# DIW Materialien Research Notes

## Quantifying the "Digital Divide" in Germany –
### Internet Use Does Not Discourage Other Cultural or Social Activities

by
Gert G. Wagner*, Rainer Pischner and John P. Haisken-DeNew

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* DIW Berlin and European-University Viadrina, Frankfurt (Oder)

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## 1    Introduction

With the ever-growing importance of the computer at home and the workplace, there are concerns emerging of a stratification of the population by a new "digital divide". The case of Germany is of interest in several respects. First, it is an open question whether there is indeed a "digital divide" along social strata in Germany. Given that around 1990 Germany had higher rates of immigration influx than the USA, it is especially of interest to know whether there are identifiable effects for the huge immigrant population in Germany. Secondly, German data allow one to analyze whether Internet use discourages other leisure activities, which belong to the "social capital" of a society. Using a large German household panel data set, one is not only able to describe recent trends in computer and internet usage, but also describe the dynamics since PC's were widely introduced in the 1980's.

## 2    Data and History

Although a large number of surveys have been conducted[1], primarily for marketing purposes etc., the use of computers and the Internet, their results do not permit highly differentiated analyses of the socio-economic aspects of these new technologies in Germany. The German Socio-Economic Panel (GSOEP) provides samples for 1998, 1999 and 2000 that encompass for 2000 12,500 households and permit a detailed analysis of Internet use. Within the survey households all 16 year and older household members are interviewed. Thus information for about 24,000 persons is available.

By means of a retrospective question, the GSOEP provides unique information about PC use for the past. As current and past PC usage at the workplace was only first asked in 1997, we are at least able to identify usage information directly for those individuals who have

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[1] See. van Einerem et al. (2001) for example.

remained in the panel up to that time[2]. Thus the GSOEP clearly provides a unique data set to study PC dissemination, with the complete household context since PC's became widely available in the early 1980's with MS-DOS as a standard operating system (see Haisken-DeNew and Schmidt, 2001). Examining the absolute levels of PC usage rates at the workplace between 1984 and 1997, Haisken-DeNew and Schmidt (2001) conclude that highly educated employees at all time periods dominate all others, as shown in Fig. 1. Further, usage growth over time is also dominated by the highly educated. Thus, there seems to be the prevalence of complementarity between high levels of education (perhaps computer skills) and computer usage. These developments are further pushed by the steady movement of the economy into services, where PC's are an integral part of the office "production function", and away from manufacturing. This leads to a "natural ordering" of usage, increasing by job status and educational background: blue collar-low skill, blue collar-high skill, white collar-low skill, white collar-high skill.



**Fig 1 . Dissemination of PCs at the Workplace**
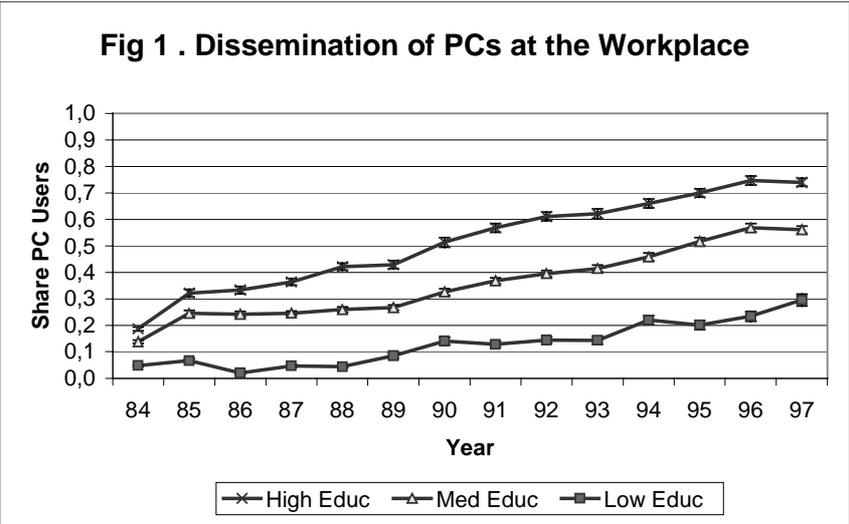
Souce: Haisken-DeNew and Schmidt (2001)

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[2] However using standard matching techniques, usage information can be imputed for those exiting the panel before 1997.

# 3  "Digital Divides"

## 3.1 PC Endowment of Private Households

In spring 2000, about 43% of the households (17 million) in Germany had at least one PC with Internet access at home (see Table 1). This has increased since 1998, when 35% had private access (see Haisken-DeNew et al. 2000).

Examining the population in Germany according to various social indicators reveals several aspects of a "digital divide" between certain segments of the population.

Due to the economic and social problems which came with German unification for people in East Germany - the former socialist GDR - as outlined in Schwarze and Wagner (1999), east-west-differences are of special interest in Germany. Accordingly, there are significant differences between eastern and western Germany with respect to both computer ownership and Internet access. In 2000, 45% of west German households had at least one PC, whereas in eastern Germany only 38% were equipped with a computer. This is a true east-west differential, not primarily an income effect.[3] There is no apparent reason for the "East German effect" - perhaps there is still an "echo effect" of the socialist economy which was by far less modern than the western economies were.

