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Bundesbank online pilot survey on consumer expectations

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Technical Paper

Bundesbank online pilot survey on consumer expectations

01/2020

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Non-technical summary

In 2019, the Bundesbank commissioned an Online Pilot Survey on Consumer Expectations (BOP-HH). The main objective of the survey was to elicit consumers' expectations regarding inflation, the development of house prices and rents, as well as interest rates on savings accounts and loans. The survey also collected information on whether consumers owned any real estate or planned to buy real estate. In addition, respondents were asked about their past and planned expenditures for a range of possible purchases, regular payments, and investments. A further aim of the survey was to develop a tool to collect information on topical policy issues in a timely manner.

The BOP-HH was carried out in Germany over three waves between April and June 2019, eliciting responses from 4,077 respondents in a total of 6,652 interviews, i.e. with some respondents interviewed in more than one wave, thus introducing a panel component to the survey. The survey was conducted online but the respondents were recruited offline. This paper presents details on the methodology of the survey and discusses the advantages and disadvantages of the survey design.

The advantages of conducting the survey online are that field periods are short, responses are stored directly, data editing requirements are minimal, and data are available almost immediately after the conclusion of the field period, all of which is even more important during adverse conditions as during the height of the corona crisis. A further advantage of conducting the BOP-HH online is that randomised controlled trials, which are particularly advantageous for analysing the effect of policy measures, can be easily implemented in the online setting. Additionally, the BOP-HH covers 398 out of 401 German districts, which represents broader geographical coverage than that achieved by face-to-face surveys. However, analyses at the level of Federal states, counties or even districts are currently limited by the relatively low number of observations at these disaggregate levels. The advantage of the BOP-HH's broader geographical coverage can therefore only be utilised over time if more waves can be pooled or if sample sizes can be increased. Similarly, the panel component of the sample provides initial insight into whether individuals revise their expectations. Only longer time series, however, would allow policy concerns, such as the anchoring of inflation expectations, or methodological issues, such as learning of panel respondents, to be addressed in more detail.

The main disadvantage of conducting a survey online is that individuals who do not regularly use the internet are less likely to be included in the survey sample. The sample is therefore only representative of the population with a greater affinity for the internet. The BOP-HH addresses this issue by reverting to initially recruiting respondents offline, via the telephone. This helps to mitigate the effect of the non-randomness of non-response to the survey, but does not resolve it. This paper shows that, compared to the general population, older female respondents and respondents with lower educational attainment are especially underrepresented in the BOP-HH. This selection bias cannot be fully offset by recruiting respondents offline.

Nichttechnische Zusammenfassung

Im Jahr 2019 gab die Bundesbank eine Online-Pilotstudie zu den Erwartungen privater Haushalte (BOP-HH) in Auftrag. Hauptziel der Erhebung war es, die Erwartungen der Haushalte in Bezug auf die Inflation, die Entwicklung der Wohnimmobilienpreise und Mieten sowie die Zinsen auf Spareinlagen und Kredite zu ermitteln. Ferner wurden Daten darüber erhoben, ob die Haushalte Immobilien besitzen oder erwerben möchten. Zudem wurden die Befragten nach ihren bisherigen und geplanten Ausgaben für eine Reihe möglicher Anschaffungen sowie nach ihren regelmäßigen Zahlungen und Investitionen befragt. Ein weiteres Ziel der Befragung bestand darin, ein Instrument zu entwickeln, mit dem zeitnah Informationen zu aktuellen wirtschaftspolitischen Themen gesammelt werden können.

Die Pilotstudie BOP-HH wurde in Deutschland von April bis Juni 2019 in drei Erhebungswellen durchgeführt. Dabei gingen im Rahmen von insgesamt 6 652 Befragungen Antworten von 4 077 Teilnehmern ein, d. h., einige Befragte wurden mehrfach befragt, die Erhebung beinhaltet also eine Panelkomponente. Die Umfrage wurde online durchgeführt, aber die Befragten wurden offline rekrutiert. Im vorliegenden Beitrag werden Einzelheiten zur Erhebungsmethodik vorgestellt und die Vor- und Nachteile des Umfragedesigns erörtert.

Die Vorteile einer Online-Befragung liegen darin, dass die Feldzeiten kurz sind, die Antworten direkt gespeichert werden, die Anforderungen an die Datenaufbereitung minimal sind und die Daten nahezu unmittelbar nach Abschluss der Feldarbeit vorliegen. Unter widrigen Umständen wie etwa auf dem Höhepunkt der Corona-Krise sind diese Vorzüge umso wichtiger. Darüber hinaus bietet die BOP-HH den Vorteil, dass sog. „randomised control trials“, die für eine Analyse der Wirkung wirtschaftspolitischer Maßnahmen besonders hilfreich sind, leicht im Rahmen einer Online-Umfrage durchgeführt werden können. Zudem umfasst die Studie 398 der insgesamt 401 deutschen Landkreise. Der geografische Abdeckungsgrad ist damit höher als bei persönlichen Befragungen. Analysen auf der Ebene von Bundesländern, Regierungsbezirken oder gar Landkreisen werden aktuell jedoch durch die relativ geringe Anzahl an Beobachtungsdaten auf diesen disaggregierten Ebenen beeinträchtigt. Der Vorteil der umfassenderen geografischen Abdeckung der BOP-HH kann daher im Zeitverlauf nur dann genutzt werden, wenn mehrere Erhebungswellen gebündelt werden oder sich die Stichproben vergrößern lassen. Die Panelkomponente der Stichprobe gibt ihrerseits erste Aufschlüsse über eine mögliche Änderung der Erwartungen privater Haushalte. Eine genauere Untersuchung geldpolitischer Aspekte wie der Verankerung der Inflationserwartungen oder methodischer Fragen wie des Lernprozesses der Befragten wäre jedoch nur bei längeren Zeitreihen möglich.

Der größte Nachteil einer Online-Befragung besteht darin, dass Privatpersonen, die das Internet nicht regelmäßig nutzen, mit einer geringeren Wahrscheinlichkeit in der Stichprobe enthalten sind. Die Stichprobe ist daher nur für den Teil der Bevölkerung repräsentativ, der eine größere Affinität zum Internet aufweist. Diesem Problem wird Rechnung getragen, indem die Befragten zunächst offline per Telefon rekrutiert werden. Dies vermindert zwar den Effekt, der aus sich der Nicht-Zufälligkeit der Antwortausfälle ergibt, aber das Problem wird dadurch nicht gelöst. Das vorliegende Technical Paper zeigt, dass ältere Frauen und Personen mit niedrigerem Bildungsstand in der BOP-HH im Vergleich zur Gesamtbevölkerung besonders stark unterrepräsentiert sind. Diese Selektionsverzerrung lässt sich durch die Offline-Rekrutierung der Befragten nicht vollständig kompensieren.

Bundesbank Online Pilot Survey on Consumer Expectations*

Elisabeth Beckmann¹

Tobias Schmidt²

Abstract

The Bundesbank commissioned an online pilot survey on consumer expectations in 2019. This paper presents the methodology of the survey and evaluates its design. The survey proved to be a distinct asset in providing timely data on household expectations at a high frequency, allowing for flexible implementation of randomised controlled trials and analyses based on the panel dimension. One drawback of the survey is that there is likely a selection bias as the survey was conducted online and may not adequately represent the expectations of the offline population. This selection bias cannot be fully offset by recruiting respondents offline.

Keywords: online surveys, household expectations, survey methodology

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1. Introduction

In 2019, the Bundesbank commissioned an Online Pilot Survey on Consumer Expectations (BOP-HH). This paper describes the BOP-HH, its methodology, and its advantages and disadvantages. In particular, this paper presents an assessment of the selection bias in the online sample as well as other survey characteristics that may affect results. The paper does not present the results of the BOP-HH and, as such, does not discuss how, for example, different treatment of outliers affects results.¹ We also do not discuss the design of the survey in terms of question wording, response categories or filtering, which will be the subject of a follow-up wave of the BOP-HH to be conducted in spring 2020.

The BOP-HH was carried out between April and June 2019. In three waves, a total of 6,652 interviews with 4,077 respondents was conducted online. Respondents were randomly selected from an online panel recruited offline. The questionnaire focused on eliciting expectations regarding inflation in particular as well as the development of house prices and rents, but also regarding interest rates on savings and mortgages. An additional block of questions concentrated on whether respondents owned any real estate or planned to buy real estate. In addition, respondents were asked about their past and planned expenditures for a range of possible purchases, regular payments, and investments covering nine categories.

All surveys need to address the issue that non-response to surveys may not be random. This selection effect is typically stronger for online surveys. In order to mitigate the selection effect, the survey institute conducting the BOP-HH specifically targets groups that are more difficult to reach online by recruiting the access panel offline via telephone interviews. The respondents of the BOP-HH are then randomly selected from this offline recruited online panel. The BOP-HH sample is weighted to be representative of the online population but not the general population. Individuals who do not have internet access are not covered by the survey and there may be additional unobservable characteristics associated with the decision to opt into an online panel. Our analysis shows that, compared to the general population, older female respondents and respondents with lower educational attainment are especially underrepresented. This selection bias constitutes the main drawback of the BOP-HH. On the other hand, the regional coverage of the BOP-HH is excellent and broader than is usually the case for face-to-face surveys – a fact which is related inter alia to travel costs for interviewers. However, with the current sample size, some districts are represented by only a few respondents, limiting the current possibilities for analyses at a regionally disaggregate level.

