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Political Ignorance and the Internet

Abstract: We examine the link between Internet usage and political ignorance. To do so, we construct a novel index measuring individuals' indifference with respect to political issues, which determines the degree of individual political ignorance. Our descriptive econometric analysis is based on a rich dataset consisting of six surveys of individuals covering the time period 2001–2014 and being representative for the German electorate. The empirical results show that in earlier years of Internet diffusion, there is a negative link between using the Internet and political ignorance. This link changes sign in later years of Internet diffusion. We discuss potential explanations of this observed change in the link such as information overload and the increase in heterogeneity of Internet users.

1 Introduction

The diffusion of the Internet has given rise to new information sources. Traditional media such as daily newspapers or broadcasters offer their news and information via online channels. Digital platforms like Google aggregate news, social media platforms like Facebook or Twitter allow for individual postings of facts and opinions. Individuals have a lot of opportunities to get informed compared to the

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pre-Internet age, when daily and often local newspapers or public TV channels were the main information sources next to family and friends as the most important peer groups. Moreover, in the past 20 years, the number of information sources as well as the amount of information available on the Internet has been increasing tremendously. Hence, if the availability of information is a prerequisite for being informed about politics and for political participation, the Internet should have fostered it. But is the Internet indeed contributing to less political ignorance and thus to more political participation? Moreover, is it possible that too much information can have adverse effects, letting individuals ignore some of the available information and becoming more politically ignorant?

In fact, despite the increasing opportunities to get informed, one can observe a decreasing voter turnout as a measure of polictial participation in many western countries in the last 25 years. For instance, in German federal elections, since the rise of the Internet has begun in the late 1990s, voter turnout has decreased from 82.2% in 1998 to 76.6% in the most recent election in 2021 (Bundeswahlleiter 2021). One potential channel that might give the Internet a role in explaining decreasing political participation is the increasing availability of information which makes it more and more difficult to identify relevant information, to process the huge amount of information and to interpret the information available in the right context. This well-studied phenomenon of information overload, which was first mentioned by Jacoby et al. (1974a,b) and plays a larger role in the consumer choice literature, might lead individuals ignoring much of the available information and therefore becoming politically ignorant, because the overload makes it too costly to study political topics.

In this study, we examine the relationship between Internet usage and political ignorance as a prerequisite for political participation. To this end we construct a novel Index measuring individuals' level of indifference with respect to political issues. For the econometric analysis, we use a rich data set consisting of six surveys of individuals being eligible to vote in Germany and covering the time period 2001–2014. Thus, we have data referring to the period of the broader diffusion of the Internet as a source of information as well as data referring to later years, when different possibilities to use the Internet – for example, for entertainment – gained prominence. The empirical results show that in earlier years of Internet diffusion, there is a negative link between using the Internet and political ignorance, whereas the link reverses in later years of Internet diffusion. Thus, the observed relation in the data between the Internet and political ignorance has changed considerably over time, supporting the hypothesis that the tremendous increase in the availability of information on the Internet has increased political ignorance. We also discuss alternative explanations such as the

increasing availability of entertaining content as well as the change in the users' (unobserved) characteristics.

The remainder of this paper is organized as follows. In Section 2, we discuss the literature related to our analysis. Section 3 provides a description of the data, explains the construction of the indifference index and presents empirical results as well as robustness checks. Finally, Section 4 discusses the results and concludes.

2 Literature

In the literature about political participation, the costs of participating play a substantial role. One of the first important contributions mentioning costs of becoming informed and stating a political decision is provided by Downs (1957). His work was further developed and formalized by Ricker and Ordeshook (1968) and received high relevance, for example, by Leon and Rizzi (2014). Downs' idea of a voter who must learn something about the candidates in an election in order to state a decision is embedded in a framework where learning takes place in a process of becoming informed, which, in turn, causes costs. Downs' reasoning results in the rational ignorance hypothesis stating that there are people rationally deciding not to vote when the costs of becoming informed and stating a decision are too high. Following Downs' rational ignorance hypothesis, there are various examples in the literature introducing different forms of costs into the process of political participation. For instance, Teixeira (1987) and Tyson (2016) as well as Wolfinger and Rosenstone (1980) explicitly consider the existence of costs to gather and process information in the context of political participation. Degan (2006), who also introduces information costs in the process of political participation, illustrates those by the time spent to search for information in the news or the time to watch political debates on TV. There are further theoretical studies, e.g. Feddersen and Sandroni (2006) and Martinelli (2006, 2007), as well as empirical studies, e.g. by Hodler et al. (2015) or Cunow et al. (2021) considering the costs of becoming informed in order to participate in political democratic processes.

The costs to become informed (to which we refer to as "information cost" in the following) might be particularly high for individuals using the Internet if the Internet overloads users with a huge amount of information. More precisely, the effect of information overload, a term introduced by Jacoby et al. (1974a,b), potentially leads individuals to refuse to politically participate, since participating and informing oneself about politics becomes too costly if too much information is available. If the amount of available information is too large, the costs to identify the relevant information and to interpret it correctly and in the right context, i.e. to

process this information, increases. It is very well documented in the empirical literature that an increasing amount of available information can increase individuals' cost to get informed and make a choice, which often leads to situations where individuals – rather than making an informed choice – make no choice at all (see, e.g. Cunow et al. 2021; Marx and Turner 2019; Wilcox 1993 besides others). In this paper, we are able to analyze the relationship between Internet usage and political ignorance in early stages as well as in later stages of Internet diffusion. These stages differ substantially with respect to the amount of information available on the Internet. If an information overload effect for Internet users exists, it should be stronger in later years as the amount of information in the Internet has grown continuously since its launch.

