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// IRENE BERTSCHEK AND DAVID F. MÜLLER

Political Ignorance and the Internet

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Abstract We examine the link between Internet usage and political ignorance. We construct a novel Index as a direct measure of individuals' indifference with respect to political issues which determines the degree of individual political ignorance. Our econometric analysis is based on a rich data set consisting of six surveys of individuals covering the time period 2001 to 2014 and being representative for the German electorate. The empirical results show that in the 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.

JEL classification: D80, O33

Keywords: Internet, information cost, indifference index, political ignorance

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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 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.

Despite the increasing opportunities to get informed, one can observe individuals becoming more indifferent with respect to political issues; indeed, one can observe decreasing voter turnout 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). There are several channels that might give the Internet a role in explaining decreasing political interest and participation. First, the diffusion of the Internet has tremendously improved the availability of information. The increasing availability 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), might lead individuals to ignore much of the available information and therefore become politically ignorant, because the overload makes it too costly to study political topics. Second, while in its first stage of diffusion the Internet was primarily a source of information, it has meanwhile become a medium offering also entertainment, shopping, and knowledge creation. Thus, there are many more possibilities to spend time on the Internet now than there were 10 or 20 years ago. This might have led individuals to substitute political participation by the other options that are offered on the Internet (see, e.g. Falck et al. (2014)). Third, the heterogeneity of Internet users has increased over time. While in its early stage of diffusion, the use of the Internet was primarily restricted to academia, then to high qualified individuals with an interest in politics, it meanwhile has diffused to individuals with a broader range of educational backgrounds, skills and interests. Thus, the decreasing interest in politics in relation to the Internet usage might also be explained by a change in the users' unobserved characteristics.

Previous related studies, for example Falck et al. (2014) and Gavazza et al. (2018), mainly focus on explaining the link between Internet diffusion and political participation, for instance in terms of voter turnout. In this study, we take a deeper look and 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 to 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 gained prominence. The empirical results show that in the 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.

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, there is no consensus about the effects of Internet usage on political participation. A recent overview on the role of the Internet and social media on political outcomes is given by Zhuravskaya et al. (2020). Accordingly, there are various channels through which the Internet may affect political participation. Falck et al. (2014) find a negative effect of Internet availability in Germany on voter turnout. One possible argument they provide is that the Internet comes with more entertaining alternatives, increasing the costs of relinquishing on leisure and thus lowering political participation. Poy and Schüller (2016) find positive effects of the Internet availability on political participation in Italy and argue that easier information access is one possible channel, whereas Campante et al. (2017) find mixed evidence in Italy and argue that the effect of the Internet on political participation depends on the ability of politicians to use the new media. Dimitrova et al. (2011) find no effects of social media and online sources on political participation. More recently, Gavazza et al. (2018) use data at the level of local authorities from the UK and estimate the effect of local broadband Internet diffusion on voter turnout. Conducting an IV estimation strategy with the weather as an instrument for broadband Internet availability, they find a negative effect of broadband diffusion on voter turnout. Furthermore, they show 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. This evidence might explain, according to Gavazza et al. (2018), the negative relationship between Internet diffusion and voter turnout. This observation is supported for instance by Blesse et al. (2021) who show that being uninformed about economic policy is positively linked to the use of social media.

The discussed evidence of the effect of the Internet on political participation demands a closer look on the potential intermediate channels between the Internet and political participation. One channel of particular interest in this work is the effect related to the fact that 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. The reason for this is

that participating and informing yourself about politics might be just too costly, as too much information is available in the first place, which makes it very costly to identify the relevant information and to interpret it correctly and in the right context. It is very well documented in the empirical literature that both an increasing amount of information and an increasing number of choices available can increase individuals' cost to make a choice which often leads to situations where individuals rather than making an informed choice they make no choice at all (see, e.g. Wilcox (1993) Cunow et al. (2021), Marx and Turner (2019) besides others).

In fact, in the literature about political decision-making the costs of political participation do play a substantial role. One of the first important contributions mentioning costs of becoming informed and stating a 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 Leite Lopez de Leon and Rizzi (2014). Downs' idea of a voter who must learn something about the candidates in an election 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) as well as Wolfinger and Rosenstone (1980) explicitly consider the existence of information costs in the context of political voting. 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. Another aspect is added by Tyson (2016), who develops a model linking the cost of voting to the costly decision to become politically informed. There are further theoretical studies, e.g. Feddersen and Sandroni (2006), Martinelli (2006, 2007), as well as empirical works, e.g. Hodler et al. (2015) or Cunow et al. (2021) which consider the costs of becoming informed in order to participate in political democratic processes.