A distinct advantage of conducting the survey online is that field periods are short, responses are stored directly, and data are available almost immediately with very little need for data editing. Thus, the BOP-HH is timelier than other surveys and is therefore appropriate for addressing topical policy issues. For some questions, however, offline

¹ For a summary of the initial results and a brief discussion of outliers, see <https://www.bundesbank.de/resource/blob/818958/372f4c2ddadc1e72f9e7437f554624e5/mL/2019-12-erwartungsbefragung-data.pdf>.

surveys are likely to be more reliable, for example if interviewers are prompted to confirm implausible answers, such as with regard to amounts, or if it is possible to contact respondents again and verify responses. For sensitive questions, conducting the survey online has been shown to be beneficial (Anderson et al., 2016).

The BOP-HH takes advantage of the fact that randomised controlled trials are implemented more easily in online surveys. These experiments yield valuable results that will be utilised for in-depth research and also provide insight regarding the phrasing of questions and response categories in future surveys.

The panel dimension of the BOP-HH has proven to be an asset as it allows insight into whether respondents revise their expectations from one survey wave to the next. Another dimension, which is also relevant from a methodological point of view and could be tackled with longer time series, is understanding the extent to which learning plays a role in the responses from panel members.

The BOP-HH is not the first survey on consumer expectations in Germany. The GfK regularly conducts a consumer survey on behalf of the European Commission that includes questions on consumer expectations.² The Bundesbank's Panel on Household Finances also features questions on consumer expectations. Compared to the PHF and other surveys, the BOP-HH is much less comprehensive but is timelier, which is particularly relevant for policy-oriented research with respect to expectations.

After evaluating the BOP-HH pilot survey, the Bundesbank decided to conduct a regular monthly survey (Bundesbank Online Panel) starting in late 2020 for a duration of up to four years. This survey will also be conducted online and – bearing in mind the advantages and disadvantages of this survey mode – will serve to complement, and not substitute, the Bundesbank's other ongoing surveys.

² Data from the GfK survey are not publicly available. By contrast, the Bundesbank is committed to providing microdata access to external researchers. Furthermore, the BOP-HH allowed external researchers to propose questions and research projects.

2. Methodology

Table 1 provides an overview of the methodological framework of the BOP-HH. The following sections provide more detail on the sampling, questionnaire design and content, fieldwork, and weighting.

Table 1: Methodological framework at a glance

Geographical scope	Germany
Target population	Individuals aged 16 years or older with internet access
Survey company	forsa
Sampling frame	forsa.omninet panel, recruited offline from forsa.omnitel
Sample	6,652 observations in 3 waves Wave 1: 2,009, Wave 2: 2,052, Wave 3: 2,591
Panel sample	<ul style="list-style-type: none"> - 539 respondents who participated in all 3 waves - 1,497 respondents who participated in at least 2 waves - 2,041 respondents who participated in only 1 wave
Reference period	April to June 2019
Questionnaire	<p>Designed by the Bundesbank and external researchers, using some questions from international surveys on consumer expectations.</p> <p>13 core questions and varying number of specific questions:</p> <ul style="list-style-type: none"> - Wave 1: 14 non-core questions, total 27 questions - Wave 2: 15 non-core questions, total 28 questions - Wave 3: 15 non-core questions, total 28 questions - Plus socio-demographics and feedback questions - Paradata automatically recorded by forsa - Experiments and sample splits <p>Final questionnaires can be downloaded here: https://www.bundesbank.de/en/bundesbank/research/pilot-survey-on-consumer-expectations/bundesbank-online-pilot-survey-on-consumer-expectations-794568</p>
Fieldwork	<p>Standalone survey, not part of forsa omnibus survey</p> <p>Duration of waves: 9 to 15 days</p> <p>Average interview duration: 18 minutes</p>
Fieldwork period	<p>Wave 1: 30 April – 8 May</p> <p>Wave 2: 29 May – 10 June</p> <p>Wave 3: 19 June – 3 July</p>
Pre-test	<ul style="list-style-type: none"> - Among Bundesbank employees: approx. 450 respondents - Conducted by forsa before wave 1: approx. 50 respondents - Conducted by forsa before wave 2: approx. 40 respondents - Conducted by forsa before wave 3: approx. 50 respondents
Contact strategy	Recruitment for forsa.omninet panel by telephone
Survey mode	<p>Invitation to participate in the BOP-HH by email</p> <p>Computer-assisted web interviewing (CAWI)</p> <p>No option of going back and correcting responses</p> <p>Soft-prompt: “Do not know” and “No response” response options are shown after respondent clicks “Proceed” without having answered the question. It is not possible to proceed without answering.</p>
Incentives for participation	100 bonus points from forsa reward system
Survey language	German
Documents used during interviews	Respondents can use documents or devices to answer questions, feedback collects information on what help/aids were used.
Response rate	<p>AAPOR response rate 1</p> <ul style="list-style-type: none"> - Wave 1: 59.7% - Wave 2: 58.9% - Wave 3: 62.5%
Weighting	Post-stratification weights account for age, gender, region and educational attainment based on forsa.omnitel target population. No trimming of weights
Editing and consistency checks	Post-interview consistency checks, minor data edits by forsa regarding coding of missing values
Data availability	<p>Application for data access via</p> <p>https://www.bundesbank.de/en/bundesbank/research/rdsc/data-access</p>

2.1. Survey mode and sampling

The BOP-HH was conducted using computer-assisted web interviewing (CAWI), which allows for short field periods and fast data processing and thus also for a high survey frequency. CAWI also allows for complex filtering and randomisation; experiments can be implemented easily and adaptations can be realised flexibly. Furthermore, online surveys are less costly than face-to-face surveys, especially if broader geographical coverage is to be achieved.

In contrast to face-to-face interviews in particular, population coverage and sampling pose a challenge in online surveys. Many online panels are characterised by selection biases, for instance because panellists opt in themselves. People who sign up for a panel unprompted are very likely to differ from other individuals in many respects. One possibility for reducing this bias is to recruit panellists offline.

The target population of the BOP-HH were individuals aged 16 years or older with internet access living in Germany. The survey was conducted within the framework of forsa.omninet, an offline recruited online panel. Respondents were recruited by telephone during the forsa.omnitel survey, which constitutes a representative sample of the German-speaking population³ aged 14 years or older. Respondents participating in the telephone survey were asked whether they would be willing to participate in online surveys. The advantage of this offline recruitment is that the online survey then also includes respondents who do not spend a lot of time on the internet. Recruiting the online panel offline thus allows the online selection bias to be reduced. In total, the forsa.omninet panel currently consists of 75,000 individuals.

The BOP-HH was conducted partially as a panel so that the persistence of expectations and their development could be investigated. It was not part of the forsa omnibus survey, but conducted as a standalone survey.

For the BOP-HH, the target sample was 2,000 respondents for waves 1 and 2, and 2,500 respondents for wave 3. The gross sample was drawn using random sampling from the forsa.omninet database, with quotas for age, gender and educational attainment. Table 2 describes the “gross sample” – the number of invitations to participate in the survey that were sent out. Survey invitations could be sent more than once during the field phase of each survey wave, and invitations could later be targeted at specific socio-demographic groups to match the socio-demographic quota of the target population. From wave 2 onwards, the waves consisted of both new respondents as well as respondents who participated in the previous waves. In wave 3, the targeted number of respondents was increased from 2,000 to 2,500.

³ Given that the frame for drawing the sample only includes German-speaking respondents, the BOP-HH only covers the German-speaking population with internet access. It is not easy to assess the biases induced by this restriction, but it is perceivable that the non-German-speaking population is larger in bigger cities.

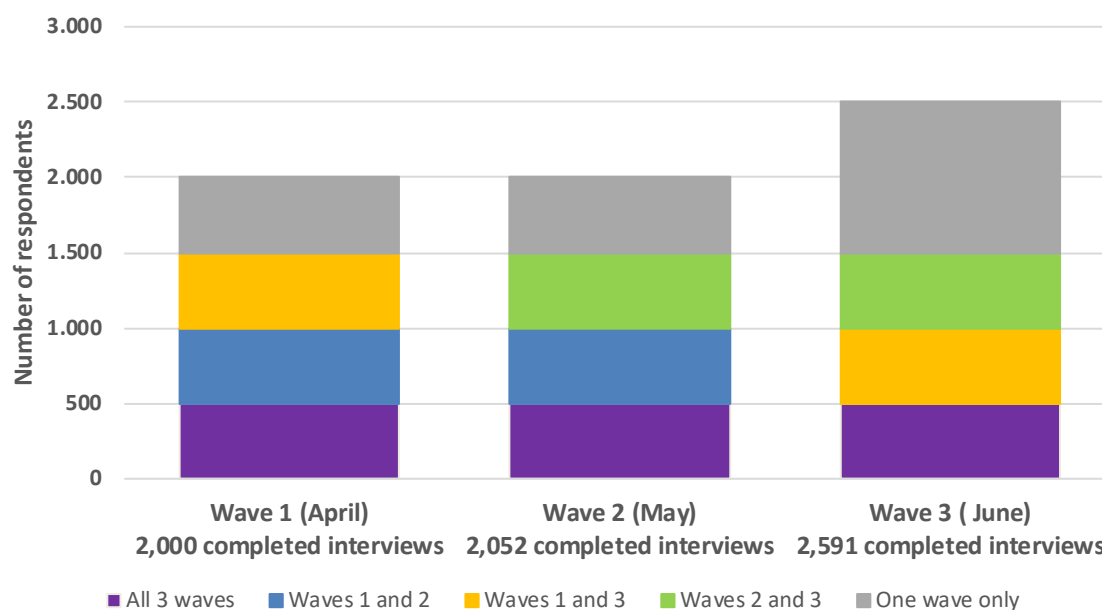
The invitation specified that the survey would focus on issues concerning the economy and society. Panel respondents received the same invitation as newly drawn respondents. The link to participate in the survey was open only for a limited period of time. The incentive to participate was 100 bonus points for the forsa reward system.⁴