The Internet does not only offer access to a huge amount of information but also a wide variety of content in particular for entertainment (see, for instance, Prior (2005) or Persson (2017)). As shown by Prior (2005) and discussed by Gentzkow and Shapiro (2015), the rise of new media such as cable TV or the Internet has increased political engagement among those individuals preferring news but has reduced political engagement among those individuals preferring entertainment. This goes along with a larger knowledge gap between these two groups of individuals. Gavazza et al. (2018) find that there is a negative link between the Internet and traditional media such as local and national newspapers, suggesting that the Internet has crowded out traditional media that have a richer political content than the Internet. Similarly, Falck et al. (2014) find evidence for a decreasing voter turnout following a better Internet availability which can be explained by substituting political content by entertaining content. For the case of knowledge on economic policy, Blesse et al. (2021) show that being uninformed is positively linked to the use of social media. They also point out, however, that in countries where other online sources are used for getting informed, such as online versions of daily newspapers, the link with uninformedness is negative. Zhuravskaya et al. (2020) mention several possible channels of how social media can affect individuals' political participation such as the entertainment opportunities that distract individuals from political topics thereby decreasing participation, or the ability of populists to reach non-voters increasing political participation. Their overview of empiricial evidence relates primarily to developing and autocratic countries though.

The level of political knowledge is a prerequisite for taking informed decisions. Previous empirical studies primarily analyze the link between Internet usage and political knowledge in terms of giving right answers to a specified set of questions (e.g. Blesse et al. (2021); Prior (2005)). In our contribution, we attempt to learn more about the link between Internet use and individuals' levels of indifference or ignorance with respect to political topics.

3 Empirical Analysis

Does the diffusion of the Internet help individuals to be politically better informed or does it make individuals politically ignorant? We intend to obtain insights into this question by analysing a comprehensive and representative data set on the German population eligible to vote. We construct a novel index measuring political indifference at the level of the individual person. An econometric analysis provides descriptive evidence of the link between political indifference and Internet usage and on how this link changes over time.

3.1 Data and Descriptives

The data set used for our empirical analysis consists of 108,594 observations and is a merge of six yearly cross sections of surveys conducted by "Forschungsgruppe Wahlen" (a pollster institute) in Germany. We use the data for the period 2001–2004, 2010 and 2014.[1] Hence, we have data referring to the period of the rise of the Internet, as well as data referring to later years, when alternative possibilities of using the Internet entered the scene, for example linked to the invention of the smartphone or to social media.

Regarding the survey mode,[2] note that the survey is conducted on the phone and answers are reported electronically. Moreover, using administrative data, the institute randomly selects households in Germany that have a telephone. Within a selected household, the person whose birthday was last is selected for the survey. One yearly survey wave consists of several smaller survey waves. There is usually one survey wave each month with approximately 1500 respondents. For each of these small survey waves, a new random sample of individuals with the described procedure is selected. The main aim of the pollster institute is to obtain a representative sample of the whole German electorate for each survey wave. Hence, we are quite confident that the cross-sectional surveys are comparable across years as they aim at being representative for the German electorate. Any change in the cross-sectional results should therefore be attributable to changes in the German electorate and not in the sample.

Each observation describes one single individual. One group of variables refers to the characteristics of the individuals,[3] like *age*, *religious affiliation*, *economic position*, *union membership*, *interest in politics*, strength of the affinity to

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1 The data sources including references are described in the Online Appendix.

2 The sources that describe the survey mode are also mentioned in the Online Appendix.

3 See Appendix A.1 for a detailed description.

individual's favorite political party (given by *affinity to party*), the number of *persons in the household* in which the individuals live, *gender*, *origin*, *formal education* as well as the variable *profession*, which is a measure of the socio-economic status regarding the autonomy of action and the position in the job constructed with a method from Hoffmeyer-Zlotnik (2003). Moreover, we constructed a variable measuring the Internet usage of an individual (see the Online Appendix for further details). Table 1 shows descriptive statistics.

A further set of 602 variables contains individuals' answers to questions about their opinions on recent political topics. Each variable documents the answer to one question.[4] For example, one question was how the individual assesses the introduction of minimum wages in Germany, or the introduction of a toll for passenger cars. The corresponding variable contains the answer of the individual, when she gave one. To be clear, not all 602 questions were asked to all individuals – each participant received only a small set of approximately 20 questions on average for two reasons: first, asking all questions to all individuals would take too much time and asking so many questions would come with the thread of very low response rates. Second, the questions partly change over time in order to refer to recent political topics and issues that do change over time. Hence, asking always the same questions is not possible, as important political topics do change and some questions are solely relevant during a specific period of time.

Table 1: Descriptive statistics for the explanatory variables used in the OLS regressions.

	Mean	**SD**	**Min**	**Median**	**Max**	**n**
Internet usage	0.59	0.51	−10.84	0.64	3.79	160,068
Interest in politics	3.43	0.98	0.00	3.00	5.00	108,637
Affinity to party	2.13	1.86	0.00	3.00	5.00	160,068
Age category	6.72	2.47	1.00	7.00	10.00	160,067
Female	0.50	0.50	0.00	1.00	1.00	160,068
Formal education	3.28	1.15	0.00	3.00	5.00	159,965
Profession	2.56	1.38	0.00	3.00	5.00	160,068
Persons in household	2.46	1.19	1.00	2.00	5.00	160,068
Economic status	2.36	0.70	0.00	2.00	3.00	160,068
Union membership	0.16	0.37	0.00	0.00	1.00	160,068
Religion	0.40	0.49	0.00	0.00	1.00	160,068
West/east	0.57	0.49	0.00	1.00	1.00	160,068

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4 All 602 questions with the corresponding answers were translated into English and are available upon request.

When an individual did not answer a question (i.e. refused to give an opinion), we call this individual indifferent about the issue in question. In this case, the individual had to state explicitly that she did not have an opinion about the specific question.

3.2 Constructing an Indifference Index

As a measure of individual political ignorance (or political indifference) we construct an indifference index. High (low) values of the indifference index indicate high (low) levels of political ignorance. The indifference index is constructed by aggregating and weighting the 602 variables referring to the questions asked in the yearly surveys and assigning a single index value between zero and 100 to every individual. In the following, we will first explain how we compute these weights. Afterwards, we will argue why using these weights leads to a useful indifference index.

The weights of the questions asked to individuals are constructed with hand-collected publication data. Each question refers to a particular topic. For instance, if the question refers to the introduction of a minimum wage, the underlying topic is "minimum wage". To construct the weight for a certain question, we count the number of publications in a representative sample of German media on the topic(s) covered in this question in the year this question was asked as well as the previous years. These numbers of publications are hand-collected from the search engine FACTIVA. For each question, we searched for all terms related to the topic that is referred to with this question on FACTIVA and collected the number of German media publications that FACTIVA reports that cover this topic.