As West Germany has a large migrant community[4], differences in the lifestyles of Germans and immigrants are of interest. This is especially true because, due to German citizenship laws, most of those immigrants still hold their foreign citizenship. Compared to German households in West Germany (with East Germany having historically almost no guest-workers) households of foreigners have far less PC ownership (38% vs. 45%) and less private Internet access (20% vs. 25%). However the foreign community in West Germany has about the same level of PC ownership as compared to the East Germans. Furthermore, private access to the Internet is slightly better for foreigners than for East Germans.

Multivariate analysis shows that the lower ownership rates and access rates are not an educational and income effect only, but there is a true immigration effect which might be due to cultural preferences of foreigners. (See Appendix 1 and Appendix 2, column 1.)

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[3] For results of multiple regression analyses see the tables in the appendix.
[4] Due to the immigration of the so-called guest-workers from mediteranian countries in the 60's (see Reitz et al. 1999).

Differentiation by household income[5] in Table 1 reveals that the PC endowment of low-income households[6] is lower at 35% compared to the average household at 41%, whereas computer ownership by wealthy households[7] is far above average (61% as compared to 41%). Households who receive (means tested) social assistance have by far the lowest ownership rate (26%). In 2000, one out of six households in western Germany was classified as wealthy, whereas in eastern Germany only one out of twenty belonged to this group.

Looking at private access to the Internet reveals even larger differences by income. The gap between wealthy households (at 37%) and those on social assistance (11%) and low-income households in general (15%) is huge. This is true for West as well as East Germany.

Households with children have an above average rate of PC ownership and private access to the Internet. These shares among single-parent households are, however, at 47% and 21% relatively low (although higher than the overall average). In this sense, the children of single parents are at a disadvantage.

### 3.2 Personal Use of the Computer and the Internet

Table 2 provides information about the use of the PC and the internet on a personal level. Here we see some substantial differences between German and foreigners, and men and women. On average, 39% of men use a PC in their free time, whereas only 26% women, and only 23% foreigners. The difference between men and women is in fact larger in West Germany (41% vs. 26%), whereas in East Germany the difference is not nearly so pronounced (34% vs. 26%). Not surprisingly, there are stronger computer preferences for males under 45 than for females of the same age group.

Corroborating the evidence found in Haisken-DeNew and Schmidt (2001) for PC usage at work, Table 2 shows an increasing leisure PC usage with educational level. Some 60% of those with the highest level of high school use a PC during leisure, compared to only 16% who have only the legal minimum high school level. Although German men who work full time have almost double the PC usage rates as compared to foreigners (48% vs. 27%), at least

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[5] A needs-weighted income is calculated, the so-called equivalence income of the households. The equivalence income takes better account of the size and structure of households than per capita income.

[6] A household is classified as "poor" if it has less than half of the average equivalence income at its disposal.

[7] A household is classified as "wealthy" if it has at least 150% of the average equivalence income at its disposal.

for those German men and foreigners who are currently "in training", the 5% differential is almost negligible. This at least shows some "catch up" in the younger cohorts of foreigners.

In the 2000 GSOEP, a detailed survey of 16 and 17 year-olds was made by means of a special questionnaire (see Table 3) which clearly shows that two-thirds of this age group make use of the Internet. Here too, there are substantial differences between those with different levels of education. Only 60% of the young men and as few as 25% of young women either holding or about to receive the minimum school-leaving certificate use the Internet. As expected, use rates are highest among advanced level high school (grammar school and sixth form college pupils), 75% of whom are Internet users.

In terms of the intensity of use, there are significant gender-specific differences. At 12 hours per week on average, young men who surf on the internet, do so for approximately twice as long as young women. Within the group of Internet users, the education-specific differences are not especially pronounced. Only young men with the minimum school-leaving certificate, at four hours per week, spend significantly less time on the web than those with a higher level of education.

### 3.3 Computers and Internet Use at Work

According to Table 4, in 2000 around one half of those in employment uses a computer at work; a little bit more than one in five also has access to the Internet. The use of a computer is not different for female and male workers, but Internet access by women is below the average at 18% (whereas 26% of men have access). This seems to be due to the lower *level* of jobs (compared to men) in which women work.

As is the case with computer use for leisure, the level of educational attainment is an important determinant of use at work. Some 78% of workers with an upper- secondary school-leaving certificate used a computer at work, compared with only just 27% of those with the minimum leaving certificate. (This is corroborated in Appendix 3 with binary logit estimation.) The influence of education is even more evident if employees are classified according to the requirements of their work. Occupations requiring a university degree also require, in more than 81% of cases, the use of a computer. On the other hand, less than 24% of those with no academic qualifications need a computer for their job.

Given that experience using modern information technology is expected to become increasingly important, it is interesting to look more closely at the use of the internet by

employees aged less than 30. In 2000, around one in two workers aged less than 30 used a computer at work. The user figures for both eastern Germany and for foreign nationals were both significantly lower at around 40%.