The decreasing voter turnout and decreasing political participation in relation to the Internet that is documented in the literature might be a consequence of individuals not being willing to inform themselves because there is too much information out there. Not being informed might be linked to political indifference and to political ignorance which then leads to the documented decrease in voter turnout. In our contribution, we attempt to learn more about the link between Internet use and individuals' levels of indifference 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 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 collected and provided 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.

Each observation describes an individual. One group of variables refers to the characteristics of the individuals², like *age*, *religious affiliation*, *economic position*, *union membership*, *interest in politics*, strength of the affinity to 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 Appendix A.2 for further details). Table 1 shows descriptive statistics.

A further set of 602 variables contains the individuals' answers to questions about their opinions on recent political topics. Each variable documents the answer to one question.³ 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. 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

To get a measure about the level of the ability and willingness of an individual to state her opinion on political issues, we construct an indifference index measuring the

¹The data is provided by Berger et al. (2001a,b, 2002a,b, 2003a,b, 2004a,b); Jung et al. (2012a,b, 2016).

²See Appendix A.1 for a detailed description.

³All 602 questions with the corresponding answers were translated into English and are available upon request.

	Mean	sd	Min	Median	Max
Internet Usage	0.6007	0.4864	-10.8401	0.6525	3.7858
Interest in Politics	3.4225	0.9807	0.0000	3.0000	5.0000
Affinity to Party	2.1390	1.8553	0.0000	3.0000	5.0000
Age Category	6.7054	2.4744	1.0000	7.0000	10.0000
Female	0.5053	0.5000	0.0000	1.0000	1.0000
Formal Education	3.2795	1.1562	0.0000	3.0000	5.0000
Profession	2.5592	1.3813	0.0000	3.0000	5.0000
Persons in Household	2.4547	1.1911	1.0000	2.0000	5.0000
Economic Status	2.3490	0.7004	0.0000	2.0000	3.0000
Union Membership	0.1575	0.3643	0.0000	0.0000	1.0000
Religion	0.3976	0.4894	0.0000	0.0000	1.0000
West/East	0.5761	0.4942	0.0000	1.0000	1.0000

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

total indifference over all 602 variables from the second group of variables in the data set. The indifference index is a measure of the individuals' political ignorance. High (low) indifference index values indicate low (high) levels of political ignorance. More specifically, the indifference index is constructed by aggregating and weighting the 602 variables and assigning a single index value between zero and 100 to every individual. The indifference index fulfils two conditions:

1. The index values are comparable across weeks and years although different numbers and types of questions are asked from week to week.
2. 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.

The weighting of the single questions reflects the recent relative relevance of the topics in the media. When the underlying topic is totally new, or when the topic is not new but receives some new relevance through new facts or information, 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 as examples. Whereas the former is already being discussed for years, the latter is a totally new topic in that year. With our analysis, we want to measure the link between the *current* Internet usage of an individual and his *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 his current Internet usage does not substantially influence his opinion and decision about climate change, although it still can influence it, which demands a low non-zero weight. 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.

The weighting is constructed by hand-collected publication data to compute the relative relevance. We count the number of publications in a representative sample of German media on each topic covered in the individual questions in the year the 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 topics related to this question in the media over FACTIVA and reported the number of publications that FACTIVA reports. To construct the indifference index, we define dummy variables O_k for $k = 1, \dots, 602$, 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 $k = 1, \dots, 602$. The value θ_{ik} takes the value one if individual i was asked to answer question k and zero otherwise. Then, the index value I for individual i which was surveyed in year j is the value of the weighted sum of actual expressed indifferences relative to the maximum value of the weighted sum, which individual i might express. The index takes values on a scale between 0 and 100:

$$I_i = \frac{100 * \sum_{k=1}^{602} O_{ki} \omega_k^j}{\sum_{k=1}^{602} \theta_{ik} \omega_k^j}$$

The weights of the questions are computed year-wise. Denote the weight to question k , which was asked in year $j \in \{2001, 2002, 2003, 2004, 2010, 2014\}$, as ω_k^j . Define the number of publications in year $j - t$, related to the topic covered in question k , as $p_{k,j-t}$. For each question there is publication data available for the year in question and the previous five years, we have for $j - t$: $t = 0, \dots, 5$. 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:

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

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. 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.