To construct the indifference index, we define dummy variables O_k for $k = 1, \cdots, 602$, where O_{ki} is zero if individual i states an opinion for question k, or if i was not asked to answer question k, and one otherwise. Hence, O_{ki} is one if the individual was asked to give her opinion on this question but was not willing and/or not able to share her opinion on this topic. Moreover, we define the dummy variables θ_k for $k = 1, \cdots, 602$. Here, θ_{ki} is equal to one if individual i was asked to answer question k during the survey and zero otherwise. Intuitively, the index equals the weighted share of questions, which the individual was indifferent about (i.e. had no opinion/answer to this question). The index takes values between 0 and 100 and for individual i surveyed in year j, the index $I_{i,j}$ is constructed by:

$$I_{i,j} = \frac{100 \sum_{k=1}^{602} O_{ki} \omega_k^j}{\sum_{k=1}^{602} \theta_{ki} \omega_k^j}$$

The weight ω_k^j of the question k asked in year $j \in \{2001, 2002, 2003, 2004, 2010, 2014\}$ is computed by considering the representative sample of German media publications about the underlying topic of question k in year j relative to the publications about the same topic in the five years before year j. The number of publications in year $j - t$, related to the topic covered in question k, is defined by $p_{k,j-t}$. For each question, there is publication data available for the year in question as well as for the previous five years, such that t can be any integer between 0 and 5. Furthermore, we define the number of questions asked in year j as K_j, where $\sum_j K_j = 602$. To avoid negative weights, we define:

$$\omega_k^j = \frac{p_{k,j} - \frac{1}{T_j}\sum_{t=0}^{T_j} p_{k,j-t}}{\sqrt{\frac{1}{T_j}\sum_{t=0}^{T_j}\left[p_{k,j-t} - \left(\frac{1}{T_j}\sum_{t=0}^{T_j} p_{k,j-t}\right)\right]^2}} + \left|\min_{k \in (1,\cdots K_j)} \omega_k^j\right|$$

Note that the weight is simply the number of standard deviations over the mean value of publications in the last five years corrected by the minimum value. For instance, suppose the weight of the minimum wage question is 2. Ignoring the addend of the minimum weight in the weight construction for a second, this means that in the year the question was asked, the number of German media publications referring to the minimum wage were two standard deviations above the mean of publications referring to the minimum wage in the five previous years.

The weighting is conducted in order for the indifference index to fulfill two conditions: First, the index values are comparable across weeks and years, even though different numbers and types of questions are asked from week to week. Second, in the process of aggregation, the single questions are weighted according to the recent relative relevance of a topic in comparison to the relevance of the same topic in the last five years. This second property of the index means that when the underlying topic is totally new, or when the topic is not new but receives some new relevance through new media publications, we assign a high weight. In contrast, topics which are already being discussed for years receive a low weight. To understand why we weight the questions before we aggregate them, consider the topics 'climate change' and the 'Ukraine crisis' in 2014. The former topic was already being discussed for years, the latter is a totally new topic in 2014. With our analysis, we want to measure the link between the *current* Internet usage of an individual and her *current* political ignorance. Considering, for example, climate change, it is very likely that the individual has already formed an opinion about this topic in the past and her current Internet usage does not substantially influence her opinion and decision about climate change. However, the current Internet usage still can influence it, which demands a low, but non-zero weight for the climate change question. By contrast, the crisis in the Ukraine was a

late-breaking topic in 2014 and it is very likely that the current usage of the Internet highly influences the decision-making process regarding this topic calling for a high weight according to our scheme. Thus, by weighting the questions, the differences of the relevance of the Internet usage for the decision making process are taken into account.

Figure 1 indicates a relatively stable average indifference value (black curve) across the six years of the sample for the aggregate of all individuals. Also the 25- and 75-percentile index value among individuals in each year does not change substantially. Therefore, we do not observe that there is a general increase/ decrease in political indifference over time.

3.3 Econometric Analysis

In order to estimate the link between Internet usage and the indifference index, we use the following econometric specification:

$$I_{i,j} = \beta_0 + \beta_1 \text{Internet Usage}_i + \gamma \mathbf{x_i} + \epsilon_i$$

The coefficient of interest is β_1; $\mathbf{x_i} = (x_{i1}, \cdots, x_{ij})$ is the vector of j control variables and γ the corresponding vector of coefficients; ϵ_i is the independent and identically distributed error term. We conduct OLS[5] estimations of different specifications
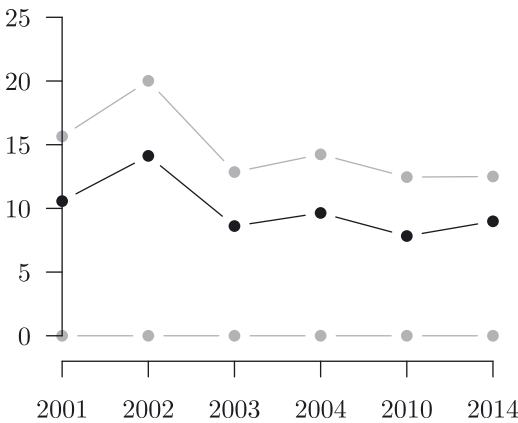

Figure 1: The graph shows for each year: the average indifference index value of all individuals in that year (black curve), the 75-percentile value of indifference index values for all individuals (grey curve above the black curve) and the 25-percentile value of indifference index values for all individuals (grey curve below the black curve, which is always equal to zero across all years).

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5 Since the index takes values on an interval between 0 and 100 and there is a bunching of individual index values at zero, we also run Tobit estimations. Since the results of OLS and Tobit do not substantially differ, we focus on the results of the OLS estimations in the following. The results of the Tobit estimations are available in the Online Appendix.

with a varying set of controls and with time dummies. Our main focus will be on the estimates of coefficient β_1. The estimation results shoud be interpreted in a descriptive way due to potential endogeneity (see Section 3.4 for further details).

For the estimations, we first use the whole sample including all years of observation and year dummies. We also run regressions separately for the year-wise samples in order to illustrate directly how coefficients change over time.