The differences due to educational level are no less pronounced among younger workers than among the working population as a whole: whereas only 30% of those young workers with minimum school qualifications require computer knowledge for their work, the figure for those with university entrance school qualifications is 80%.

Less use of computers is made in small enterprises. In plants with fewer than 5 workers, 54% have nothing to do with computers, and a similar figure (58%) applies to enterprises with between 5 and 20 workers. In large firms, by contrast, the proportion of non-users is much lower (34% in firms with 200-1999 workers and 40% in those with 2000 or more).

## 4  Competition between Internet Use and Social Capital

The world over, there is a discussion whether heavy Internet use "discourages" other activities, especially those which are part of the most important "social capital". In particular, there are objections about the use of Internet by teenagers who are in the process of accumulating social capital and thus a lack of this kind of capital could have a negative impact on there future life.

Table 5 shows differences in leisure activities by age groups. All in all, we did not find evidence for the discouragement hypothesis, but we can conclude that those who use a PC and the internet are more active in cultural activities. In addition, it is remarkable that 63% of foreigners who are active computer users speak predominantly German, compared to only 37% of those who do not use the new technologies.

The GSOEP data also show that use of the Internet does not prevent 16 and 17 year-olds from engaging in activities in other areas. Table 6 illustrates that teenaged internet users have similar reading habits than non-users. For both groups, "playing a musical instrument" is of equal importance. It might be a surprise for many readers that active sport has a larger importance for internet users than for other teenagers, although internet users are typically thought to be "stay-at-homes". However, due to the fact that the internet is used more heavily by teenagers in prep-school, who have more time for active sports than other teenagers, this effect of a positive correlation between internet use and active sport is not surprising. In Appendix 4 these results are confirmed in the ordered logit analysis of intensity of various

activities like playing sports, etc. Here teens who use the internet or a computer at home play sports more often, go more often to cultural events and are more active in politics. However a logit analysis (see Appendix 5) reveals that there is no partial effect of internet use on how important teen consider sport activities to be.

There is no negative impact of internet use on extra-curricula activities in school (Table 7). As many Internet users are "class presidents" as non-users; internet users are involved more heavily in school theater or dance groups than other pupils. The same is true for playing music in the school orchestra or exercising sports in special groups. However, again this is not a pure effect of internet use, but an effect of differences in the composition of users and non-users.

Although the internet does not facilitate to encourage more leisure activities which accumulate social capital, it does not discourage either. For 16 and 17 year old teenagers in Germany there is on average no danger of insufficient amounts of "social capital" due to the emergence of the Internet and its heavy use by teenagers.


## 5       Conclusions

Private Internet use in Germany is spread across all social strata. However, there are substantial differences with respect to the level of education and age. As might be expected, the Internet has so far bypassed most older people. In the spring of 2000, among the top age group (60 and older), the user share was only at a significant level among the relatively small circle of those with high educational level**.**

Wealthy parents are far more likely to place a computer at their children's disposal and thus a regular internet connection than those on lower incomes. Private computer access is particularly low in single-parent households, most of which are on low incomes. Thus schools should have the capacity to offer *all children*, irrespective of their social background, access to computers and the Internet. That implies not only a better endowment with hardware and software, but also funding for maintenance and providing teachers with the required skills.

The lack of experience with the use of computers could exacerbate the difficulties on the labor market already experienced by those with only a minimum school-leaving certificate. Given the discussion in the literature concerning "skill-biased technological change", and the resulting increasing skill premia awarded to highly educated employees, getting school

children "computer trained" before they go onto the job market could prove to be a crucial career path step.

Use of PC and the Internet at home and the workplace in West Germany dominate that of the East Germany. Germans also use computers more than foreigners living in Germany. Considering the fact that many foreigners have been living in Germany for generations, one might think of them as being effectively German. However, the logit results show clear cultural differences.

There appears to be strong evidence for the hypothesis that teens who use a PC and/or the Internet do *not* do so at the expense of what most would consider desirable "social activities" such as reading, playing sports. Indeed, such "computer kids" are indeed *less likely* to just "hang around" and "do nothing".

**References**

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Table 1 : Endowment of Private Households in Germany with Personal Computers (PC) in Spring 2000