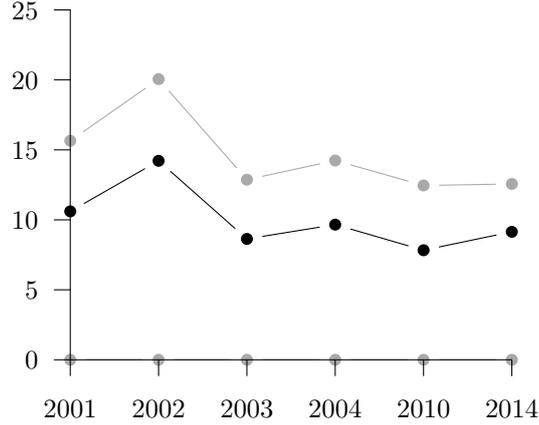


Figure 1: The graph shows for each year: the average indifference index value of all individuals in that year (black curve), the 75-percentile value of indifference index values for all individuals (grey curve above the black curve) and the 25-percentile value of indifference index values for all individuals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

3.3 Econometric Analysis

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

$$Index_i = \beta_0 + \beta_1 * Internet\ Usage_i + \gamma \mathbf{x}_i + \epsilon_i$$

The coefficient of interest is β_1 ; $\mathbf{x}_i = (x_{i1}, \dots, x_{ij})$ is the vector of j control variables and γ the corresponding vector of coefficients, ϵ_i is the error term. We conduct OLS estimations of different specifications with a varying set of controls and with time dummies.

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.⁴

In the full sample, the estimated coefficient $\hat{\beta}_1$ is negative and significant in all specifications implying a negative link between Internet usage and the indifference index (see Table 2 in Appendix A.3). 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 positive link between political indifference and Internet use in that year.

⁴Most of the relevant estimation results are provided in Appendices A.3, A.4 and A.5. Further results are available upon request.

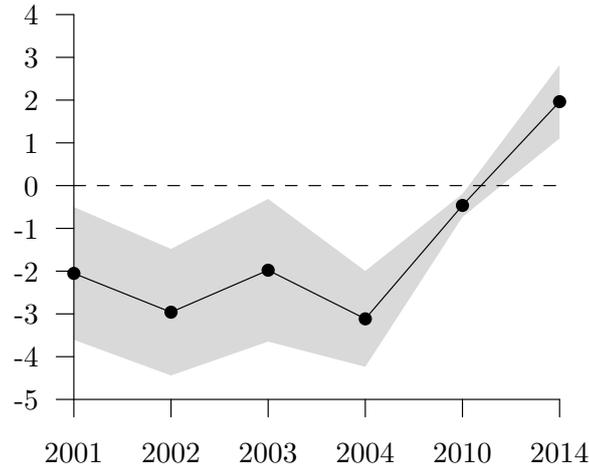


Figure 2: Coefficient of Internet usage estimated separately across years with OLS including all control variables and robust standard errors. The grey area above and below the coefficients represents the 95%-confidence interval.

This pattern is similar for several specifications and thus holds if we add further controls (see specifications 3, 4, and 6 in Table 2). By conducting year-wise estimations (see Appendix A.5) the same results for the Internet usage coefficient can be shown more clearly (see Figure 2): we obtain negative estimated coefficients $\hat{\beta}_1$ 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.

There are several explanations for this result related to each other. First, there might be an increasing information overload on the Internet over time making it more difficult to make decisions. As already explained above, the information overload might make it too costly for individuals to become politically informed, which lets them remain politically ignorant. Second, individuals' purposes for using the Internet might have changed over time. While they were primarily seeking 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. Third, the set of Internet users might have changed over time in a way we cannot capture with our control variables. In the earlier years of Internet diffusion its usage might have been restricted 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 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.