In the full sample, the estimated coefficient $\widehat{\beta}_1$ is negative and significant in all specifications, implying a negative link between Internet usage and the indifference index (see Table 2). This result suggests that individuals using the Internet are better informed and thus less likely to be politically ignorant. As the interaction with time dummies shows, the negative link between the indifference index and Internet usage is reinforced in 2002, but alleviated in the following years. In 2014, the negative coefficient of Internet usage is even outweighed by the coefficient of the interaction term resulting in a significant positive link between political indifference and Internet usage in that year. This pattern is similar for several specifications and holds if we add further controls (see specifications 3, 4, and 6 in Table 2). By conducting year-wise estimations (see Table 4 in Appendix A.3) the same results for the Internet usage coefficient can be shown more clearly (see Figure 2): we obtain negative estimated coefficients $\widehat{\beta}_1$ for the early years of observation that are decreasing in size over time, and a positive estimated coefficient for the last year of observation. Thus, in the early years of Internet usage, individuals using the Internet seem to be less indifferent with respect to the political debate while, in later years, those who use the Internet are more likely to be politically ignorant.

This evidence supports the hypothesis of an increasing information overload of the Internet over time, making it more costly to take decisions. More specifically, as the Internet gets more and more overloaded with information, the information overload effect should be stronger in later years of Internet diffusion. In fact, what we see in Figure 2 suggests that in early years of Internet diffusion, additional availability of information helped users to be better informed and less politically ignorant. By contrast, in later years, the increasing amount of information has led to an overload letting Internet users ignore information and making them politically ignorant.

There are indeed further alternative explanations for our findings. First, individuals' purposes for using the Internet might have changed over time. While individuals were primarily seeking for information in the early years of Internet diffusion, in 2014, they might have had higher preferences for entertainment because the Internet offered this entertainment more than it did in 2001–2004 (e.g. Persson 2017; Prior 2005). Hence, the group of Internet users in later years

Table 2: Pooled regressions where *p < 0.05, **p < 0.01 and ***p < 0.001. An "&" between two variables indicates an interaction between those.

Dependent variable:	(1) Weighted Index b/se	(2) Weighted Index b/se	(3) Weighted Index b/se	(4) Index Index b/se	(5) Weighted Index b/se	(6) Weighted Index b/se	(7) Unweighted Index b/se
Internet usage	−3.075*** (0.16)	−0.458*** (0.12)	−9.418*** (0.52)	−2.791*** (0.51)	−0.484*** (0.12)	−2.532*** (0.51)	−2.658*** (0.50)
Dummy 2002	3.021*** (0.18)	3.147*** (0.16)	5.005*** (0.39)	4.483*** (0.36)	7.366*** (0.74)	7.998*** (0.80)	5.533*** (0.78)
Dummy 2003	−2.920*** (0.18)	−2.603*** (0.17)	−2.592*** (0.44)	−2.714*** (0.41)	−5.383*** (0.81)	−5.448*** (0.89)	−5.805*** (0.88)
Dummy 2004	−1.859*** (0.16)	−1.831*** (0.15)	−1.867*** (0.39)	−2.140*** (0.36)	−3.975*** (0.69)	−4.174*** (0.76)	−3.978*** (0.77)
Dummy 2010	−2.759*** (0.16)	−2.848*** (0.14)	−6.628*** (0.30)	−3.915*** (0.28)	−8.418*** (0.62)	−9.195*** (0.67)	−6.907*** (0.67)
Dummy 2014	−1.517*** (0.16)	−1.431*** (0.15)	−5.250*** (0.40)	−3.454*** (0.35)	−3.206*** (0.67)	−5.047*** (0.74)	−4.557*** (0.78)
Dummy 2002 & int. use			−3.205*** (0.70)	−2.481*** (0.65)		−1.891** (0.64)	−1.398* (0.63)
Dummy 2003 & int. use			1.227 (0.72)	0.791 (0.67)		0.437 (0.66)	0.394 (0.65)
Dummy 2004 & int. use			2.169*** (0.65)	1.228* (0.60)		0.966 (0.59)	1.181* (0.60)
Dummy 2010 & int. use			8.109*** (0.54)	2.486*** (0.52)		2.164*** (0.51)	2.218*** (0.51)
Dummy 2014 & int. use			7.894*** (0.63)	3.791*** (0.57)		3.563*** (0.57)	3.914*** (0.57)
Interest pol.		−3.277*** (0.05)		−3.246*** (0.05)	−3.813*** (0.14)	−3.791*** (0.14)	−3.835*** (0.14)

Table 2: (continued)

Dependent variable:	(1) Weighted Index b/se	(2) Weighted Index b/se	(3) Weighted Index b/se	(4) Index Index b/se	(5) Weighted Index b/se	(6) Weighted Index b/se	(7) Unweighted Index b/se
Dummy 2002 & interest pol.					-1.234*** (0.20)	-1.114*** (0.20)	-0.709*** (0.19)
Dummy 2003 & interest pol.					0.831*** (0.22)	0.864*** (0.21)	0.931*** (0.21)
Dummy 2004 & interest pol.					0.649*** (0.18)	0.647*** (0.18)	0.699*** (0.19)
Dummy 2010 & interest pol.					1.634*** (0.17)	1.592*** (0.16)	1.081*** (0.16)
Dummy 2014 & interest pol.					0.544** (0.18)	0.510** (0.18)	0.275 (0.18)
Affinity to party		-0.918*** (0.02)		-0.908*** (0.02)	-0.915*** (0.02)	-0.907*** (0.02)	-1.018*** (0.02)
Economic status		-0.614*** (0.07)		-0.636*** (0.07)	-0.616*** (0.07)	-0.635*** (0.07)	-0.665*** (0.07)
Formal education		-0.281*** (0.04)		-0.200*** (0.04)	-0.274*** (0.04)	-0.198*** (0.04)	-0.248*** (0.04)
Profession		-0.514*** (0.03)		-0.464*** (0.03)	-0.519*** (0.03)	-0.479*** (0.03)	-0.518*** (0.03)
Age		0.544*** (0.02)		0.446*** (0.02)	0.534*** (0.02)	0.452*** (0.02)	0.442*** (0.02)
West/east		-1.236*** (0.09)		-1.109*** (0.09)	-1.211*** (0.09)	-1.095*** (0.09)	-1.087*** (0.09)
Female		2.959*** (0.08)		2.913*** (0.08)	2.947*** (0.08)	2.909*** (0.08)	3.128*** (0.08)