| | Total | | West Germany | | East Germany | |
|---|---|---|---|---|---|---|
| | PC ownership | PC with Internet connections | PC ownership | PC with Internet connections | PC ownership | PC with Internet connections |
| Total | 43 | 23 | 45 | 25 | 38 | 17 |
| **Nationality bracket** | | | | | | |
| German household | 44 | 24 | 45 | 25 | 38 | 17 |
| Foreigner household[1] | 38 | 20 | 38 | 20 | . | . |
| **Income bracket** | | | | | | |
| Social benefit recipient | 26 | 11 | 25 | 11 | 30 | 9 |
| Low-income household[1] | 35 | 15 | 35 | 17 | 34 | 12 |
| Middle-income household[1] | 41 | 21 | 42 | 22 | 37 | 17 |
| High-income household[1] | 61 | 37 | 61 | 38 | 66 | 34 |
| **Household type** | | | | | | |
| One-person household | 30 | 19 | 31 | 20 | 22 | 13 |
| (Married) couple without children | 38 | 21 | 40 | 23 | 27 | 12 |
| Single-parent household | 47 | 21 | 46 | 22 | 51 | 17 |
| (Married) couple with oldest child younger than 16 | 68 | 34 | 69 | 36 | 65 | 26 |
| (Married) couple with youngest child older than 16 | 61 | 28 | 60 | 29 | 64 | 28 |
| (Married) couple with children in both age groups | 76 | 36 | 75 | 36 | 80 | 33 |
| Multi-generation household | 53 | 20 | 75 | 18 | 54 | 25 |

1 Low-income households are classified as those with less than half of average equivalent income. High income households are those whose income is more than 150% of the average. The remainder are considered as middle-income households.

Source: GSOEP 2000

Table 2: Computer Use in Leisure, 2000

| | Total | | Men | | Women | | Foreigners | |
|---|---|---|---|---|---|---|---|---|
| | PC use, total | With Internet access | PC use, total | With Internet access | PC use, total | With Internet access | PC use, total | With Internet access |
| **Total** | 32 | 16 | 39 | 20 | 26 | 11 | 23 | 10 |
| **Region** | | | | | | | | |
| West Germany | 33 | 17 | 41 | 22 | 26 | 12 | 22 | 10 |
| East Germany | 30 | 11 | 34 | 13 | 26 | 9 | / | / |
| **Age** | | | | | | | | |
| 16-29 years | 50 | 26 | 56 | 29 | 45 | 23 | 28 | 10 |
| 30-44 years | 48 | 24 | 53 | 30 | 42 | 18 | 30 | 15 |
| 45-59years | 32 | 15 | 39 | 19 | 25 | 10 | 13 | 5 |
| 60 years and older | 8 | 3 | 13 | 4 | 5 | 2 | 12 | / |
| **School-leaving certificate** | | | | | | | | |
| Minimum school-leaving certificate | 16 | 6 | 22 | 9 | 11 | 3 | 14 | 3 |
| Lower secondary | 39 | 16 | 45 | 21 | 34 | 13 | 26 | 10 |
| Technical college | 52 | 27 | 59 | 32 | 41 | 20 | 39 | 23 |
| University entrance certificate | 60 | 38 | 67 | 44 | 52 | 31 | 61 | 34 |
| **Occupational status** | | | | | | | | |
| Full-time | 45 | 23 | 48 | 25 | 38 | 18 | 27 | 12 |
| Regular Part-time | 42 | 20 | 58 | 48 | 39 | 16 | 31 | 14 |
| Marginal Part-time | 41 | 21 | 49 | 32 | 39 | 17 | 32 | / |
| In training | 49 | 19 | 53 | 21 | 43 | 16 | 44 | / |
| Unemployed | 18 | 8 | 22 | 10 | 16 | 6 | 15 | 6 |

(/): not displayed due to small number of cases.

Source: GSOEP 2000

Table 3: Use of the Internet by Young People Aged 16 and 17 in 2000

| (Intended) school-leaving certificate | Internet use % share | | | Internet users' average weekly use in hours | | |
|---|---|---|---|---|---|---|
| | Total | Male | Female | Total | Male | Female |
| Minimum leaving certificate | 45 | 60 | 25 | 4 | 4 | 5 |
| Lower secondary | 67 | 74 | 59 | 10 | 13 | 4 |
| University entrance | 75 | 77 | 72 | 9 | 14 | 6 |
| Total | 68 | 73 | 63 | 9 | 12 | 5 |
| Source: GSOEP 2000 (youth questionnaire). | | | | | | |

Table 4: Computer Use at Work, 2000

| | Total | | Men | | Women | | Foreigners | | Workers under 30 years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PC use, total | With Internet access | PC use, total | With Internet access | PC use, total | With Internet access | PC use, total | With Internet access | PC use, total | With Internet access |
| Total | 49 | 23 | 49 | 26 | 49 | 18 | 22 | 15 | 50 | 25 |
| **Region** | | | | | | | | | | |
| West Germany | 50 | 24 | 51 | 22 | 49 | 19 | 22 | 15 | 51 | 26 |
| East Germany | 44 | 16 | 39 | 18 | 50 | 15 | / | / | 45 | 20 |
| **Age** | | | | | | | | | | |
| 16-29 years | 50 | 25 | 45 | 25 | 55 | 25 | 24 | 19 | 50 | 25 |
| 30-44 years | 53 | 25 | 53 | 29 | 54 | 19 | 26 | 16 | N/A | N/A |
| 45-59years | 45 | 19 | 47 | 24 | 43 | 13 | 14 | 7 | N/A | N/A |
| 60 years and older | 35 | 15 | 39 | 19 | 27 | / | / | / | N/A | N/A |
| **School-leaving certificate** | | | | | | | | | | |
| Minimum school-Leaving certificate | 27 | 8 | 27 | 9 | 27 | 6 | 9 | 4 | 21 | 7 |
| Lower secondary | 53 | 20 | 50 | 23 | 54 | 17 | 36 | 20 | 51 | 21 |
| Technical college | 65 | 35 | 70 | 43 | 56 | 20 | 35 | 30 | 64 | 28 |
| University entrance certificate | 78 | 48 | 81 | 56 | 74 | 37 | 58 | 48 | 82 | 5453 |
| **Required qualification for task performed** | | | | | | | | | | |
| No training | 24 | 11 | 25 | 13 | 22 | 8 | 8 | 4 | 36 | 22 |
| Vocational training | 50 | 19 | 46 | 20 | 56 | 17 | 31 | 18 | 51 | 21 |
| Technical college | 79 | 42 | 84 | 49 | 69 | 29 | / | / | 89 | 58 |
| University | 81 | 54 | 83 | 60 | 78 | 44 | / | / | 90 | 66 |