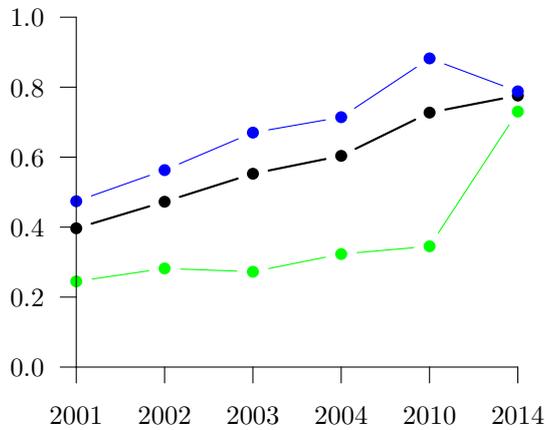


Figure 3: Average probability of using the Internet for all individuals (black curve), for individuals with above-average formal education (blue curve), and below-average education (green curve) for each year in the sample.

To get some more insights into the determinants of the indifference index, the estimated coefficients of the twelve control variables are examined in more detail in the following. The estimations refer to the full specification (6) in Table 2 in Appendix A.3. The coefficient estimates are quite stable over the different specifications and are all highly 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 *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 0.92 decrease in the indifference index, i.e. the more a person is committed to a party, the more she will share the views of this party rather than developing her own opinions on specific political issues. An alternative perspective on this result is that the higher a person's loyalty to a certain party, the

more likely she is to delegate the task of forming opinions on specific topics to this party, hence yielding a lower level of information for herself.

A one-unit higher (categories 1-4) self-assessed *economic status* is related to a 0.67 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".⁵

The *membership in a union* is connected with a 0.61 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 3.31 points (specification (2) in Table 2) indicating that the more one is interested in politics, the more one is informed about it and the less one is indifferent.

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 discussions⁶ 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.⁷

There are two coefficients measuring the role of education and the socio-economic status⁸ with respect to the indifference index, *formal education* and *profession*. With a higher level of *profession* (categories 1-5) the index decreases by 0.49 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 0.19 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.⁹

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 1.12 lower indifferent index on average. The differences in political participation for post-soviet states and

⁵See, e.g. Teixeira (1987, p. 107) measuring the impact of income on political participation, or Wolfinger and Rosenstone (1980, p. 20) stating that income itself has an "independent explanatory power".

⁶See 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.

⁷For 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"

⁸Socio-economic status is measured by *profession*, see appendix A.1 for a detailed explanation.

⁹See, 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).

other western states are well studied in the literature.¹⁰

The estimated coefficient for *religion* indicates that an individual with no religious affiliation has an indifference index which is 1.04 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.¹¹

The regression results for the dummy variable *female* yield a highly significant and positive coefficient of 2.93 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*.¹² 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.¹³

3.4 Robustness Checks

The empirical analysis we have conducted so far might suffer from several limitations. First, 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

¹⁰Studies which are explaining possible differences, are, e.g. Barnes (2006) or Innes (2001). Furthermore, the German Federal Agency for Political Education (Scharenberg, 2004; Crome, 2000) 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.

¹¹For 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.

¹²Results are shown in the year-wise estimations in Appendix A.5.

¹³Generally, 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.

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 over time of the estimated coefficients referring to the control variables resulting from the year-wise estimations as well as the reasonable signs of the estimated coefficients underline the credibility of the evidence we found with respect to the Internet usage coefficient.

Second, 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.4. 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.

Third, 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. In Table 2, we show 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 Appendix A.6. 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 where 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 amount of 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. For the econometric analysis we use a rich and representative data set consisting of six surveys of individuals being eligible to vote in Germany and covering the time period 2001 to 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 gained prominence.

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. There might be several explanations for this phenomenon: due to information overload it has become more difficult to retrieve relevant and reliable information from the Internet; the supply of entertainment on the Internet as well as social media content have tremendously increased over time; the group of individuals using the Internet has become more heterogeneous, just to name a few possible candidates. The results imply that factual and neutral reporting is more important than ever, and so is Internet and media literacy. Building up Internet and media literacy as an integral part of school education and improving the communication of research results to the public via traditional as well as via social media as part of publicly funded research are possible measures. The law against hate speech (Network Enforcement Act) introduced in Germany in 2018 aims at preventing misinformation in the Internet and at contributing to factual and neutral communication. The evaluation of such measures and their effects on political ignorance may be the subject of future research.