Table 2: (continued)

| Dependent variable:	(1) Weighted Index b/se	(2) Weighted Index b/se	(3) Weighted Index b/se	(4) Index Index b/se	(5) Weighted Index b/se	(6) Weighted Index b/se	(7) Unweighted Index b/se
Persons in household		-0.427***		-0.400***	-0.430***	-0.408***	-0.424***
		(0.03)		(0.03)	(0.03)	(0.03)	(0.03)
Religion		-1.096***		-1.026***	-1.077***	-1.017***	-1.011***
		(0.09)		(0.09)	(0.09)	(0.09)	(0.09)
Union membership		-0.571***		-0.613***	-0.562***	-0.600***	-0.612***
		(0.10)		(0.10)	(0.10)	(0.10)	(0.10)
Constant	12.889***	25.247***	15.417***	26.247***	27.070***	27.934***	28.905***
	(0.14)	(0.32)	(0.27)	(0.40)	(0.57)	(0.62)	(0.61)
Observations	108,534	108,534	108,534	108,534	108,534	108,534	108,534
R^2	0.039	0.165	0.052	0.167	0.170	0.171	0.178
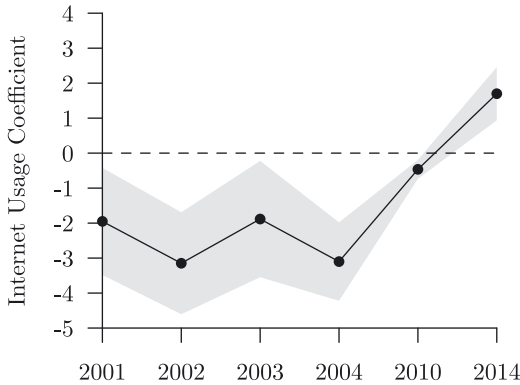
Figure 2: Coefficient of Internet usage, estimated separately across years with OLS including all control variables and heteroscedasticity-robust standard errors. The grey area above and below the coefficients represents the 95%-confidence interval.

might simply use the Internet for different purposes than those in earlier years, changing the link between being a user and political ignorance. Relatedly, political misinformation and hate speech in social media content might cause individuals to withdraw from these media and turn to more entertaining Internet content (see for example the overviews by Blesse et al. (2021) and Zhuravskaya et al. (2020) showing inconclusive evidence on the link between social media and knowledge or political participation). Second, the set of Internet users might have changed over time in a way we cannot capture with our control variables. In earlier years of Internet diffusion, its usage was restricted rather to high-skilled individuals using the Internet predominantly for information search and professional communication. In later years, due to the increasing broadband diffusion and the invention of the smartphone in 2007, more and more individuals with different characteristics and different preferences have been connected to the Internet. With respect to the latter explanation, Figure 3 shows the development of the average probability that
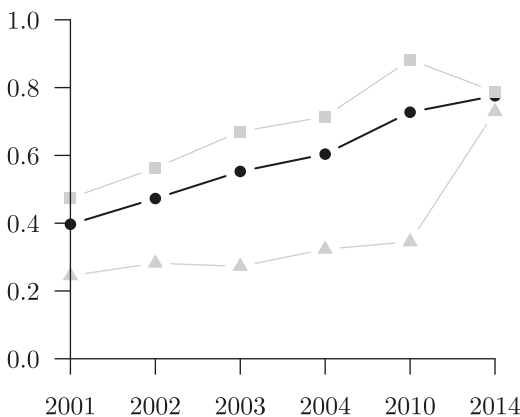

Figure 3: Average probability of using the Internet for all individuals (black curve with dots), for individuals with above-average formal education (grey curve with squares) and below-average education (grey curve with triangles) for each year in the sample.

an individual uses the Internet distinguishing between individuals with above- and below-average formal education. There is a clear upward trend in the Internet usage for all individuals. Furthermore, individuals with below-average formal education use the Internet much less on average in the earlier years of the sample while they fully catch up with the individuals who have above-average formal education later on.

To get some more insights into the determinants of the indifference index, the estimated coefficients of the 12 control variables are examined in more detail in the following. The estimations refer to the full specification (6) in Table 2. The coefficient estimates are quite stable over the different specifications and are all significant. The coefficients of the control variables show the expected sign. Political indifference is negatively related to individuals' general interest in politics or belonging to a political party or a religious group, living with further individuals in one household or belonging to a union. There is also a negative and significant link for individuals who have a higher level of formal education, a higher economic or professional status. West Germans are politically less indifferent than East Germans whereas older people and women are significantly more indifferent to political issues.

A one-unit increase in the *age* of a person (measured in categories 1–11) is related to an increase in the indifference index by approximately 0.46 points. This might be explained through preferences becoming more stabilized with increasing age ("preference stabilization"). An older decision-maker already formed her political preferences, inducing the voting decision to be mainly driven through experiences and decisions made in the past. Therefore the information on the most recent political topics have less of an impact on her preference seeking, which means she becomes politically more ignorant.

A further variable reflecting the stability of preferences is the *affinity to a political party*. A higher degree of affinity is linked to a 0.91 decrease in the indifference index, i.e. the more a person is committed to a party, the less she will be politically indifferent.

A one-unit higher (categories 1–4) self-assessed *economic status* is related to a 0.64 points lower indifference index, i.e. an individual who evaluates her economic position as good might have more resources to get informed about political topics than those, whose main interest is to get out of the personal "recession".[6]

The *membership in a union* is connected with a 0.60 lower indifference index indicating that the membership is associated with a person's generally higher political awareness and thus a lower indifference index.