Table 2: Overview of gross sample – survey invitations by wave

	Wave 1	Wave 2	Wave 3
Fresh sample	3,367	2,018	1,781
Panel sample wave 1		1,465	735
Panel sample waves 1 and 2			901
Panel sample wave 2			729
Total	3,367	3,483	4,146

Figure 1 shows the number of completed interviews by wave and illustrates the panel structure of the survey. In total, the final data comprise 6,652 completed interviews with 4,077 individuals.

Figure 1: Sample structure and panel components



⁴ These points accumulate over different surveys in which respondents participate and can be redeemed for various small items. The equivalent monetary value of 100 points is approximately €1.

2.2. Questionnaire design and content

The questionnaires⁵ consist of a set of core questions and varying modules of questions that were proposed by researchers to answer specific research questions. As a result, not all of the questions were included in all three waves. Table 3 provides an overview of which questions were asked in which waves – as indicated by the question number. Furthermore, it shows whether these questions were part of the core questionnaire or part of specific research projects.

The questionnaire focuses on eliciting expectations and the relevant control variables to understand expectation formation. The first set of questions addresses current developments that affect the economy, including Brexit, the European elections, and climate change policies. An additional block elicits whether respondents own any real estate or are planning to buy real estate as well as the reasons for these decisions or plans. This is followed by the central block of questions on expectations regarding inflation, the development of house prices and rents, and the development of interest rates on savings and mortgages. Respondents are additionally asked about their past and planned expenditures for a range of possible purchases, regular payments, and investments covering a total of nine categories.

The Bundesbank opened up the BOP-HH for contributions from external researchers. The questions that were submitted by researchers to investigate specific research questions were positioned where appropriate, either after the core expectations questions or within the context of the other blocks of questions. Table A1 in the Annex lists the research projects; Table 3 shows which questions are associated with which project (for example, “Pro 14B”). At the end of the questionnaire, respondents are asked to provide feedback on the questionnaire and fill in socio-economic information including household size, labour market status, educational attainment and household income. Finally, forsa automatically records information on the region and the population of the respondent’s place of residence (in categories) and adds information on the respondent’s age and gender. Furthermore, some additional paradata are recorded, including the length of the interview, the device used to complete the interview (computer, tablet or smartphone), and the respondent’s experience with other surveys.

The consumer expectation questions are detailed and take into account different measurements as well as the experience and recommendations from other surveys, such as the Federal Reserve Bank of New York Survey of Consumer Expectations. The questions on inflation expectations are asked in qualitative (asking respondents to provide the direction of the change), quantitative (asking respondents to provide a point estimate) and probabilistic form (asking respondents to assess the probability that inflation will fall within a certain range by distributing points across categories). Surveys of inflation expectations differ in terms of question wording. While some use “prices in general” – see,

⁵ The questionnaires can be downloaded at <https://www.bundesbank.de/en/bundesbank/research/pilot-survey-on-consumer-expectations/bundesbank-online-pilot-survey-on-consumer-expectations-794568>.

for example, the Michigan Survey of Consumers and, in Germany, the PHF⁶ – other surveys just use “consumer prices” – for example, the European Commission’s GfK Survey in Germany – and a third group of surveys, including the New York Fed’s Survey of Consumer Expectations, uses “inflation”. Bruine de Bruin et al. (2012) show that questions about “inflation” lead to less dispersed responses than questions about “prices in general”. Furthermore, although the “inflation” wording is rated as more difficult (Bruine de Bruin et al., 2012), previous research has shown that respondents are able to provide a correct definition of inflation (Leiser and Dori, 2005). These findings are confirmed by a more recent comparative study by Bruine de Bruin et al. (2017), which shows that, for face-to-face surveys, responses to “inflation” questions are less dispersed than responses to “prices in general” questions. For online surveys, however, the opposite holds true. If respondents are given the opportunity to revise their answers, both online and face-to-face surveys show higher dispersion for “prices in general”. Bearing in mind these implications of question wording, the BOP-HH follows the New York Fed SCE and asks about “inflation”.

Expectations regarding the development of house prices and rents are also surveyed in qualitative, quantitative and probabilistic form. For interest rates on mortgages and saving accounts, the expectations regarding the development of interest rates are assessed in qualitative and quantitative form. Finally, expectations regarding general economic developments, in particular unemployment and rent expectations, are asked in qualitative form only.

Especially for the questions on expectations, the flexibility of online surveys was utilised. The sample was split randomly into different groups, which were then asked the same question in terms of content but with different wording. In addition, sample splits were applied depending on whether the respondents participated in the survey in only one, two or all three waves. The programming of the questionnaire does not allow respondents to go back and change any of their previous responses. This approach differs from that used in some other established surveys, such as the Michigan Survey of Consumers, where respondents who give more extreme answers (defined as inflation expectations of more than 5%) are explicitly asked whether they would like to revise their response. Previous research has shown that less able respondents tend to revise their answers more frequently than respondents with higher-level abilities, and that revision leads to more correct answers (Liu et al., 2015). This finding holds true for expectations (Bruine de Bruin et al., 2017). Not allowing respondents to revise their responses is therefore likely to lead to a higher dispersion of responses and also to more extreme responses. However, this design was necessary in order to implement information treatments and randomised controlled trials.

The questionnaire was programmed to use “soft prompts”: initially, respondents are not shown the options of answering with “Do not know” or “No answer”. Only if they click “Proceed” without having answered the question are they shown these two options. It is not possible to proceed to the next question without answering the question, i.e. respondents have to at least click “Do not know” or “No answer”. One reason for choosing this method

⁶ For details on the PHF survey, see Altmann et al. (2020) and von Kalckreuth et al. (2012).

was to encourage uncertain respondents to give a quantitative estimate of their expectations. This approach is in line with findings from the literature that suggest that survey design that encourages non-response may not succeed in collecting the full range of individuals' expectations (Bruine de Bruin et al., 2017).

The survey was programmed so that it automatically adapted to screen size and the device used, i.e. for some questions, subheadings were repeated for smartphone users so that respondents did not have to scroll to see the relevant part of the question. Thus, the survey design takes into account studies that showed that response quality for online surveys does not differ between smartphone and PC users provided that the survey is programmed to be optimised for smartphones (see, for example, Andreadis, 2015).

Before the questionnaires were fielded, comprehensive pretests were conducted. These pretests included a survey of Bundesbank employees on the intranet in which respondents were asked to provide detailed feedback. The questionnaire was subsequently adapted before the procurement process started.

After the final questionnaire was agreed upon between the Bundesbank and forsa, the questionnaires were programmed by forsa. Both forsa and Bundesbank employees tested the programmed questionnaires. Before each wave, additional pretests were carried out with around 50 respondents. Following the pretests, adjustments were made to the wording and filtering of questions. Additionally, explanations were provided in the questionnaire, and limits for certain fields in which respondents had to enter numbers were introduced.

Table 3: Structure of questionnaires across waves

Topic	Wave 1	Wave 2	Wave 3	Origin
Current policy issue	001	001	001	Core
Wave-specific policy issue	100	200	300	Core
Home ownership	002	002	002	Core
Intention to buy property	003A	003A	003A	Core
	003B	003B	003B	Core
Risk owning vs renting	101			Pro 03
Reason for not buying property		201A		Core
		201B		Core
Moving house			301	Pro 08
House price development			302	Pro 08
Expectations qualitative	004	004	004	Core
Inflation expectations other	102			Pro 12
Perception current house prices	103	205A		Pro 03
Perception future house prices	104			Pro 03
Perception future house prices	104			Pro 03
House price expectations probabilistic	105			Pro 03
	106			Pro 03
Rent expectations	107			Pro 03
	107			Pro 03
	107			Pro 03
House price expectations quantitative		202	303	Core
House price expectations probabilistic		203	304	Core
		204A	305A	Core
		204B	305B	Core
		204C	305C	Core
House price perception		205B		Core
House price information source			306	Pro 23
Inflation development			307	Core
Inflation expectations qualitative	005A	005A	005A	Core
Inflation expectations quantitative	005B	005B	005B	Core
Inflation expectations interval	108A			Pro 13
	108B1			Pro 13
	108B2			Pro 13
Inflation perception high/low	109			Pro 02
Preference higher inflation	110A			Pro 02
Preference lower inflation	110B			Pro 02
Inflation expectations probabilistic		207	308	Core
Inflation expectations min./max.		208	309	Pro 09
Inflation expectations		209	310	Pro 09
Interest rate expectations		210		Core
		211		Core
		212		Pro 02
		213A		Pro 02
		213B		Pro 02

Note: The numbers in columns "Wave 1", "Wave 2" and "Wave 3" indicate the number of the question in the respective questionnaire.