| Continued.... | Total | | Men | | Women | | Foreigners | | Workers under 30 years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PC use, total | With Internet access | PC use, total | With Internet access | PC use, total | With Internet access | PC use, total | With Internet access | PC use, total | With Internet access |
| **Enterprise size** | | | | | | | | | | |
| Fewer than 5 workers | 45 | 21 | 45 | 27 | 45 | 16 | 36 | / | 40 | 24 |
| 5 to 20 workers | 39 | 18 | 37 | 21 | 42 | 15 | 13 | 7 | 42 | 19 |
| 20 to 100 workers | 43 | 20 | 41 | 22 | 45 | 17 | 13 | 8 | 45 | 22 |
| 100 to 200 workers | 46 | 19 | 44 | 21 | 48 | 16 | 20 | / | 48 | 23 |
| 200 to 2000 workers | 54 | 24 | 52 | 28 | 57 | 18 | 21 | 14 | 54 | 26 |
| More than 2000 workers | 62 | 29 | 63 | 32 | 61 | 25 | 33 | 23 | 63 | 32 |
| Self-employed | 57 | 35 | 68 | 44 | 38 | 19 | / | / | / | / |
| **Occupational status** | | | | | | | | | | |
| Full-time | 52 | 25 | 50 | 26 | 58 | 23 | 22 | 15 | 52 | 25 |
| Part-time | 42 | 13 | 45 | 27 | 41 | 11 | 23 | / | 49 | 32 |
| In training | 42 | 15 | 40 | 17 | 46 | 13 | / | / | 43 | 15 |
| In marginal employment | 32 | 17 | 40 | 28 | 29 | 12 | / | / | 54 | 43 |

(/): not displayed due to small number of cases.

Source: GSOEP 2000

Table 5 Private PC and Internet Use and other Leisure Activities by Sex and Age
(% Share of those who Perform Named Activity at Least Once a Month)

| | Total | | Male | | Female | |
|---|---|---|---|---|---|---|
| | Using PC or Internet | Not Using PC or Internet | Using PC or Internet | Not Using PC or Internet | Using PC or Internet | Not Using PC or Internet |
| **Visits to cultural events e.g. concerts, theatre, presentations** | | | | | | |
| Age 16 – 29 | 24 | 15 | 21 | 17 | 28 | 12 |
| 30 – 44 | 16 | 10 | 17 | 7 | 16 | 12 |
| 45 – 59 | 20 | 12 | 15 | 9 | 27 | 14 |
| 60 and older | 32 | 13 | 24 | 12 | 46 | 14 |
| Total | 20 | 12 | 18 | 11 | 23 | 13 |
| | | | | | | |
| **Active sport** | | | | | | |
| Age 16 – 29 | 62 | 45 | 63 | 53 | 61 | 38 |
| 30 – 44 | 48 | 35 | 49 | 36 | 48 | 34 |
| 45 – 59 | 40 | 22 | 35 | 20 | 48 | 23 |
| 60 and older | 32 | 16 | 35 | 17 | 27 | 15 |
| Total | 48 | 25 | 47 | 27 | 50 | 23 |
| | | | | | | |
| **Participation in public initiatives, in political parties, local government** | | | | | | |
| Age 16 – 29 | 2 | 1 | 3 | 1 | 2 | 1 |
| 30 – 44 | 2 | 1 | 3 | 1 | 2 | 1 |
| 45 – 59 | 6 | 3 | 8 | 3 | 3 | 2 |
| 60 and older | 9 | 2 | 10 | 4 | 7 | 1 |
| Total | 3 | 2 | 4 | 3 | 2 | 1 |
| | | | | | | |
| **Church-going, visits to religious events** | | | | | | |
| Age 16 – 29 | 9 | 13 | 10 | 9 | 8 | 16 |
| 30 – 44 | 12 | 14 | 11 | 13 | 16 | 15 |
| 45 – 59 | 22 | 20 | 23 | 14 | 22 | 24 |
| 60 and older | 26 | 28 | 25 | 24 | 29 | 30 |
| Total | 15 | 21 | 15 | 17 | 15 | 24 |