A one-unit increase in the *interest in politics* as a general measure (categories 1 to 5) is associated with a decrease of the indifference index by 3.71 points indicating that the more one is interested in politics, the more one is informed about it and the less one is indifferent.[7]

Each additional *person in the household* of the individual is related to a 0.41-point decrease in the index indicating that living together with other people might foster political discussions[8] or just make the division of tasks attractive. The division of tasks might include acquiring and processing information and thus yielding a higher degree of information to those living together with others in their household.[9]

There are two coefficients measuring the role of education and the socio-economic status[10] with respect to the indifference index, *formal education* and *profession*. With a higher level of *profession* (categories 1–5) the index decreases by 0.48 points whereas a higher level of *formal education* (categories 1–5) has a coefficient only half as large as that of *profession*, i.e. it is related with a decrease in the index of 0.20 points. Thus, higher education and higher socio-economic status are related to a lower level of political indifference. This result is in line with the existing literature.[11]

The coefficient for *West/East* indicates that individuals living in the western part of Germany compared to the eastern part (post-soviet state) have a 1.10

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7 As pointed out for eyample by Prior (2019), interest in politics is formed during the years of adolescence and hardly changes over later stages of life.
8 See the literature on social interaction and political participation, for example, La Due Lake and Huckfeldt (1998), McClurg (2003) or Nickerson (2008), who show that individuals in a household can influence each other's political participation.
9 For example, Wolfinger and Rosenstone (1980, p. 44) beside others, support the idea that the number of people living together in the household matter for political participation by stating that "[m]arried people are more likely to vote than those who are single, separated, divorced or widowed".
10 Socio-economic status is measured by *profession*, see Appendix A.1 for a detailed explanation.
11 See, for example Brady et al. (1995), who show that higher socio-economic status is indeed associated with higher political participation. Other studies relating education, socio-economic status and political participation and knowledge are, e.g. Mayer (2011), Milstein Sondheimer and Green (2010), Wolfinger and Rosenstone (1980, p. 13) or Burden (2009).

lower indifferent index on average. The differences in political participation for post-soviet states and other western states are well studied in the literature.[12]

The estimated coefficient for *religion* indicates that an individual with no religious affiliation has an indifference index which is 1.02 points lower than the average. One possible explanation for this effect is that individuals who left the church (those are individuals without any religious affiliation) might be those with a higher political awareness in the sense that those people might be more sensitized and critical to specific societal issues and are thus also better informed about political topics in general. There is evidence in the literature supporting this view.[13]

The regression results for the dummy variable *female* yield a significant and positive coefficient of 2.91 for women. Since this effect is very large, we further analysed by which group of women this effect is driven and thus included an interaction term between *female* and *age*.[14] By including the interaction with age in the year-wise specifications, the coefficient for *female* becomes insignificant, indicating that the measured effect of "female indifference" in the first regression is solely driven by older women. These findings are in line with the literature, as they are well-established in political science.[15]

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12 Studies which are explaining possible differences, are, e.g. Barnes (2006) or Innes (2001). Furthermore, the German Federal Agency for Political Education (Crome and Muszynski 2000; Scharenberg 2004) concludes that political education in eastern Germany lags behind the western part of Germany, possibly causing higher effort required to process political information and thus resulting in higher indifference.

13 For example, Bedford-Strohm and Jung (2015, p. 519) conducted a survey in Germany and found two important facts: First, the most mentioned reason for people leaving the evangelic church was the missing credibility of the church as an institution (mentioned by 70.3% as a reason). Second, 63.8% of the subjects stated the church is not compatible to a modern society. Both statements indicate that those who left the church critically assess the role of the church in the society. Furthermore, there are also authors (e.g. Wazlawik (2014, p. 51), beside others) mentioning a possible effect of the scandals about sexual abuses in the church and the number of people leaving the church, although there is, to the best of our knowledge, no detailed empirical study about this effect. However, this also indicates that people leaving the church might do it because they are critical about the institution and its behavior, underlining the argumentation made above.

14 Results are shown in the year-wise estimations in Appendix A.3.

15 Generally, political science has dealt with the question for years, why women participate less in politics, see, e.g. Welch (1977) or Ingelhart and Norris (2003). Furthermore, the differences between men and women in political participation should diminish over time through the emancipation of women, which is in line with our findings.

3.4 Limitations and Robustness Checks

The empirical analysis we have conducted so far has several limitations. First, the econometric results might be prone to endogeneity due to omitted variables or due to simultaneity and therefore can be interpreted as descriptive evidence only. As regards omitted variable bias, for instance, we do not observe individuals' ability to process information. This characteristic might affect the use of the Internet, however, it is likely to be correlated also to education and profession and thereby to affect political indifference. With respect to simultaneity, using the Internet as a source of information is likely to have an effect on political indifference. However, the level of political indifference might also determine individuals' purpose for which they use the Internet and thus also determine the Internet usage per se.

Second, since we do not have a panel data set but a series of cross-sections, the estimate of the Internet coefficient might be prone to sample selection. More specifically, it is possible that in later years a sample was chosen which is substantially different in its characteristics than the sample which was chosen in earlier years, which might explain the change in the estimated coefficient over time. However, we argue that it is very unlikely that our analysis suffers from such a sample selection problem. The reasoning of this claim lies in the representativeness of the sample for the whole German electorate. The pollster institute, which is renowned for its election forecasts, claims that the sample is representative for the whole German electorate in each year. Thus, a substantial change in the sample, which might explain the change in the coefficient is unlikely. Moreover, the stability of the estimated control-variable coefficients over time, as well as the reasonable signs of these estimations underline the credibility of the evidence we found with respect to the Internet usage coefficient. Still, with panel data, we could take into account unobserved heterogeneity by fixed effects estimations.

Third, the analysis conducted so far might suffer from the sample of questions changing over time. Most of the questions refer to recent topics and do solely appear in one year. Hence, the change in the Internet coefficient might simply be attributable to the change in the set of questions. To gather some evidence against this concern, we conduct further estimations. Of all questions asked, we could identify eight questions which are asked in all six years without any changes. We construct a weighted indifference index in the exact same way as before using solely those eight questions. OLS estimations with this reduced indifference index

as the dependent variable are shown in Appendix A.2. They show qualitatively similar results to the ones above: we see a clear upward trend in the Internet coefficient over time. The coefficient is significantly negative in the early years and it increases substantially over time. Hence, this finding provides some evidence against the concern that the observed change in the Internet coefficient in the main analysis might stem from a change in questions.