2.3. Field work

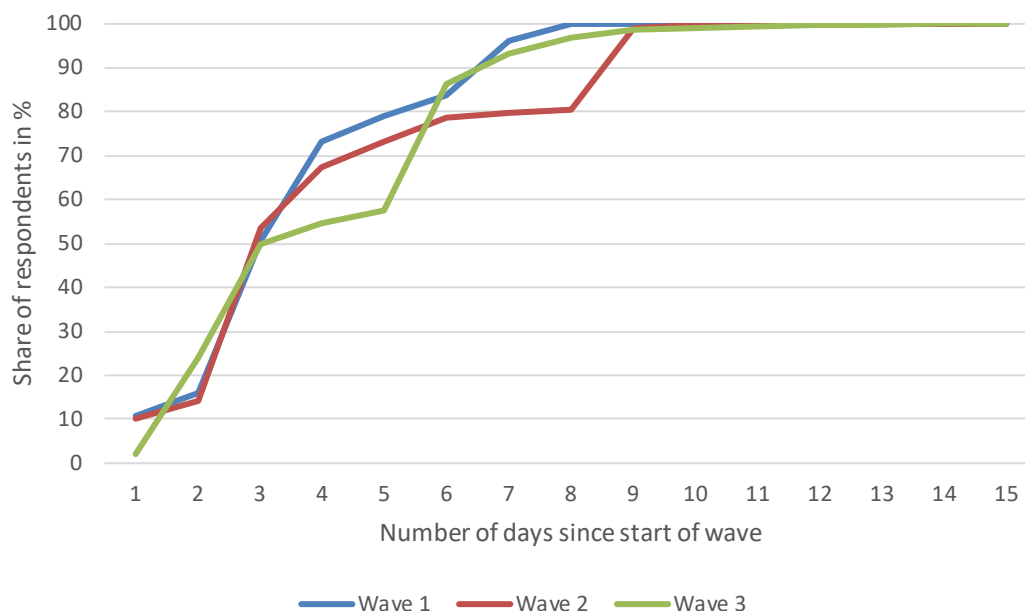
The three waves were conducted in three consecutive months. Table 4 shows the dates and durations of each wave. All three waves included normal working days, weekends and days that are public holidays in (parts of) Germany: 1 May, 30 May, 10 June and 20 June. The average interview duration hardly changed over the three waves.

Table 4: Timing and duration of field phase

Wave	Dates	Duration of wave	Median interview duration
Wave 1	30 April – 8 May 2019	9 days	19 minutes
Wave 2	29 May – 10 June 2019	13 days	18 minutes
Wave 3	19 June – 3 July 2019	15 days	18 minutes

Figure 2 illustrates the percentage of interviews completed over the duration of each wave. It shows that, in all three waves, there was a peak in response during the first few days and a second, less pronounced peak towards the end of the wave, when additional addresses were fielded.

Figure 2: Distribution of interviews over duration of wave



Turning from response to non-response, Table 5 shows how many individuals did not respond at all to the invitation to participate in the interview, how many clicked on the survey link but did not answer the first question, and how many started but did not complete the

interview. Non-response could be problematic if it is not random, but depends on variables that influence survey outcomes.

Comparing response and non-response indicators across waves shows that they are fairly stable. In particular, the response rate, defined as AAPOR response rate 1 (AAPOR, 2016),⁷ is stable across waves. It is very difficult to compare this response rate with other surveys as the survey mode influences the response rate (De Leeuw, 2005). However, comparing it with response rates from face-to-face surveys (see, for example, ECB, 2016) shows that the response rate in the BOP-HH is relatively high.

Table 5: Non-response and incomplete interviews

	Wave 1	Wave 2	Wave 3
Gross sample	3,367	3,483	4,146
No response to invitation	666	823	855
Responded but did not answer the first question	457	392	448
Responded but did not complete interview	235	216	252
Responded and completed interview	2,009	2,052	2,591
Response rate	60%	59%	62%

Furthermore, it is possible to distinguish between response rates for those who were invited to participate in only one wave and those who were invited to participate in more than one wave. Table 6 shows that the response rate for those who were invited to participate a second and/or third time in the survey is higher than for non-panel respondents. The higher response rate for panellists is observed for both panel waves. This finding is in line with response rates for cross-sectional and panel surveys from other countries, including the United States (Schoeni et al., 2013).

Table 6: Response rate of panel respondents

	Wave 2	Wave 3
Reinvited respondents who participated in wave 1 only	1,465	735
Reinvited respondents who participated in waves 1 and 2		901
Reinvited respondents who participated in wave 2		729
No response to invitation	464	791
Response rate	68%	67%

⁷ The AAPOR response rate 1 is defined as the number of complete interviews divided by the number of complete and incomplete interviews and the number of non-interviews (refusal plus non-contacts).

2.4. Weighting

Weights were constructed by forsa for each individual that completed the survey. The weights are constructed in such a way that the marginal distributions of age, gender, educational attainment and region resemble the data of the forsa.omnitel omnibus survey, representing the German online population aged 14 years or older. To calculate the target distributions for the calibration variables, the forsa.omnitel sample is restricted to individuals aged 16 or older with internet access.

Table 7 shows the target distribution across German Federal states to the unweighted and weighted sample distribution. Table 8 describes the target distribution for age, gender and region to that of the unweighted and weighted sample distribution. Table 9 presents the target distribution for educational attainment to that of the unweighted and weighted sample distribution. As sampling from the forsa.omninet panel contained elements of quota sampling, the difference between the weighted and unweighted samples is relatively small.

Table 7: Target versus sample distributions – Federal states

Federal state	Target forsa	Sample, unweighted	Sample, weighted
Schleswig-Holstein	3.6%	4.5%	3.6%
Hamburg	2.3%	2.6%	2.3%
Lower Saxony	9.8%	10.2%	9.8%
Bremen	0.8%	0.8%	0.8%
North Rhine-Westphalia	21.3%	20.7%	21.2%
Hesse	7.6%	8.6%	7.6%
Rhineland-Palatinate	4.8%	5.1%	4.8%
Baden-Württemberg	13.5%	12.0%	13.5%
Bavaria	16.3%	17.6%	16.3%
Saarland	1.1%	1.3%	1.1%
Berlin	4.5%	4.5%	4.5%
Brandenburg	2.9%	2.9%	2.9%
Mecklenburg-Vorpommern	1.8%	1.6%	1.8%
Saxony	4.7%	3.2%	4.7%
Saxony-Anhalt	2.6%	1.7%	2.6%
Thuringia	2.5%	2.8%	2.5%

Table 8: Target versus sample distributions – region, gender and age

Region / Gender / Age	Target forsa	Sample, unweighted	Sample, weighted
East / Female / 16-24	0.90%	0.6%	0.9%
East / Female / 25-34	1.60%	1.0%	1.6%
East / Female / 35-44	1.50%	1.3%	1.5%
East / Female / 45-59	2.70%	2.0%	2.7%
East / Female / 60+	2.60%	2.6%	2.6%
East / Male / 16-24	1.00%	0.5%	1.0%
East / Male / 25-34	1.70%	1.4%	1.7%
East / Male / 35-44	1.60%	1.7%	1.6%
East / Male / 45-59	2.80%	2.5%	2.8%
East / Male / 60+	2.50%	3.2%	2.5%
West / Female / 16-24	5.10%	2.4%	5.1%
West / Female / 25-34	6.70%	3.8%	6.7%
West / Female / 35-44	6.40%	4.7%	6.4%
West / Female / 45-59	11.70%	10.8%	11.7%
West / Female / 60+	9.8%	15.2%	9.8%
West / Male / 16-24	5.70%	2.9%	5.7%
West / Male / 25-34	7.10%	6.2%	7.1%
West / Male / 35-44	6.40%	5.9%	6.4%
West / Male / 45-59	11.90%	15.3%	11.9%
West / Male / 60+	10.1%	16.2%	10.1%

Table 9: Target versus sample distribution – educational attainment

Education	Target forsa	Sample, unweighted	Sample, weighted
Still attending school	3.8%	1.1%	3.5%
Secondary general school certificate (West)	26.0%	19.3%	22.2%
Intermediate school (West)	21.5%	35.6%	27.6%
University entrance qualification (West)	28.9%	27.9%	30.4%
Secondary general school certificate (East)	1.8%	1.3%	2.1%
Intermediate school (East)	9.0%	8.1%	9.6%
University entrance qualification (East)	6.5%	7.5%	7.4%
No information	1.7%	0.7%	0.6%

3. How well does the sample represent the target population?

The information on non-respondents in the gross sample is very limited, both in terms of refusals from respondents who participated in the forsa.omnitel survey but did not agree to become part of the forsa.omninet panel as well as in terms of respondents who are panellists of forsa.omninet but did not respond to the invitation to participate in the BOP-HH.⁸

Measures such as R-indicators, balance and distance measures used by previous research (for example, Schouten et al., 2009; Lundquist and Särndal, 2012) therefore cannot be computed, and our assessment focuses on a comparison between the respondent sample and the target population for those responses where there is an unbiased benchmark, namely socio-demographic characteristics.

