the Internet to private households in industrialized societies could have harmful effects on users' social capital or social involvement. This concern is based on two theoretical considerations. First, using the Internet is predominantly an individual activity. People have to re-allocate their time. Internet users have to cut down on time spent doing other activities in order to devote it to the Internet. Thus it is possible that such a privatization of leisure time could mean having less social communication and consequently smaller social networks. Second, the Internet provides the opportunity for online shopping. Such a privatisation of transaction reduces the need to leave the home and could deprive individuals of opportunities for face-to-face communication.

Previous research conducted mainly within the United States provides inconclusive evidence. Some studies suggest that Internet use does indeed reduce individuals' social involvement, while others produced opposing results. This article presents new results from a panel study conducted in 1998 and 2001. The study measures social involvement using two indicators. First, respondents were asked to report the number of individuals whom they regard as close friends. Second, they had to report how much time they spent with their social network in the week prior to the interview.

Methods of panel-analysis were applied to the data by calculating the difference in social involvement and regressing it on the difference in Internet use between 1998 and 2001. The proportion of individuals that use the Internet increased considerably in this period. Results of the random sample suggest that the proportion of occasional and regular users increased from 27% in 1998 to 61% in 2001. Particularly, respondents with higher household income, higher levels of education, and larger social networks adopted the Internet earlier than others as expected. However, this increase in Internet use is neither related to any change in network size nor to the time spent with the network. Further analysis of respondents' leisure time use suggests that respondents substitute the time formerly spent on watching TV with the time they devote to the Internet. Thus, the concern that use of the Internet might undermine social capital, which is one resource that led to the adoption of the Internet in the first place,

is not confirmed by this study. It should be noted, however, that this study observed the sample for the relatively short time period of three years. Thus, the study can of course not exclude the possibility that Internet use could be consequential in the long run.

APPENDIX

Table A1

Comparison of Some Socio-demographic Characteristics of the Random Sample with Official Statistical Sources

	Random Sample N = 1196	Swiss Labor Force Survey N = 10 518
<i>Sex</i>		
male	52.3%	47.3%
female	47.7%	52.7%
<i>Age</i>		
20–39 years	39.7%	37.1%
40–64 years	42.2%	41.7%
65 and older	17.5%	18.0%
<i>Marital status</i>		
single	26.8%	25.6%
married	58.7%	61.5%
divorced	8.6%	6.6%
widowed	5.9%	6.3%
<i>Household size</i>		
1 person	22.2%	16.9%
2 persons	37.7%	35.7%
3 persons	15.9%	16.2%
4 persons	16.1%	19.8%
5 and more persons	8.1%	11.4%
<i>Schooling</i>		
Primary school	13.4%	17.2%
Secondary I	59.6%	63.6%
Secondary II (technical schools, higher occupational education)	20.5%	12.5%
University	6.5%	6.7%

Notes: The Swiss Labor Force Survey is conducted by the Swiss Statistical Bureau and recognized as one of the most reliable data sources in Switzerland. The proportions refer to the population living permanently in the German part of Switzerland from the age of 18 upward in 1998.

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SUMMARY

A lively debate has recently emerged about the consequences of the diffusion of the Internet. While many social scientists emphasize the beneficial economic consequences of the Internet some suspect that it has also disadvantages for users' social capital. So far the existing empirical evidence concerning the effect on social capital is mainly based on cross-sectional data and is still contradictory. This study is based on a longitudinal survey conducted in 1998 and 2001 among a random sample of Swiss citizens. It analyzes the determinants of the adoption of the Internet and the consequences for respondents' personal networks as well as the time they spent socializing with their network. The results show that the Internet was adopted sooner by individuals with high financial, human and social capital. Furthermore, the results suggest that Internet use is not associated with a reduction in respondents' networks or with the time they spent socializing with friends. Instead the findings suggest that the time users devote to the Internet is taken away from the time they spend on watching television.

ZUSAMMENFASSUNG

Die Diffusion des Internets hat in jüngster Zeit eine lebhafte Debatte über ihre Konsequenzen ausgelöst. Während viele Sozialwissenschaftler die ökonomischen Vorteile betonen, befürchten andere, dass das Internet Nachteile für das Sozialkapital der Nutzer hat. Die bisherigen empirischen Befunde zu den Konsequenzen für das Sozialkapital beziehen sich dabei grösstenteils auf Querschnittsdaten und sind widersprüchlich. Die vorliegende Studie basiert auf Paneldaten einer Deutschschweizer Zufallsstichprobe, die 1998 und 2001 schriftlich befragt wurde. Es werden sowohl die Determinanten der Internetadaption als auch die Konsequenzen hinsichtlich der persönlichen Netzwerke und der mit dem Freundeskreis verbrachten Zeit untersucht. Die Ergebnisse zeigen, dass das Internet schneller von Personen mit relativ hohem Finanz-, Human- und Sozialkapital übernommen wurde. Des Weiteren zeigt sich, dass die Internetnutzung weder eine Verringerung der persönlichen Netzwerke noch der mit dem Netzwerk verbrachten Zeit verursacht hat. Die Untersuchungsergebnisse legen vielmehr den Schluss nahe, dass ein Teil der für das Fernsehen verwendeten Zeit durch die Internetnutzung ersetzt wird.

RÉSUMÉ

Une discussion vive s'est déclenchée récemment sur les conséquences de la diffusion de l'internet. Tandis que certains sociologues tendent à en relever les avantages économiques, d'autres voient plutôt des inconvénients quant au capital social des usagers. Les dates empiriques relevées jusqu'à présent sur les conséquences pour le capital social se basent surtout sur des données transversales et sont contradictoires. L'étude présente se base sur les données d'un panel aléatoire résultant d'un sondage écrit en Suisse alémanique en 1998 et 2001. Nous analysons les déterminantes de l'adaptation de l'internet ainsi que les conséquences qui en dérivent quant aux réseaux sociaux personnels et au temps passé en compagnie d'amis. Les résultats montrent que l'internet est adopté plus rapidement par des personnes disposant d'un capital financier, humain et social plutôt élevé. En outre, il s'avère que l'usage de l'internet ne cause de réduction ni de la taille du réseau social personnel ni du temps passé en son sein. Les résultats laissent supposer que l'internet remplace une partie du temps destiné à la télévision.

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