Finally, considering the weighting of the questions in the aggregation process of the indifference index, one might ask how the results change when the aggregation of the questions is done without the weighting scheme. More specifically, in such a simple aggregation, an individual's value of the unweighted indifference index is equal to the share of questions about which this individual was indifferent. Table 2 contains the results of the OLS estimations with the unweighted indifference index as dependent variable in specification (7). The results show that there is no qualitative difference compared to the estimation results obtained by using the weighted index as dependent variable. To understand the meaning of this result, consider the relationship between the weight of a question and the share of people who were indifferent about it, which is analyzed in the Online Appendix. The results of this analysis show that there is no statistically significant relationship between the share of indifferent people and the weight of a question. Assume that the weighting is indeed a good measure of the recent relative relevance, i.e. the novelty of a question. Then, for the individuals, it follows that, on average, being politically indifferent does not depend on the novelty of a question and a topic. Hence, the link between Internet usage and political indifference does not only change over time for those questions for which we would assume that individuals have a higher need for information, but for any question which is asked to individuals.

4 Conclusion

This paper contributes to the increasing literature investigating the role of the Internet for information availability, decision making and political participation. In contrast to previous studies, we examine the direct relationship between Internet usage and political indifference as a prerequisite for political (non-)participation. A novel Index allows measuring individuals' levels of indifference with respect to political issues.

Our empirical results show that the role of the Internet as a source of information on political issues has changed over time. While there was a strong negative link between the use of the Internet and political indifference during the early 2000s, this link has changed in later years of Internet diffusion, turning into a positive link in 2014. Thus, people using the Internet have become politically more ignorant over time. Future research should contribute to empirically disentangling different explanations for this changing link between Internet usage and political ignorance over time. Moreover, one should aim at identifying causal effects of Internet use on political ignorance. Although our data cover a wide range of individual characteristics, more detailed measures of the economic status such as the income or of the educational background measured by the years of education could be helpful. The availability of panel data would allow taking into account unobserved heterogeneity, for instance, with respect to individuals' ability to process information. However, in particular long panels often suffer from problems like panel attrition. Alternatively, one might use pseudo-panel or synthetic-panel techniques. The latter has been applied basically for analyzing income distribution and poverty over time with a limited number of cross-sections so far (see for example Moreno et al. (2021)). We leave the application of more recent econometric techniques for future research as our limited set of variables could not sufficiently control for all important factors, even in a synthetic panel.

Appendix

A.1 Variable Description

The following variables are used in the empirical analysis.

- *Internet Usage* is equal to the probability that the individual is using the Internet. See the Online Appendix for a detailed description.
- *Age* is the age of the individual and is measured in 10 categories: 18–20, 21–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–59, 60–69 and higher than 70.
- *Female* is a dummy variable taking the value one if the individual is a woman.
- *Age * Female* is the interaction term between the dummy female age.
- *West/East* is a dummy variable taking the value one if the individual is living in the western part of Germany and zero otherwise.

- *Interest in Politics* is a categorical variable measuring the intensity of interest in politics in five categories. In order to elicit individuals' interest in politics, individuals were asked "How much are you interested in politics" (without reading out any options from which individuals could choose). Depending on their answer, the interviewer assigned a number between 1 and 5: 1 if the individuals said she is "not interested in politics", 2 if she said she is "rarely interested", 3 if she said she is "somewhat interested", 4 if she said she is "strongly interested" and 5 if she said she is "very strongly interested".
- *Economic Status* is a self-assessment about the own economic status measured in three categories, where 1 means bad economic status and 3 means good economic status.
- *Formal Education* is a categorial variable measuring the formal education in six categories: 1 – the person is still in school, 2 – the person reached no certificate of secondary education, 3 – the person reached a certificate of secondary education, 4 – the person reached a secondary school level examination, 5 – the individual reached final secondary school examinations, and 6 – the person graduated from college.
- *Profession* is a classification in five categories of the individual's socioeconomic status regarding their autonomy of action and position in the job according to the measure developed by Hoffmeyer-Zlotnik (2003).
- *Union Membership* is a dummy variable taking the value one if the individual is member of a union and zero otherwise.
- *Religion* is a dummy variable taking the value one if the individual has no religious affiliation.
- *Affinity to Party* is measuring the strength of the individuals' affinity to a certain political party. The variables measures the strength in six categories from no affinity to very strong affinity.
- *Persons in Household* measures the number of persons in the household.
- *Indifference Index* is the weighted aggregation of the political topics an individual was indifferent about. See main text for a detailed description of the construction.

A.2 OLS Estimations – Index from Constant Questions

Table 3: Pooled regressions, where $*p < 0.05$, $**p < 0.01$ and $***p < 0.001$. An "&" between two variables indicates an interaction between those.

Dependent variable:	(1) Cons. Q. Index b/se	(2) Cons. Q. Index b/se	(3) Cons. Q. Index b/se	(4) Cons. Q. Index b/se	(5) Cons. Q. Index b/se	(6) Cons. Q. Index b/se
Internet usage	−2.356*** (0.14)	−0.701*** (0.12)	−8.245*** (0.47)	−4.416*** (0.46)	−0.654*** (0.12)	−4.067*** (0.46)
Dummy 2002	−0.169 (0.15)	−0.076 (0.14)	−0.013 (0.34)	−0.355 (0.32)	−1.111 (0.69)	−1.420 (0.74)
Dummy 2003	−1.286*** (0.16)	−1.068*** (0.15)	−1.444*** (0.38)	−1.551*** (0.36)	−4.371*** (0.73)	−4.734*** (0.80)
Dummy 2004	−0.155 (0.15)	−0.123 (0.14)	−0.118 (0.36)	−0.297 (0.35)	−1.255 (0.68)	−1.408 (0.74)
Dummy 2010	−0.251 (0.14)	−0.279* (0.13)	−3.536*** (0.28)	−1.891*** (0.27)	−2.085*** (0.60)	−3.302*** (0.64)
Dummy 2014	−3.524*** (0.12)	−3.412*** (0.12)	−7.263*** (0.26)	−6.236*** (0.25)	−11.614*** (0.52)	−14.124*** (0.57)
Dummy 2002 & int. use			0.591 (0.61)	1.151* (0.58)		1.056 (0.57)
Dummy 2003 & Int. Use			1.968** (0.63)	1.854** (0.60)		1.448* (0.59)
Dummy 2004 & int. use			1.941** (0.59)	1.477** (0.57)		1.308* (0.56)
Dummy 2010 & int. use			7.124*** (0.49)	3.857*** (0.47)		3.534*** (0.47)
Dummy 2014 & int. use			7.683*** (0.48)	5.487*** (0.46)		5.221*** (0.46)
Interest pol.		−2.059*** (0.05)		−2.033*** (0.05)	−2.822*** (0.13)	−2.770*** (0.13)
Dummy 2002 & interest pol.					0.325 (0.18)	0.340 (0.18)
Dummy 2003 & interest pol.					0.991*** (0.20)	1.008*** (0.19)
Dummy 2004 & interest pol.					0.354 (0.18)	0.359* (0.18)
Dummy 2010 & interest pol.					0.556*** (0.16)	0.480** (0.16)
Dummy 2014 & interest pol.					2.360*** (0.14)	2.294*** (0.14)