As Table 8 and Table 9 show, the differences between the weighted and unweighted samples are quite small. We do not have information on how frequently forsa sent out invitations. However, it is likely that representativeness is achieved solely by resampling certain groups over the duration of the survey, i.e. resampling in order to meet the socio-demographic and regional quotas.⁹ The differences between the weighted and unweighted samples are therefore, by construction, quite small due to quota sampling. Nevertheless, there are some differences that are worth noting: women aged 45-59 are underrepresented both in eastern and western Germany, while women aged 44 or younger are overrepresented in western Germany but not in eastern Germany. Thus, the unweighted sample will be biased towards younger western German women. Similarly, comparing the target and unweighted samples shows that individuals with intermediate educational attainment living in western Germany are heavily overrepresented. Again, using unweighted data would imply that the results are biased, as it is known that educational attainment is correlated with expectations.

4. Who is missing from the target population?

While conducting the BOP-HH online has distinct advantages, this comes with the risk that the sample may be biased for two reasons: first, not all individuals have access to and use the internet on a regular basis. The literature has shown that online surveys are less “representative” of the general population compared to offline surveys (Anderson et al., 2016; Cornesse and Bosnjak, 2018).¹⁰ Second, some individuals who have internet access may be selected into the survey based on unobservable characteristics. As there is no directory of all internet users, the probability of internet users becoming survey respondents is unknown for self-recruited online panels. It is therefore not possible to correct this

⁸ It should be noted that, since the calibration target variables represent the online population, the unweighted sample of the BOP-HH survey shows non-response of the online population, which is likely a selection based on unobservable characteristics that are correlated with willingness to respond to online surveys.

⁹ The kinks in Figure 2 suggest that there were up to three “invitation stages” per wave.

¹⁰ The definition of “representative” here follows the traditional definition of mirroring “true” parameters (Kruskal and Mosteller, 1979).

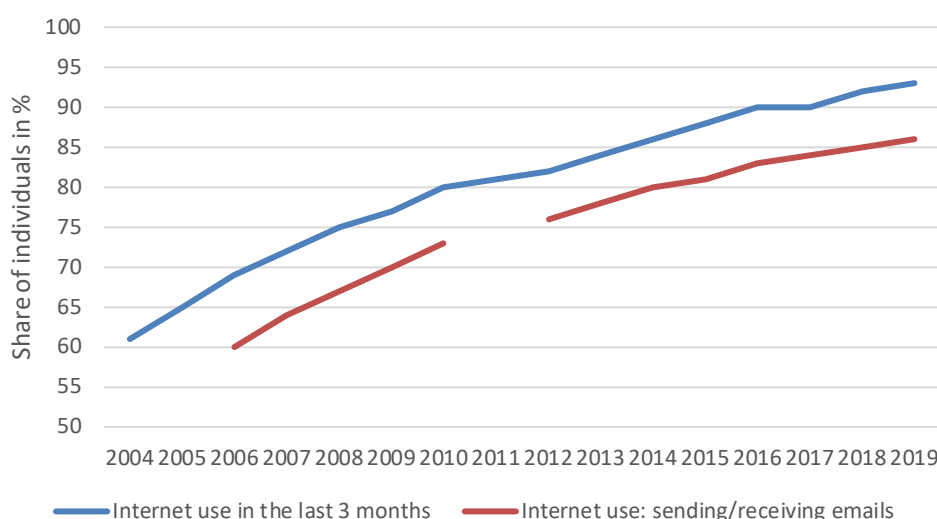
selection bias by weighting, and this results in biased results for traditional online panels. The forsa.omninet panel attempts to circumvent the latter problem by recruiting respondents via telephone. Nevertheless, an element of selection bias likely persists, as the respondents who agree to participate in the forsa.omninet panel display a certain affinity for surveys – they participated in the telephone survey before being asked to join the online panel. Therefore, it is important to critically assess how the respondents of the BOP-HH differ from the general population as well as from the online population and how these differences may affect results.

In order to assess which subgroups of the population are underrepresented in the forsa.omninet survey and to what extent the target population is therefore different from the general German population, we compare the forsa.omninet target population to microcensus data from the Federal Statistical Office.¹¹

4.1. Socio-demographic coverage

When the use of the internet to conduct surveys first gained momentum, research focused on the issue of the extent to which internet coverage was non-representative (Fricker et al., 2005). Figure 3 illustrates the development of internet use in Germany since 2004 and shows that the percentage of users increased from 61% in 2004 to 93% in 2019. Respondents of the BOP-HH need to have an email address, as survey invitations are sent by email. Email usage increased from 60% in 2006 to 86% in 2019.

Figure 3: The development of internet use in Germany

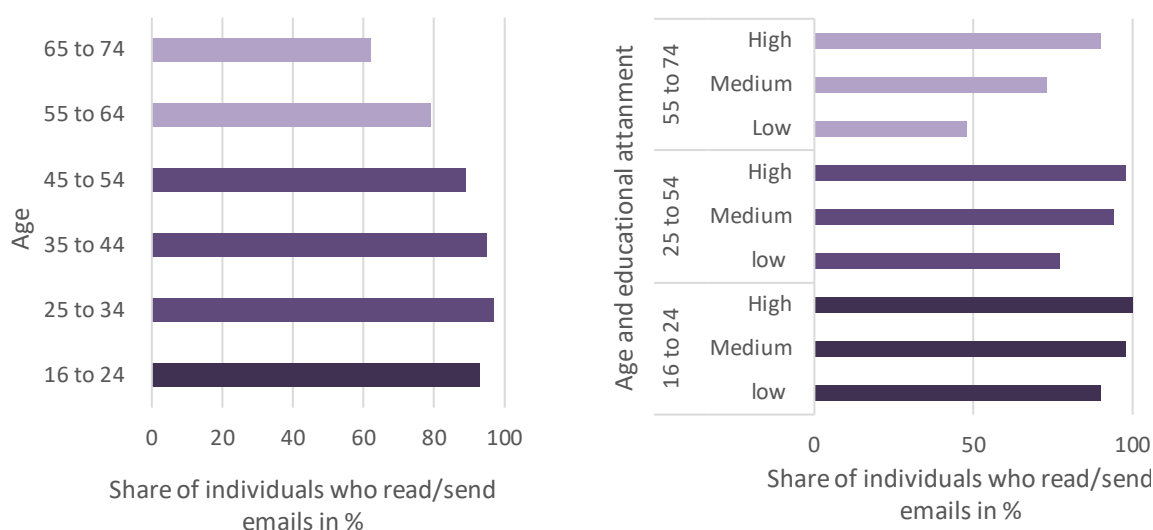


Source: Eurostat (online data code: isoc_ci_ifp_iu, isoc_ci_ac_i).

¹¹ See <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Wohnen/Tabellen/liste-haushaltsstruktur-art-wohnungsnutzung.html> or <https://www.destatis.de/EN/Themes/Society-Environment/Housing/Tables/liste-household-structure-tenure-status-dwelling-unit.html>, last accessed 29 October 2019.

Figure 4 illustrates heterogeneities amongst email account users. There is no information on email use amongst individuals who are more than 74 years old, but the figure illustrates that usage in general decreases with age: 62% of individuals aged 65-74 send and receive emails, while the usage rate amongst individuals aged 16-24 is 93%. Among younger individuals with higher educational attainment, email usage is almost universal. Less than 50% of individuals aged 55 to 74 with low educational attainment send and receive emails. Taken together, these figures show that, while “only” one in fifteen individuals in general will not be included in the survey, for some population groups, every second individual will not be covered by an online survey.

Figure 4: Internet use by age and educational attainment



Source: Eurostat (online data code: isoc_ci_ac_i).

Comparing the online population according to forsa with the general population according to the microcensus reveals a similar pattern. The last column in Table 10 shows the difference between the forsa online population and the general population according to the Microcensus. Negative numbers indicate that the respective group is underrepresented in the online population. Table 10 also shows that older individuals are underrepresented in the online population compared to the general population. This effect is stronger for women than for men. Younger individuals are overrepresented, but to a lesser degree than the underrepresentation of older individuals. More importantly, the comparison between the online population according to forsa and internet use according to Eurostat reveals that the underrepresentation of older individuals in the online population is much weaker than could be expected: according to Eurostat, 62% of individuals aged 65 to 74 read and send emails, which implies that 38% of individuals aged 65 to 74 among the general population are not represented in the online population. The difference that we observe between the online population and the general population for older individuals is, at 5 percentage points for women and 2 percentage points for men, much smaller.

Table 10: Online population versus general population – age and gender

Age	Online population according to forsa		Individuals registered at main residence aged 16 or older according to microcensus		Difference forsa-microcensus	
	Male	Female	Male	Female	Male	Female
16-24	0.060	0.067	0.058	0.053	0.002	0.014
25-34	0.083	0.088	0.078	0.073	0.005	0.015
35-44	0.079	0.080	0.073	0.071	0.006	0.009
45-59	0.144	0.147	0.139	0.139	0.005	0.008
60+	0.124	0.126	0.143	0.172	-0.019	-0.046

Table 11 compares the educational attainment of the online target population and the general population. Individuals with a secondary general school certificate are underrepresented in the online population by 5 percentage points, which is in line with Figure 4, which shows much lower internet usage amongst individuals with lower educational attainment. The magnitude of the underrepresentation according to the forsa online population is, again, lower than could be expected according to Eurostat.