Source: GSOEP 2000

Table 6: Importance of Activities

| Shares in % | NOT Using a PC / Internet | | | Using a PC / Internet | | |
|---|---|---|---|---|---|---|
| | Very Important/ Important | Less important | Not important | Very Important/ Important | Less important | Not important |
| Watching Television / Videos | 52 | 43 | 5 | 53 | 45 | 2 |
| Playing Computer Games | 10 | 45 | 44 | 41 | 43 | 16 |
| Listening to Music | 96 | 4 | 0 | 88 | 12 | - |
| Playing a Musical Instrument | 16 | 21 | 63 | 17 | 19 | 64 |
| Playing Sports | 65 | 26 | 9 | 75 | 18 | 7 |
| Being with Boy/Girl Friend | 91 | 7 | 3 | 92 | 7 | 2 |
| Being with Friends | 78 | 9 | 13 | 70 | 17 | 14 |
| Reading | 31 | 47 | 22 | 39 | 38 | 22 |
| Doing nothing, hanging around | 45 | 42 | 12 | 37 | 40 | 22 |
| (/): not displayed due to small number of cases. | | | | | | |
| Source: GSOEP 2000 (youth questionnaire) | | | | | | |

Table 7: Use of the PC/Internet and Other Activities by Young People aged 16 and 17, Spring 2000

| There are many different ways of being active at school in addition to actual classes. Are you or have you ever been involved in one or more of the following areas? | Those Not Using PC or Internet | Those Using PC or Internet |
|---|---|---|
| Yes, I was | % | % |
| - class president/class representative to the student councill | 21 | 29 |
| - student body president / president of the student council | 6 | 2 |
| - involved in the school newspaper | 2 | 9 |
| - involved in a school theater or dance group | 4 | 21 |
| - involved in a school orchestra, chorus or other type of music group | 18 | 26 |
| - involved in a sports group at school | 18 | 40 |
| - involved in some other type of group | 13 | 19 |
| No, none of these | 49 | 33 |

Source: GSOEP 2000 (youth questionnaire)

**Appendix 1** Binary Logit Estimation: PC-Internet-Access Ownership of Households

| | ( 1 )<br>PC, No Internet<br>Access | ( 2 )<br>PC and Internet<br>Access |
|---|---|---|
| Household in West Germany | 0.108<br>( 0.049 )* | 0.296<br>( 0.058 )* |
| German Nationality | 0.934<br>( 0.077 )* | 0.663<br>( 0.095 )* |
| Equivalence Household Income | 0.000<br>( 0.000 )* | 0.000<br>( 0.000 )* |
| Size of Household | 0.184<br>( 0.039 )* | 0.026<br>( 0.041 ) |
| Gets social assist | -0.642<br>( 0.132 )* | -0.483<br>( 0.178 )* |
| Married couple without children | 0.168<br>( 0.068 )* | 0.180<br>( 0.078 )* |
| Single-parent household | 1.087<br>( 0.107 )* | 0.485<br>( 0.127 )* |
| Married couple with oldest child younger than 16 years | 1.525<br>( 0.123 )* | 1.048<br>( 0.131 )* |
| Married couple with oldest child older than 16 years | 1.240<br>( 0.119 )* | 0.853<br>( 0.128 )* |
| Married couple with children in both age groups | 1.835<br>( 0.175 )* | 1.164<br>( 0.180 )* |
| Multi-generation household | 0.933<br>( 0.231 )* | 0.556<br>( 0.265 )* |
| Other combinations | 0.392<br>( 0.183 )* | 0.142<br>( 0.231 ) |
| constant | -3.256<br>( 0.117 )* | -3.462<br>( 0.134 )* |
| Observations | 12024 | 12024 |
| Pseudo $R^2$ | 0.1279 | 0.0583 |

(Standard Errors in parentheses, * = significant at the 10%-level)
The binary dependent variable is coded as (0). No, (1) Yes
<u>Therefore, larger positive coefficents indicate a higher probability of a particular activity</u>!