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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 section A.2 for a detailed description.
- *Age* is the age of the individual and is measured in ten 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 categorial variable measuring the intensity of interest in politics in five categories, where 1 means very low interest in politics and 5 very high interest in politics.
- *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 Constructing an Index of Internet Usage

In the surveys underlying the data sets of Forschungsgruppe Wahlen, individuals are asked about their current usage of the Internet. However, the variables measuring the Internet usage by individuals are not contained in the same data set as all the other variables. Although these variables are collected at the individual level in the same survey, they are not published, neither on the Internet nor upon request. Only aggregate information about the Internet usage is published in quarterly reports.¹⁴ These reports contain the ratios of people using the Internet in different subgroups of the dataset (for example, in the report, we see the ratio of Internet users in the group of people from our data set having a college degree). Hence, considering the people with a college degree in our data set, we exactly know the ratio of Internet users in this subsample. Since each individual is a member of many subgroups, for each of which we know the ratios of Internet users, we can calculate an individual probability of Internet usage by using information from Internet usage in many subgroups. In every report published by Forschungsgruppe Wahlen, the ratio of Internet users is presented for 25 characteristics on average. In the following, we describe a procedure of reconstructing the Internet usage probability at the individual level.

Let D be a dummy variable taking the value one if the individual is using the Internet and zero otherwise. Hence, the expected value of D for an individual i is equal to the probability that i is using the Internet. Furthermore, we denote Q as the quarter, in which i was observed. We emphasize the conditioning on Q in the following as the calculations are conducted quarter-wise due to quarterly internet usage reports. Let c_l (for $l = 1, \dots, L$) be one of L characteristics that i may either have ($c_{li} = 1$) or not. To employ a linear CEF model to calculate individual Internet usage probabilities we first need to characterize the covariance structure of the dummies c_l and D . Denote $c := (c_1, \dots, c_L)$. Then:

$$\text{cov}(c_1, \dots, c_L, D|Q) = \begin{pmatrix} \Sigma_{cc|Q} & \Sigma_{Dc|Q} \\ \Sigma_{cD|Q} & \Sigma_{DD|Q} \end{pmatrix}$$

The objects $\Sigma_{cc|Q} = \text{cov}(c_1, \dots, c_L|Q)$ and $\Sigma_{DD|Q} = \text{var}(D|Q)$ can readily be estimated. For the remaining object, we need some rearrangements first. By using the law of iterated expectations, we can write $\Sigma_{cD|Q} = (\Sigma_{Dc|Q})^t$ as:

$$\begin{aligned} \Sigma_{cD|Q} &= E[cD|Q] - E[c|Q]E[D|Q] \\ &= E[E[cD|Q, c]] - E[c|Q]E[D|Q] \\ &= E[cE[D|Q, c]] - E[c|Q]E[D|Q] \end{aligned}$$

Since we observe the sample version of $E[D|Q, c_l]$ as well as $E[c|Q]$ and $E[D|Q]$ in the quarterly reports as well as in the main data set, we can estimate $\Sigma_{cD|Q}$.

¹⁴We used the documents by Forschungsgruppe Wahlen (2001a,b,c,d, 2002a,b,c,d, 2003a,b,c,d, 2004a,b,c,d, 2010a,b,c,d, 2014a,b,c,d).

Now denote $\check{c} = (1, c)$ and consider:

$$E[D|c, Q] = \check{c} * \gamma + \varepsilon$$

where $\gamma = (\gamma_0, \gamma_1, \dots, \gamma_L)^t$ is the vector of coefficients and ε is some error term. Let $\mu_{D,Q}$ be the population mean of D in quarter Q and $\mu_{c,Q}$ be the population mean vector of characteristics in quarter Q . Using this, we estimate Internet usage probability by:

$$\hat{D} = \mu_{D,Q} + \Sigma_{Dc|Q} \Sigma_{cc|Q}^{-1} (c - \mu_{c,Q})$$

where \hat{D} is the predicted value of the Internet usage. As Hansen (2017, p. 30) points out, "the linear CEF model [which we employ here] is empirically unlikely to be accurate unless x [(in our case \check{c})] is discrete and low-dimensional so all interactions are included". Hence, the low-dimensional and discrete vector of characteristics we use, give justice to work with the CEF model in this case and should yield appropriate results.