Table 11: Online population versus general population – educational attainment

	Online population according to forsa	Individuals registered at main residence, aged 16 or older according to Microcensus	Difference forsa-Microcensus
Still attending school	0.038	0.026	0.012
Secondary general school certificate	0.278	0.331	-0.053
Intermediate school	0.305	0.286	0.019
University entrance qualification	0.354	0.315	0.039
No information	0.017	0.042	-0.025

Based on the BOP-HH, we cannot assess the extent to which the underrepresentation of older individuals, particularly women and those with lower educational attainment, in the online population compared to the general population will bias results. These underrepresented individuals could hold very different expectations. To obtain an idea of the possible bias, we draw on data from the European Commission's GfK Consumer Climate Survey, which is conducted by telephone. We compare inflation expectations for the groups that are underrepresented in the online population and those that are not. We use data from April 2019 to match the survey period of the BOP-HH. Table 12 presents the comparison of inflation expectations for the online and offline populations based on the GfK Consumer Climate Survey. Although there are differences in mean inflation expectations between the groups, the differences are not statistically significant. This provides one indication that the bias introduced by the BOP-HH online population could be minor.

However, the question wording in the GfK Consumer Climate Survey and the BOP-HH differs and we only look at one of many possible indicators that could vary between the online and offline populations. A robust analysis would require, for example, a mixed mode survey.

Table 12: Inflation expectations based on the GfK survey: do those who are not included in the BOP-HH hold different expectations to those who are included?

	Respondents	Min.	Median	Mean	Max.	Mann-Whitney test
	All	0.10	3.00	4.39	69.00	
A	Aged < 60	0.10	3.00	4.53	69.00	H0: A = B
B	Aged 60+	0.20	3.00	4.11	60.00	z = 0.635, p = 0.526
C	Female, aged < 60	0.10	3.00	5.31	69.00	H0: C = D
D	Female, aged 60+	0.20	3.00	4.59	60.00	z = -0.052, p = 0.959
E	Male, aged < 60	0.10	3.00	3.79	50.00	H0: E = F
F	Male, aged 60+	0.20	3.00	3.58	20.00	z = 0.946, p = 0.344
G	Education ≤ secondary	0.10	3.00	4.66	69.00	H0: G = F
H	Education ≥ intermediate	0.10	3.00	4.33	60.00	z = -0.103, p = 0.917

4.2. Subnational population and geographical area coverage

We now turn to subnational population and geographical area coverage. Are there Federal states that are underrepresented in the sample in terms of their populations? Are some areas of Germany not covered? Table 13 compares the forsa.omnitel target for the Federal states with data on the number of individuals registered at the main residence aged 16 or older according to the Microcensus from the Federal Statistical Office. The values represent the share of each Federal state in the total German population aged 16 years or older. The third column shows the difference between the forsa target and the microcensus, with negative values indicating that the respective Federal state is underrepresented in the forsa target. North Rhine-Westphalia is the most underrepresented Federal state in relative terms, whereas Bavaria is comparatively overrepresented. Deviations, however, are small at 0.4 and 0.7 percentage point respectively.

Combining regional and gender distributions,

Table 14 shows that states in eastern Germany (defined as including Berlin) are slightly underrepresented. Goldfayn-Frank and Wohlfart (2020) show that inflation expectations of individuals who lived in the former German Democratic Republic are significantly higher than those of Germans who did not live in the former GDR. Lower representation of the East German states may therefore bias the results of inflation expectations. However, the bias is slight and the difference identified by Goldfayn-Frank and Wohlfart (2020) only applies to individuals who were 15 or older in 1989, which should further reduce any bias introduced by the definition of the forsa target population.

Table 13: Online population versus general population – Federal state

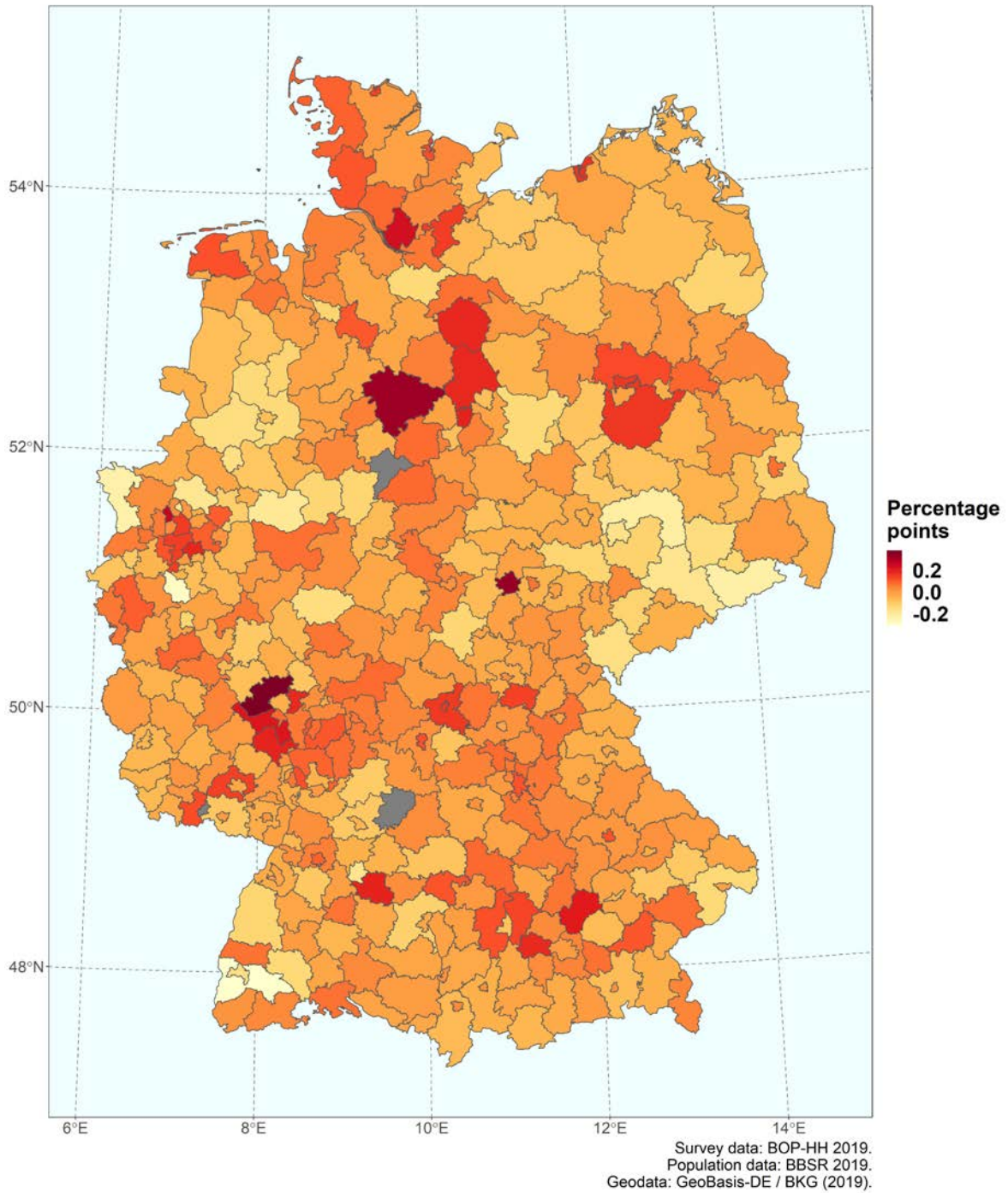
Federal state	Online population according to forsa		Individuals registered at main residence aged 16 or older according to microcensus as share of total population	Deviation forsa-microcensus
	Male	Female	Male	Female
Schleswig-Holstein	0.036		0.035	0.001
Hamburg	0.023		0.022	0.001
Lower Saxony	0.098		0.096	0.002
Bremen	0.008		0.008	0.000
North Rhine-Westphalia	0.213		0.217	-0.004
Hesse	0.076		0.075	0.001
Rhineland-Palatinate	0.048		0.049	-0.001
Baden-Württemberg	0.135		0.132	0.003
Bavaria	0.163		0.156	0.007
Saarland	0.011		0.012	-0.001
Berlin	0.045		0.043	0.002
Brandenburg	0.029		0.030	-0.001
Mecklenburg-Vorpommern	0.018		0.020	-0.002
Saxony	0.047		0.050	-0.003
Saxony-Anhalt	0.026		0.028	-0.002
Thuringia	0.025		0.027	-0.002

Table 14: Online population versus general population – East-West

	Online population according to forsa		Individuals registered at main residence aged 16 or older according to microcensus		Deviation forsa-microcensus (negative numbers indicate that the forsa online panel underrepresents the respective population)	
	Male	Female	Male	Female	Male	Female
West	0.412	0.397	0.394	0.408	0.018	0.003
East	0.096	0.093	0.097	0.100	-0.001	-0.004

While online surveys do not require interviewers to travel to respondents and can therefore achieve better geographical coverage compared to face-to-face surveys, it could also be the case that certain areas have poorer internet coverage or mobile phone reception. The BOP-HH covered individuals from 398 of the 401 districts (Landkreise) in Germany. Figure 5 illustrates the districts in Germany that are covered disproportionately: the maximum “over-coverage” is 0.2 percentage point, and thus the regional distribution is almost proportional to population size. Furthermore, the over-coverage and under-coverage of districts appears to be randomly distributed throughout Germany.