**Appendix 2** Binary Logit Estimation: Internet Access of Adults at Home

| | ( 1 ) Home PC/Internet | ( 2 ) Home PC | ( 3 ) Home Internet |
|---|---|---|---|
| Men | 0.380 ( 0.039 )* | 0.632 ( 0.037 )* | 0.689 ( 0.046 )* |
| Household in West Germany | 0.206 ( 0.043 )* | 0.137 ( 0.041 )* | 0.362 ( 0.053 )* |
| German Nationality | 1.237 ( 0.061 )* | 1.082 ( 0.063 )* | 0.866 ( 0.087 )* |
| Equivalence Household Income | 0.000 ( 0.000 )* | 0.000 ( 0.000 )* | 0.000 ( 0.000 )* |
| Size of Household | 0.118 ( 0.015 )* | 0.170 ( 0.014 )* | 0.090 ( 0.017 )* |
| Age of employee (16 years and older) | 0.023 ( 0.008 )* | 0.049 ( 0.008 )* | 0.052 ( 0.011 )* |
| age * age | -0.001 ( 0.000 )* | -0.001 ( 0.000 )* | -0.001 ( 0.000 )* |
| Part-time | -0.089 ( 0.061 ) | 0.156 ( 0.059 )* | 0.031 ( 0.076 ) |
| In training | -0.287 ( 0.105 )* | -0.081 ( 0.097 ) | -0.380 ( 0.123 )* |
| In marginal employment | -0.194 ( 0.095 )* | 0.360 ( 0.091 )* | 0.330 ( 0.109 )* |
| Minimum school living certificate | -0.436 ( 0.069 )* | -0.353 ( 0.069 )* | -0.467 ( 0.096 )* |
| Lower secondary certificate | 0.519 ( 0.069 )* | 0.367 ( 0.069 )* | 0.284 ( 0.092 )* |
| Technical college | 1.030 ( 0.096 )* | 0.881 ( 0.090 )* | 0.840 ( 0.109 )* |
| University | 1.575 ( 0.079 )* | 1.083 ( 0.073 )* | 1.161 ( 0.092 )* |
| Constant | -1.933 ( 0.187 )* | -3.277 ( 0.183 )* | -4.345 ( 0.243 )* |
| Observations | 22313 | 22414 | 22414 |
| Pseudo $R^2$ | 0.3249 | 0.2160 | 0.1976 |

(Standard Errors in parentheses, * = significant at the 10%-level)
The binary dependent variable is coded as (0). No, (1) Yes
Therefore, larger positive coeffecicts indicate a higher probability of a particular activity!

**Appendix 3** Binary Logit Estimation: Internet Use at Work

| | ( 1 )<br>Work PC | ( 2 )<br>Work Internet |
|---|---|---|
| Men | -0.134<br>( 0.043 )* | 0.449<br>( 0.052 )* |
| Household in West Germany | 0.601<br>( 0.047 )* | 0.689<br>( 0.059 )* |
| German Nationality | 1.207<br>( 0.079 )* | 0.748<br>( 0.101 )* |
| Age of employee (16 years and older) | 0.048<br>( 0.012 )* | 0.028<br>( 0.014 )* |
| age * age | -0.001<br>( 0.000 )* | -0.001<br>( 0.000 )* |
| Full-time (reference) | -- | -- |
| Part-time | -0.561<br>( 0.059 )* | -0.560<br>( 0.077 )* |
| In training | -0.200<br>( 0.105 )* | -0.461<br>( 0.133 )* |
| In marginal employment | -0.945<br>( 0.092 )* | -0.321<br>( 0.110 )* |
| No certificate (reference) | -- | -- |
| Minimum school living certificate | -0.074<br>( 0.104 ) | -0.211<br>( 0.152 ) |
| Lower secondary certificate | 1.079<br>( 0.104 )* | 0.851<br>( 0.148 )* |
| Technical college | 1.670<br>( 0.122 )* | 1.486<br>( 0.159 )* |
| University | 2.309<br>( 0.109 )* | 2.163<br>( 0.148 )* |
| Constant | -3.168<br>( 0.267 )* | -3.944<br>( 0.332 )* |
| Observations | 13811 | 13811 |
| Pseudo $R^2$ | 0.1528 | 0.1473 |

(Standard Errors in parentheses, * = significant at the 10%-level)

The binary dependent variable is coded as (0). No, (1) Yes
Therefore, larger positive coefficents indicate a higher probability of a particular activity!

**Appendix 4** Ordered Logit Estimation: Effects of PC or Internet Use on Leisure Activities of adults (16 years and older)

| | ( 1 ) Cultural Events | ( 2 ) Active in Sports | ( 3 ) Active in Politics | ( 4 ) Active in Church |
|---|---|---|---|---|
| Men | 0.1924 ( 0.037 )* | -0.2914 ( 0.037 )* | -0.4209 ( 0.065 )* | 0.2603 ( 0.037 )* |
| Household in West Germany | -0.1087 ( 0.043 )* | -0.5827 ( 0.045 )* | -0.0509 ( 0.075 ) | -1.3757 ( 0.048 )* |
| German Nationality | -0.6217 ( 0.063 )* | -0.5298 ( 0.063 )* | -0.6833 ( 0.141 )* | 0.2185 ( 0.058 )* |
| Equivalence Household Income | -0.0003 ( 0.000 )* | -0.0002 ( 0.000 )* | -0.0001 ( 0.000 )* | 0.0000 ( 0.000 ) |
| Size of Household | 0.0332 ( 0.016 )* | 0.0383 ( 0.016 )* | -0.1645 ( 0.028 )* | -0.2610 ( 0.016 )* |
| Age of employee (16 years and older) | -0.0122 ( 0.006 )* | 0.0355 ( 0.006 )* | -0.0707 ( 0.012 )* | -0.0123 ( 0.006 )* |
| age * age | 0.0002 ( 0.000 )* | 0.0001 ( 0.000 ) | 0.0005 ( 0.000 )* | -0.0001 ( 0.000 )* |
| Minimum school living certificate | -0.2303 ( 0.075 )* | 0.0744 ( 0.077 ) | -0.0921 ( 0.158 ) | -0.0520 ( 0.071 ) |
| Lower secondary certificate | -0.7385 ( 0.080 )* | -0.3940 ( 0.080 )* | -0.3494 ( 0.163 )* | -0.0157 ( 0.077 ) |
| Technical college | -1.0452 ( 0.111 )* | -0.3706 ( 0.107 )* | -0.5363 ( 0.199 )* | -0.1555 ( 0.105 ) |
| University | -1.5973 ( 0.088 )* | -0.7886 ( 0.086 )* | -0.8264 ( 0.167 )* | -0.2754 ( 0.084 )* |
| Using of a personal Computer or Internet at home | -0.3524 ( 0.043 )* | -0.3578 ( 0.041 )* | -0.3599 ( 0.074 )* | 0.0656 ( 0.044 ) |
| Observations | 12403 | 11982 | 12006 | 12043 |
| Pseudo R$^2$ | 0.0848 | 0.1016 | 0.0401 | 0.0626 |