A.3 OLS Estimations - Main Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Weighted Index b/se	Weighted Index b/se	Weighted Index b/se	Weighted Index b/se	Weighted Index b/se	Weighted Index b/se	Unweighted Index b/se
Internet Usage	-3.075*** (0.16)	-0.436*** (0.12)	-9.593*** (0.53)	-2.883*** (0.52)	-0.462*** (0.12)	-2.618*** (0.52)	-2.632*** (0.51)
D. 2002	3.026*** (0.18)	3.150*** (0.16)	4.972*** (0.40)	4.446*** (0.37)	7.467*** (0.76)	8.057*** (0.81)	5.650*** (0.79)
D. 2003	-2.934*** (0.18)	-2.615*** (0.17)	-2.610*** (0.45)	-2.730*** (0.41)	-5.475*** (0.83)	-5.543*** (0.90)	-5.868*** (0.89)
D. 2004	-1.891*** (0.16)	-1.865*** (0.15)	-1.919*** (0.39)	-2.189*** (0.36)	-4.055*** (0.70)	-4.265*** (0.77)	-4.020*** (0.78)
D. 2010	-2.809*** (0.16)	-2.897*** (0.14)	-6.748*** (0.31)	-4.000*** (0.29)	-8.647*** (0.63)	-9.449*** (0.67)	-7.092*** (0.67)
D. 2014	-1.795*** (0.16)	-1.721*** (0.15)	-5.796*** (0.41)	-3.964*** (0.36)	-3.510*** (0.70)	-5.564*** (0.78)	-3.623*** (0.81)
D. 2002 & Int. Use			-3.099*** (0.71)	-2.379*** (0.66)		-1.766** (0.65)	-1.300* (0.63)
D. 2003 & Int. Use			1.286 (0.73)	0.828 (0.68)		0.463 (0.67)	0.395 (0.66)
D. 2004 & Int. Use			2.262*** (0.65)	1.291* (0.61)		1.023 (0.60)	1.201* (0.60)
D. 2010 & Int. Use			8.285*** (0.55)	2.585*** (0.53)		2.255*** (0.53)	2.212*** (0.52)
D. 2014 & Int. Use			8.326*** (0.65)	4.129*** (0.59)		3.895*** (0.58)	4.038*** (0.59)
Interest Pol.		-3.308*** (0.05)		-3.276*** (0.05)	-3.859*** (0.14)	-3.835*** (0.14)	-3.859*** (0.14)
D. 2002 & Interest Pol.					-1.263*** (0.20)	-1.146*** (0.20)	-0.755*** (0.20)
D. 2003 & Interest Pol.					0.855*** (0.22)	0.889*** (0.22)	0.948*** (0.21)
D. 2004 & Interest Pol.					0.662*** (0.19)	0.661*** (0.19)	0.701*** (0.19)
D. 2010 & Interest Pol.					1.687*** (0.17)	1.642*** (0.17)	1.124*** (0.17)
D. 2014 & Interest Pol.					0.549** (0.18)	0.514** (0.18)	0.018 (0.19)
Affinity to Party		-0.933*** (0.02)		-0.923*** (0.02)	-0.930*** (0.02)	-0.921*** (0.02)	-1.037*** (0.02)
Economic Status		-0.649*** (0.07)		-0.671*** (0.07)	-0.651*** (0.07)	-0.670*** (0.07)	-0.707*** (0.07)
Formal Education		-0.278*** (0.04)		-0.193*** (0.04)	-0.271*** (0.04)	-0.191*** (0.04)	-0.259*** (0.04)
Profession		-0.519*** (0.03)		-0.471*** (0.03)	-0.524*** (0.03)	-0.486*** (0.03)	-0.529*** (0.03)
Age		0.551*** (0.02)		0.454*** (0.02)	0.541*** (0.02)	0.459*** (0.02)	0.455*** (0.02)
West/East		-1.258*** (0.09)		-1.121*** (0.09)	-1.232*** (0.09)	-1.107*** (0.09)	-1.111*** (0.09)
Female		2.935*** (0.08)		2.891*** (0.08)	2.923*** (0.08)	2.887*** (0.08)	3.148*** (0.08)
Persons in Household		-0.431*** (0.04)		-0.405*** (0.04)	-0.435*** (0.03)	-0.413*** (0.04)	-0.436*** (0.04)
Religion		-1.110*** (0.09)		-1.037*** (0.09)	-1.090*** (0.09)	-1.028*** (0.09)	-1.031*** (0.09)
Union Membership		-0.582*** (0.10)		-0.627*** (0.10)	-0.572*** (0.10)	-0.613*** (0.10)	-0.623*** (0.10)
Observations	108594	108594	108594	108594	108594	108594	108594

Table 2: * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$. Constant included in all regressions.