Table 3: (continued)

Dependent variable:	(1) Cons. Q. Index b/se	(2) Cons. Q. Index b/se	(3) Cons. Q. Index b/se	(4) Cons. Q. Index b/se	(5) Cons. Q. Index b/se	(6) Cons. Q. Index b/se
Affinity to party		−0.739*** (0.02)		−0.728*** (0.02)	−0.738*** (0.02)	−0.728*** (0.02)
Economic status		−0.340*** (0.06)		−0.357*** (0.06)	−0.334*** (0.06)	−0.351*** (0.06)
Formal education		−0.120*** (0.03)		−0.024 (0.03)	−0.123*** (0.03)	−0.030 (0.03)
Profession		−0.431*** (0.03)		−0.389*** (0.03)	−0.434*** (0.03)	−0.396*** (0.03)
Age		0.329*** (0.02)		0.236*** (0.02)	0.330*** (0.02)	0.245*** (0.02)
West/east		−0.526*** (0.08)		−0.401*** (0.08)	−0.510*** (0.08)	−0.388*** (0.08)
Female		2.150*** (0.07)		2.123*** (0.07)	2.145*** (0.07)	2.121*** (0.07)
Persons in household		−0.305*** (0.03)		−0.282*** (0.03)	−0.302*** (0.03)	−0.281*** (0.03)
Religion		−0.625*** (0.08)		−0.561*** (0.08)	−0.617*** (0.08)	−0.557*** (0.08)
Union membership		−0.201* (0.08)		−0.244** (0.08)	−0.180* (0.08)	−0.221** (0.08)
Constant	7.528*** (0.12)	15.433*** (0.29)	9.876*** (0.24)	16.932*** (0.36)	17.898*** (0.53)	19.167*** (0.58)
Observations	108,534	108,534	108,534	108,534	108,534	108,534
R^2	0.025	0.106	0.035	0.108	0.110	0.112

A.3 OLS Year-Wise Estimations

All estimations are OLS estimations with robust standard errors and the dependent variable is the indifference index. The standard errors of the coefficients are in parentheses.

Table 4: Year-wise regressions, where $*p < 0.05$, $**p < 0.01$ and $***p < 0.001$. An "&" between two variables indicates an interaction between those.

Dependent variable:	(1) Weighted Index b/se	(2) Weighted Index b/se	(3) Weighted Index b/se	(4) Weighted Index b/se	(5) Weighted Index b/se	(6) Weighted Index b/se
Internet usage	-1.951* (0.78)	-3.148*** (0.74)	-1.884* (0.85)	-3.100*** (0.57)	-0.464*** (0.14)	1.699*** (0.39)
Age	0.208* (0.09)	0.180* (0.09)	0.339*** (0.10)	0.041 (0.07)	0.268*** (0.04)	0.300*** (0.06)
Age & interaction	0.585*** (0.10)	0.778*** (0.10)	0.459*** (0.11)	0.491*** (0.08)	0.298*** (0.06)	0.488*** (0.08)
West/east	-1.368*** (0.27)	-1.107*** (0.28)	-1.059*** (0.29)	-1.091*** (0.23)	-1.061*** (0.17)	-0.699*** (0.19)
Interest pol.	-3.738*** (0.15)	-4.572*** (0.15)	-3.204*** (0.17)	-3.221*** (0.13)	-2.446*** (0.10)	-3.128*** (0.12)
Economic status	-1.027*** (0.20)	-0.884*** (0.19)	-0.913*** (0.20)	-0.374* (0.15)	-0.188 (0.11)	-1.086*** (0.14)
Female	-0.675 (0.63)	-1.398* (0.65)	-0.220 (0.69)	-0.391 (0.56)	0.191 (0.43)	-0.326 (0.60)
Formal education	-0.228* (0.11)	-0.231 (0.12)	-0.018 (0.15)	0.142 (0.11)	-0.158* (0.07)	-0.304*** (0.07)
Profession	-0.291* (0.10)	-0.643*** (0.11)	-0.370*** (0.11)	-0.530*** (0.08)	-0.370*** (0.06)	-0.599*** (0.08)
Union membership	-0.186 (0.28)	-1.023*** (0.30)	-1.484*** (0.29)	-0.454 (0.25)	-0.492** (0.19)	-0.215 (0.18)
Religion	-1.343*** (0.26)	-1.241*** (0.27)	-0.947*** (0.28)	-0.830*** (0.22)	-0.885*** (0.16)	-0.790*** (0.17)
Affinity to party	-1.022*** (0.06)	-1.318*** (0.06)	-0.581*** (0.07)	-0.813*** (0.05)	-0.737*** (0.04)	-0.944*** (0.04)
Persons in household	-0.325*** (0.10)	-0.299* (0.10)	-0.522*** (0.11)	-0.291*** (0.09)	-0.304*** (0.06)	-0.480*** (0.08)
Constant	29.798*** (0.95)	37.377*** (0.98)	23.579*** (1.12)	25.498*** (0.84)	19.043*** (0.56)	24.454*** (0.88)
Observations	15,025	17,198	10,156	15,196	30,868	20,091
R^2	0.162	0.195	0.142	0.160	0.090	0.177

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