Digitalisation and adoption of fintech in Germany: gathering survey evidence on households

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Abstract

Research on fintech typically relates to the supply side; there is little evidence on the demand side, especially the household sector. We analyse the adoption of fintech solutions by households in Germany. Setting up a special module of the German wealth survey (PHF) with almost 4,200 active participants, we shed light on households' awareness and usage of two specific fintech services: robo-advisors and online credit platforms. We link it to the much more general concept of innovation (ie digitalisation) –, since, for households, digital competence determines much of the costs and benefits of fintech. We find that only a limited number of households are aware of robo-advisors and even fewer use this service. On the other hand, almost half of the individuals in Germany are aware of online credit platforms and about 12% of those use them. We suggest a three-stage model for adoption. *Awareness* of credit platforms is positively related to the level of digitalisation and negatively to age, and is less prevalent among women. *Latent adoption* (the willingness to consider using credit platforms when the need arises) is strongly related to digitalisation and, in addition, depends on age, income, gender and wealth, but also on social and financial networks. Among those who are ready to make an evaluation, *concrete adopters* (real users) are much more interested in speed and convenience, and worry less about data privacy and anonymity than those who have not yet adopted the service. As digitalisation will be increasingly universal in the years to come, also given the shifts induced by the ongoing pandemic, the spread of fintech usage can be expected to increase.

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Introduction

Financial industries in Europe and the world are undergoing a transformation, fuelled by the successive steps of digitalisation. Fintech companies offer a range of new services at the household level, eg crypto-assets, robo-advisors and credit platforms, which have the potential to challenge the predominant role of banks in retail credit and financial investment. Just as with personal computers and mobile phones, fintech is changing the life of consumers directly. However, available information on fintech services typically relates to the supply side only. There is very little evidence on the demand side on the use of fintech. Who are the users? For what purposes is fintech used? What other, more traditional services may it replace?[112]

In an ongoing research project by the Deutsche Bundesbank, we analyse the adoption process of fintech services for households in Germany. Using survey data from a special module of the German wealth survey (PHF) on almost 4,200 participants, we shed light on households' awareness and usage of two specific fintech services: *robo-advisors* and *online credit platforms*. We link fintech adoption to *digitalisation*, a rather general and fundamental innovation. In our view, digital competences will determine much of the costs and benefits of fintech at the household level.

The results shown in this paper are all preliminary; the purpose is not so much to state new results but rather to gauge the potential of classical survey statistics in solving empirical issues on fintech use and adoption.

Analytical framework

We model the adoption of fintech solutions as a multi-stage process, adapting the mainstream theory of innovation diffusion to the issue of fintech use by households (Graph 1). As with other innovations, the first stage of the adoption process is *awareness*.[113] Only households that are aware of a new product or service can consider it as part of their choice set when making a decision. In the second stage, they have enough knowledge about the new alternative to be able to make an abstract evaluation. If the evaluation outcome is positive, we label it a *latent adoption*: the household is ready to consider the innovation as a relevant (potential) solution when the need arises.[114] Latent adoption is not the same as *actual adoption* – the third stage – because many financial services, such as financing purchases with credit, insurance or investment decisions, are actually made only intermittently, some only once in a lifetime. The decision on actual implementation is thus made with a view to the concrete circumstances of the financing decision at hand. In the second and third stage of adoption, classical cost-benefit analysis is expected to play an important role – more abstract in the second stage and very concrete in the third stage. A number of factors can influence this evaluation of costs and benefits, eg age, human capital levels, experience with related technologies, social network effects, etc.

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[112]   An exception is the study by Henry, Huynh, Nicholls and Nicholson (2019) on the use of bitcoin by households.

[113]   The standard reference is the pioneering work of Rogers (2003), now in its 5th edition. The first edition was published in 1962.

[114]   In the five stages of innovation diffusion described by Rogers (2003), this is the "persuasion phase".