A.4 OLS Estimations - Index from Constant Questions

	(1)	(2)	(3)	(4)	(5)	(6)
	Const. Q.	Const. Q.				
	Index	Index	Index	Index	Index	Index
	b/se	b/se	b/se	b/se	b/se	b/se
Internet Usage	-2.367*** (0.14)	-0.693*** (0.12)	-8.343*** (0.47)	-4.455*** (0.47)	-0.646*** (0.12)	-4.099*** (0.46)
D. 2002	-0.158 (0.15)	-0.067 (0.14)	-0.007 (0.34)	-0.354 (0.33)	-0.996 (0.69)	-1.320 (0.75)
D. 2003	-1.289*** (0.16)	-1.068*** (0.15)	-1.455*** (0.39)	-1.561*** (0.37)	-4.463*** (0.74)	-4.832*** (0.80)
D. 2004	-0.172 (0.15)	-0.141 (0.14)	-0.144 (0.37)	-0.323 (0.35)	-1.306 (0.68)	-1.466* (0.75)
D. 2010	-0.279* (0.14)	-0.306* (0.13)	-3.607*** (0.28)	-1.936*** (0.27)	-2.231*** (0.60)	-3.460*** (0.65)
D. 2014	-3.521*** (0.12)	-3.419*** (0.12)	-7.332*** (0.27)	-6.283*** (0.25)	-11.558*** (0.53)	-14.105*** (0.57)
D. 2002 & Int. Use			0.616 (0.61)	1.177* (0.59)		1.099 (0.58)
D. 2003 & Int. Use			2.007** (0.63)	1.885** (0.60)		1.466* (0.59)
D. 2004 & Int. Use			1.985*** (0.60)	1.506** (0.57)		1.333* (0.56)
D. 2010 & Int. Use			7.222*** (0.49)	3.902*** (0.48)		3.572*** (0.47)
D. 2014 & Int. Use			7.819*** (0.49)	5.562*** (0.47)		5.292*** (0.46)
Interest Pol.		-2.080*** (0.05)		-2.055*** (0.05)	-2.852*** (0.13)	-2.799*** (0.13)
D. 2002 & Interest Pol.					0.294 (0.19)	0.309 (0.18)
D. 2003 & Interest Pol.					1.018*** (0.20)	1.035*** (0.20)
D. 2004 & Interest Pol.					0.364* (0.18)	0.369* (0.18)
D. 2010 & Interest Pol.					0.590*** (0.16)	0.514** (0.16)
D. 2014 & Interest Pol.					2.345*** (0.14)	2.278*** (0.14)
Affinity to Party		-0.745*** (0.02)		-0.735*** (0.02)	-0.745*** (0.02)	-0.735*** (0.02)
Economic Status		-0.350*** (0.06)		-0.368*** (0.06)	-0.345*** (0.06)	-0.362*** (0.06)
Formal Education		-0.122*** (0.03)		-0.025 (0.03)	-0.125*** (0.03)	-0.031 (0.03)
Profession		-0.435*** (0.03)		-0.393*** (0.03)	-0.439*** (0.03)	-0.401*** (0.03)
Age		0.334*** (0.02)		0.241*** (0.02)	0.336*** (0.02)	0.250*** (0.02)
West/East		-0.536*** (0.08)		-0.408*** (0.08)	-0.520*** (0.08)	-0.396*** (0.08)
Female		2.150*** (0.07)		2.123*** (0.07)	2.145*** (0.07)	2.120*** (0.07)
Persons in Household		-0.307*** (0.03)		-0.284*** (0.03)	-0.304*** (0.03)	-0.283*** (0.03)
Religion		-0.633*** (0.08)		-0.568*** (0.08)	-0.624*** (0.08)	-0.564*** (0.08)
Union Membership		-0.210* (0.08)		-0.253** (0.08)	-0.188* (0.08)	-0.230** (0.08)
Observations	108594	108594	108594	108594	108594	108594

Table 3: * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$. Constant included in all regressions.

A.5 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.