Figure 5: Geographical coverage

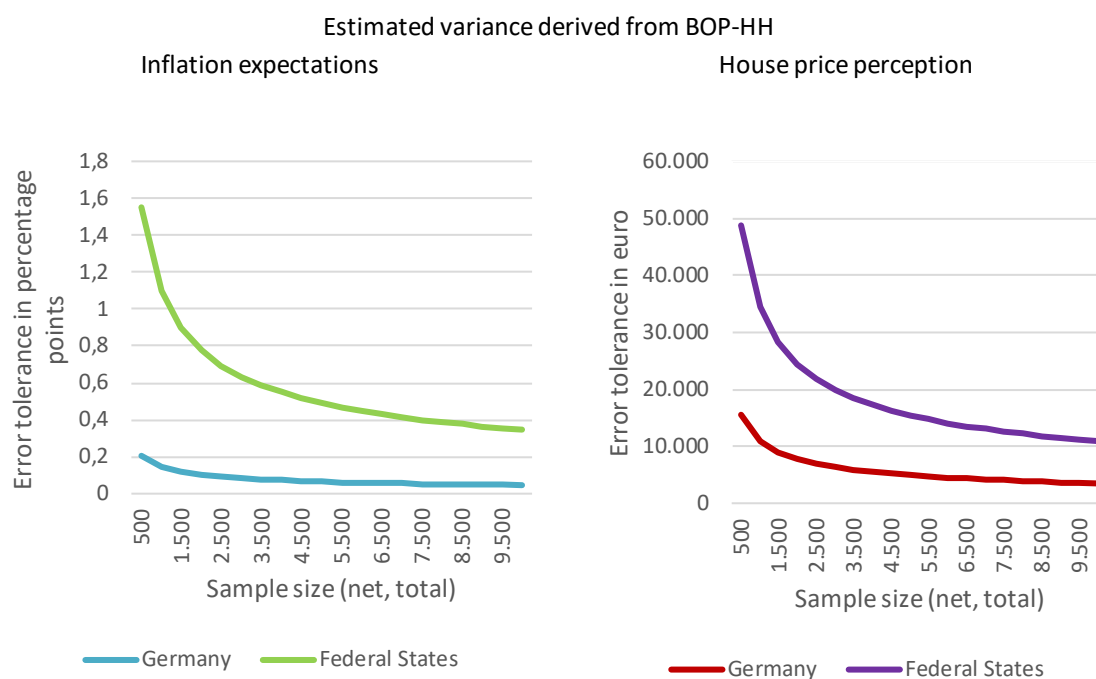


The fact that 398 out of 401 districts were covered by the BOP-HH should not be misinterpreted as allowing for analyses at the district level. Following the standard approach in the survey literature, we calculate the error tolerance implied by possible sample sizes n_{prop} based on:

$$n_{prop} \geq \frac{\hat{V}_Z^2}{e^2}$$

We set $z = 1.96$ and calculate the estimated variance based on the BOP-HH results on inflation expectations as well as house price assessments. Figure 6 illustrates that the error tolerance decreases with the sample size. However, only if we pool all three waves of the BOP-HH would we approach a level where the data would be representative at the Federal state level.

Figure 6: Error tolerance by sample size



In summary, the BOP-HH achieves good coverage in terms of geographical area. The subnational population coverage is also good, with slight overrepresentation of two Federal states and overall slight underrepresentation of East Germany. For a more in-depth analysis of regional differences at the level of smaller geographical areas, a larger sample size would be required, however.

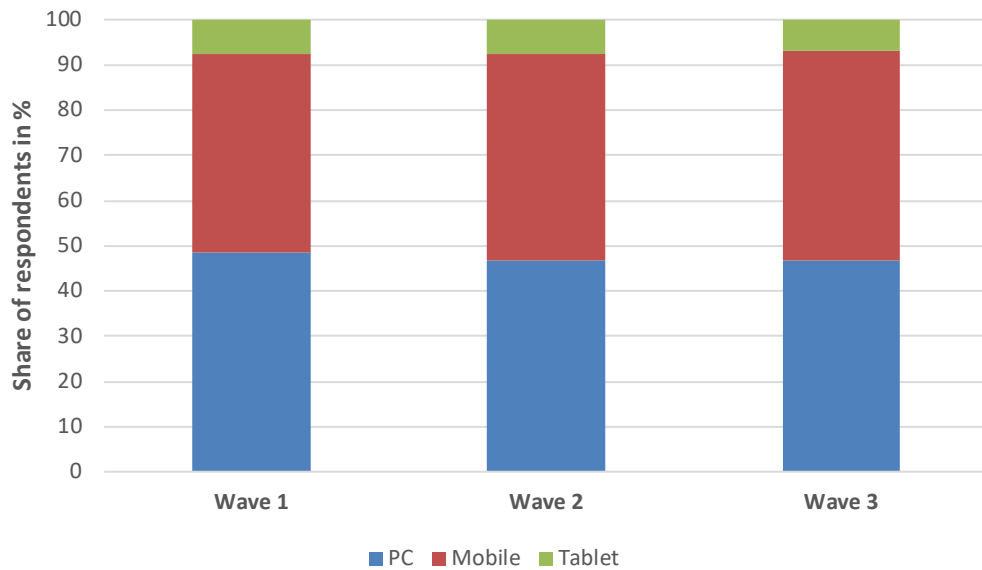
5. Characteristics of the online population

A number of survey methodology papers address the question of whether the device (smartphones or tablets versus computers or laptops) used to complete online surveys affects response quality. Findings from the literature are inconclusive about the effect of the device used on quality. Struminskaya et al. (2015), for example, suggest that there is a difference in response quality, while Antoun et al. (2017) and Sommer et al. (2017) do not find a difference in general data quality between mobile and PC responses. One reason why the device effect seems to be diminishing is likely that surveys, including the BOP-HH, are increasingly being programmed to adapt automatically for optimal display on mobile devices.

Smartphone penetration has been increasing rapidly in recent years. In Germany, the percentage of smartphone users increased from 40% in 2013 to 80% in 2018. Figure 7 shows the percentage of respondents who completed the BOP-HH on a PC or laptop, on a

smartphone, and on a tablet. Among the respondents who participated in more than one wave, 17% used different devices in different waves.

Figure 7: Device used to fill in the survey



In the BOP-HH, respondents are free to choose the type of device used to complete the survey. Figure 8 shows that, among the groups of young people less than 30 years old, around 65-75% answered the questionnaire using a mobile device. However, among the groups aged 60 or older, the percentage of people that chose to answer with a PC ranges from 70-84%.

Figure 8: Device usage by age group

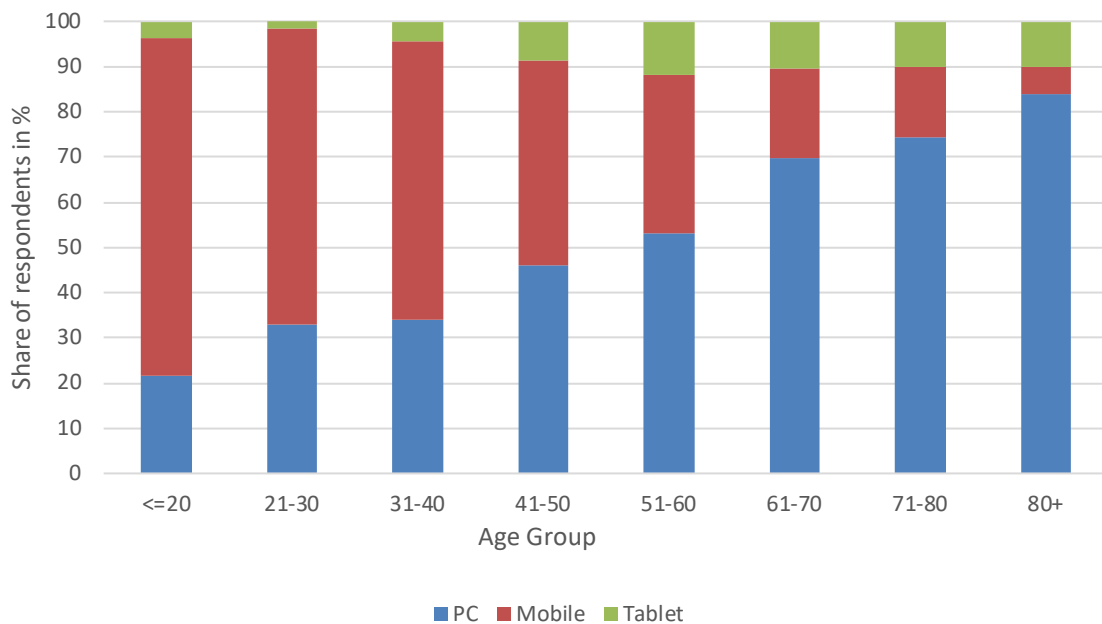


Table 15 additionally shows that respondents who completed the survey on a smartphone are younger, richer and, importantly, more often in full-time employment than those who completed the survey on a PC or tablet. They also tend to have a higher level of educational attainment.