(Standard Errors in parentheses, * = significant at the 10%-level)

The ordered dependent variable is coded as (1) Every Week, (2) Every Month, (3) Less than Once a Month and (4) Never.
Therefore, negative coefficents indicate more of a particular activity!

**Appendix 5** Binary Logit Estimation: Effects of Internet Use on other Activities: 16 and 17 year old Teens

| | (1) Watch TV | (2) Play Computer Games | (3) Listen to Music | (4) Play Musical Instrument | (5) Play Sports | (6) Boy/Girl Friend | (7) Being with Friends | (8) Reading | (9) Doing Nothing |
|---|---|---|---|---|---|---|---|---|---|
| Using of a personal Computer or Internet | 0.106 (0.268) | -1.592 (0.288)* | 0.063 (0.275) | -0.002 (0.292) | -0.162 (0.257) | -0.446 (0.282) | -0.129 (0.259) | -0.249 (0.262) | 0.486 (0.263)* |
| Men | -0.540 (0.267)* | -1.944 (0.295)* | 0.658 (0.277)* | -0.139 (0.292) | -0.458 (0.260)* | 1.217 (0.287)* | 0.785 (0.259)* | 1.255 (0.273)* | 0.631 (0.262)* |
| German Nationality | -0.393 (0.415) | -0.665 (0.435) | -0.281 (0.427) | -0.025 (0.461) | -0.170 (0.404) | 0.131 (0.438) | -0.269 (0.385) | 1.324 (0.419)* | -0.384 (0.412) |
| Born in Germany | 0.461 (0.710) | 0.261 (0.716) | 0.024 (0.668) | 1.269 (0.734)* | 0.639 (0.638) | -0.422 (0.656) | -0.120 (0.634) | -0.852 (0.624) | -0.067 (0.660) |
| Minimum leaving certificate (*Hauptschule*) | -1.233 (1.182) | -1.649 (1.199) | -1.931 (1.115)* | 0.568 (1.278) | 2.490 (1.265)* | -1.701 (1.049) | 1.192 (1.082) | 0.837 (1.213) | -1.043 (1.155) |
| ower secondary (*Realschulabschluss*) | -0.815 (1.142) | -1.068 (1.155) | -0.818 (1.053) | 0.069 (1.200) | 1.799 (1.225) | -0.952 (0.980) | 0.711 (1.017) | 0.242 (1.156) | -0.567 (1.111) |
| *Fachabitur* | -0.278 (1.171) | -1.269 (1.181) | -0.484 (1.089) | 0.085 (1.239) | 1.731 (1.253) | -1.195 (1.026) | 0.430 (1.051) | 0.081 (1.186) | -0.095 (1.147) |
| University entrance (*Abitur*) | -0.725 (1.147) | -1.109 (1.158) | -0.660 (1.062) | -1.116 (1.203) | 1.454 (1.233) | -0.646 (0.987) | 0.905 (1.029) | -0.714 (1.165) | -0.849 (1.119) |
| Other certificate | -1.474 (1.479) | -1.321 (1.518) | 1.327 (1.605) | -- | 2.918 (1.506)* | -1.364 (1.406) | 3.659 (1.520)* | -0.277 (1.473) | -2.278 (1.518) |
| Observations | 227 | 224 | 226 | 221 | 225 | 222 | 226 | 226 | 225 |
| Pseudo $R^2$ | 0.0224 | 0.1668 | 0.0432 | 0.0507 | 0.0243 | 0.0512 | 0.0401 | 0.0884 | 0.0374 |

(Standard Errors in parentheses, * = significant at the 10%-level) In Model (4), there were no teens with "Other Certificate".

The ordered dependent variable is coded as (1) very important, (2) important, (3) less important and (4) completely unimportant. Therefore, negative coefficents indicate incresaing importance of a particular activity!