	(1)	(2)	(3)	(4)	(5)	(6)
	Index	Index	Index	Index	Index	Index
	2001	2002	2003	2004	2010	2014
	b/se	b/se	b/se	b/se	b/se	b/se
Internet Usage	-2.053** (0.79)	-2.960*** (0.75)	-1.979* (0.85)	-3.116*** (0.57)	-0.464*** (0.14)	1.963*** (0.44)
Age	0.212* (0.09)	0.194* (0.09)	0.346*** (0.10)	0.051 (0.07)	0.268*** (0.04)	0.324*** (0.06)
Age & Female	0.585*** (0.10)	0.792*** (0.10)	0.461*** (0.11)	0.498*** (0.08)	0.298*** (0.06)	0.509*** (0.08)
West/East	-1.398*** (0.27)	-1.115*** (0.28)	-1.148*** (0.30)	-1.071*** (0.23)	-1.061*** (0.17)	-0.730*** (0.21)
Interest in Politics	-3.763*** (0.15)	-4.645*** (0.16)	-3.227*** (0.18)	-3.261*** (0.13)	-2.446*** (0.10)	-3.335*** (0.13)
Economic Status	-1.096*** (0.21)	-0.861*** (0.19)	-0.983*** (0.21)	-0.358* (0.16)	-0.188 (0.11)	-1.273*** (0.16)
Female	-0.646 (0.64)	-1.482* (0.65)	-0.271 (0.70)	-0.450 (0.56)	0.191 (0.43)	-0.380 (0.63)
Formal Education	-0.224 (0.11)	-0.262* (0.12)	0.014 (0.15)	0.146 (0.11)	-0.158* (0.07)	-0.321*** (0.08)
Profession	-0.308** (0.11)	-0.650*** (0.11)	-0.370*** (0.11)	-0.543*** (0.08)	-0.370*** (0.06)	-0.630*** (0.08)
Union Membership	-0.220 (0.28)	-1.070*** (0.30)	-1.456*** (0.30)	-0.472 (0.25)	-0.492** (0.19)	-0.210 (0.19)
Religion	-1.411*** (0.26)	-1.207*** (0.27)	-1.017*** (0.29)	-0.822*** (0.23)	-0.885*** (0.16)	-0.848*** (0.19)
Affinity to Party	-1.040*** (0.06)	-1.334*** (0.06)	-0.597*** (0.07)	-0.819*** (0.05)	-0.737*** (0.04)	-0.998*** (0.04)
Persons in Household	-0.319** (0.10)	-0.311** (0.10)	-0.529*** (0.11)	-0.285*** (0.09)	-0.304*** (0.06)	-0.519*** (0.08)
Constant	30.184*** (0.97)	37.619*** (1.00)	23.904*** (1.14)	25.577*** (0.85)	19.043*** (0.56)	25.774*** (0.94)
N	15033	17209	10160	15199	30868	20125
R^2	0.163	0.196	0.143	0.161	0.090	0.182

Table 4: * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$

A.6 Weights and Indifference Share

The following graph shows the relationship between the weight assigned to a question and the share of individuals which were indifferent about this question. Each point corresponds to one single question.

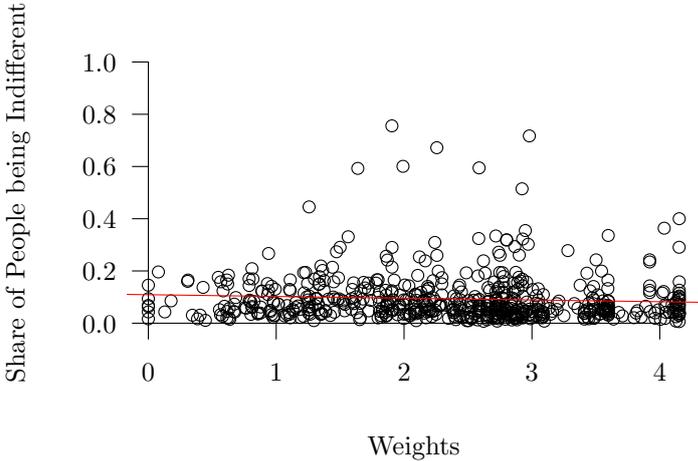


Figure 4: Each point corresponds to a single question. The estimated regression line in the figure has a slope which is not significantly different from zero.



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