Table 15: Socio-demographic characteristics by device used for survey completion

	PC	Smartphone	Tablet
Age	53	39	54
Monthly household income, €	2,830	3,197	3,125
Employed full-time, %	39	52	44
Retired, %	33	9	29

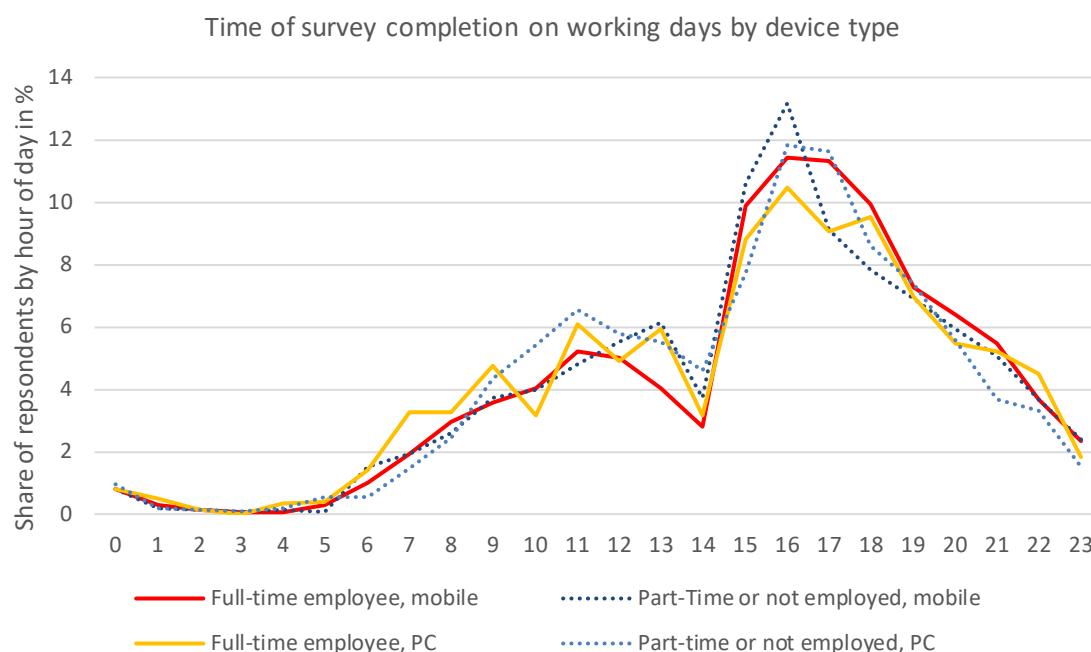
On average, BOP-HH respondents who used a smartphone to complete the survey spent 1.5 minutes less on the survey and interrupted survey completion 0.1 times more often than PC respondents (Table 16). However, this could also be related to the respondents' age, income, and level of educational attainment.

Table 16: Interview duration and interruptions by device type

	PC	Smartphone	Tablet
Interview duration in minutes	18.08	16.38	18.44
Time per question in minutes	0.05	0.04	0.05
Number of interview interruptions	1.15	1.26	1.21

Figure 9 provides an illustration of one possible situational context that may affect completion. It plots the percentage of respondents who completed the survey against the hour of day on working days only and differentiates between full-time employees and those who did not work full-time. It shows that the response pattern in terms of hour of day is almost identical for those who worked and those who did not, and that there is no difference in device use between working hours or non-working hours for those who worked full-time.

Figure 9: Device and hour of day of survey completion



This suggests that the situational context may not affect device choice, but that it is rather strongly correlated with socio-demographic characteristics that can be controlled for in regression analyses. Table 17 shows inflation expectations based on the quantitative question about inflation expectations from the BOP-HH. Mean inflation expectations are lowest for respondents who completed the survey on a PC and 0.2 percentage point higher for respondents who completed the survey on a mobile device. However, the difference is not statistically significant according to the Kruskal-Wallis H-test.

Table 17: Inflation expectations by device used for survey completion

Inflation expectations	PC	Smartphone	Tablet
Minimum	-10	-12	-10
Median	2	2	2
Mean	2.47	2.61	2.64
Maximum	12	12	12

6. Summary and conclusions

Understanding developments in household expectations is important for monetary policy and financial stability. In 2019, the Bundesbank therefore commissioned a pilot survey on consumer expectations, the BOP-HH. Following this pilot phase, the Bundesbank decided to conduct a regular monthly online survey starting in late 2020. This paper described the methodology of the BOP-HH and discussed the advantages and drawbacks of the pilot survey.

The main disadvantage of the BOP-HH compared to other surveys is that there is greater risk of selection bias: respondents need to have internet access in order to participate in the

survey and, if they do have access, they need to exercise the choice to be part of the survey provider's online panel. This paper showed that the BOP-HH collected a large amount of data for an online survey.

The BOP-HH has very good regional coverage, with 398 out of 401 German districts represented by at least one interview. This coverage is broader than is usually the case for face-to-face surveys. With the current sample size, however, the possibilities for regionally disaggregate analyses are highly limited.

Furthermore, the survey achieves good socio-demographic coverage. The survey provider recruits panellists offline and specifically targets individuals who are harder to reach online. Offline recruitment of the online sample thus ensures that the sample also covers respondents with lower online affinity. Partially due to quota sampling, there are moderate differences between the target population and the sample.

However, the BOP-HH pilot study also shows that, even with an offline recruited online panel, some issues that are present in (almost) all online surveys remain, albeit to a lesser degree – including, most importantly, differences between the online population and the general population. With a more sophisticated weighting scheme that takes into account transition probabilities from offline recruitment to the online survey, this issue of coverage could be addressed in future surveys. Constructing such weights would require comprehensive information on the offline sample, the selection process for respondents who were asked to participate in the online survey, and respondents who were asked to participate and refused. Furthermore, it would be beneficial to have a better understanding of the response rate within the online panel as well as of potential selectivity into the specific sample or panel and its impact on the measurement and outcome. Again, this could be addressed by collecting more information on non-respondents in future surveys.

The BOP-HH pilot study was conducted as a mobile and PC online survey. About 40% of the respondents completed the survey on a mobile device (smartphone or tablet). Programming the survey to automatically adapt to smartphone screen sizes appears to have been successful in moderating device effects. Currently, the information collected on respondents' online affinity is limited. Collecting more detailed information on respondents' habits concerning internet use would help to differentiate and identify possible effects of online affinity on response behaviour. Future research could also investigate the device effects in more detail, for example by utilising the fact that panel respondents switch devices between surveys.

The chief advantage of the BOP-HH compared to other surveys is the quick availability of data. This allows current policy issues to be addressed in a timely manner and the BOP-HH to complement other surveys conducted by the Bundesbank that are more comprehensive and have a lower risk of selection bias. The lessons learned during the pilot phase of the BOP-HH will serve as valuable input to improve the processes and methodology of the regular Bundesbank Online Panel that will be conducted on a monthly basis starting in late 2020.

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Annex

Table A1: Overview of research projects contributed by external researchers

Authors	Affiliation	Topic
Dräger, Lena	University of Hanover	Perceptions of future monetary policy and inflation
Lamla, Michael	University of Essex	
Pfajfar, Damjan	FED Board	
Abbassi, Puriya	Bundesbank	Real estate boom/bust cycles
Beutel, Johannes	Bundesbank	
Bachmann, Rüdiger	University of Notre Dame	Neo-Fisherism
Born, Benjamin	FAS	
Sims, Eric	University of Notre Dame	
Weber, Michael	The University of Chicago	
Kuchler, Theresa	NYU Stern	Co-movement of macroeconomic expectations
Ludwig, Alex	Goethe/SAFE	Distance to market and house price expectations
Mankart, Jochen	Bundesbank	
Quintana, Jorge	Goethe/SAFE	
Vellekoop, Nate	Goethe/SAFE	
Wiederholt, Mirko	Sciences Po	
Coibion, Oliver	UT Austin	Uncertainty shocks, inflation expectations, and choice
D'Acunto, Francesco	Boston College	
Gorodnichenko, Yuriy	UC Berkeley	
Weber, Michael	The University of Chicago	
Hoffmann, Matthias	Bundesbank	Higher-order beliefs about macroeconomic variables
Hürtgen, Patrick	Bundesbank	
Bachmann, Rüdiger	University of Notre Dame	Inflation ambiguity of households
Carstensen, Kai	University of Kiel	
Schneider, Martin	Stanford University	
Dovern, Jonas	University of Erlangen-Nürnberg	Subjective beliefs and inflation expectations
Conrad, Christian	Heidelberg University	Central bank communication and inflation expectations
Glas, Alexander	University of Erlangen-Nürnberg	
Le Blanc, Julia	Bundesbank	Information and illiquidity in housing markets
Kindermann, Fabian	University of Regensburg	
Piazzesi, Monika	Stanford University	
Schneider, Martin	Stanford University	

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