Multi-stage process of fintech adoption	Graph 1

1st stage: awareness

depending a.o. on preferences, benefits and costs of adoption

2nd stage: latent adoption – innovation considered a relevant alternative

as above, when triggered by concrete needs, eg credit demand

3rd stage: concrete adoption

Source: Authors' elaboration.

Among those determinants, we consider in particular the role of *digitalisation*. We argue that much of the cost side of fintech is captured by the personal level of digitalisation. If a person is highly digitalised, the remaining costs of using fintech services are rather specific to the financial situation of the consumer. On the other hand, if the household is not digitalised at all, eg has no internet access, the costs of adopting fintech services are prohibitively high. Digitalisation is thus an *enabler of fintech services* on the demand side. With our survey information, we are able to measure all three stages of the adoption process of online credit platforms and the level of digitalisation of households. This paper presents preliminary results; we will focus on descriptive evidence of awareness and on the two stages of adoption.

The database

In summer 2019, the survey team in the Bundesbank's Research Centre administered a survey on the use of fintech services as a module of an interim paper-and-pencil (PAPI) survey of the "Panel on household finances (PHF)".[115] As the module is fully integrated into the household panel, it is possible to link the answers regarding the fintech questions to pre-existing panel information from the main face-to-face survey (CAPI). Among other things, this information includes an extended set of socio-demographic variables and details on households' asset holdings and liabilities. In total, we contacted 5,835 households and 10,397 people all over Germany. All the members aged 16 or older of the households participating in the main survey were contacted. The response rate was 40.6%, or 4,172 individuals. Not all respondents had

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[115] The PHF survey (Panel of Household Finance) is the German contribution to the Household Finance and Consumption Survey (HFCS), a set of harmonised surveys on households' assets and liabilities in the euro area. In terms of methodology and content, the PHF is comparable to the Survey of Consumer Finances (SCF) of the Federal Reserve Board but, unlike the SCF, it is conducted as a panel survey. The regular Computer-Assisted-Personal-Interview ("CAPI") surveys of the PHF collect detailed information on households' assets and liabilities every three years, and they are supplemented with interim Paper-and-Pencil ("PAPI") surveys in the year before the main CAPI surveys. Those interim surveys are administered to all panel members. For more details on the PHF, see von Kalckreuth et al (2012) and www.bundesbank.de/phf-research.

internet access though. Thus, for the major part of the analysis on fintech use and awareness, the sample consists of 3,712 observations.

Key empirical concepts

We focus on two services: online credit platforms and robo-advisors. To measure households' awareness, we use direct questions about whether respondents have heard of these fintech services. Similarly, for actual use/adoption, we ask about use of the service at present or at any time in the past.

To model the second stage of the adoption process of online credit platforms as described above, we need a measure of latent adoption. We extract it from a hypothetical question: respondents were first asked to state whether they would potentially be willing to take out a loan within the next five years for a number of stated purposes and then whether they would consider an online credit platform for taking out the loan. The latter are considered "latent adopters".

In order to measure digitalisation levels of households, we use three different digitalisation indicators (DIs). All of them are based on four survey questions: "How often have you used the internet in the last three months?",[116] "Do you use online banking for the account you use for the majority of your payments?", "Do you order securities online?" and "Generally speaking, do you like to settle transactions and other matters via the internet?". Although the measures are rather dissimilar in terms of construction, the DIs correspond very well with each other.

Preliminary results

a. Use and awareness of robo-advisors and online credit platforms

Using population weights on the data, we find that only a rather limited number of residents in Germany are aware of robo-advisors (< 8%) and even fewer use them: less than 10% of those who know about the service. On the other hand, almost half of the individuals are aware of online credit platforms and, of those, about 12% use them. Perceived advantages of online credit platforms are low fees, high speed and convenience. Perceived disadvantages include concerns about safety, data protection, but also issues of clarity and comprehensibility. Credit platforms seem to be especially relevant for people who are likely to borrow money for maintaining buildings, buying a car, and restructuring credits (40% to 50% of citations). To a lesser extent – less than a third – they are relevant for potential buyers of homes and other types of credit. Around 56% of those that had heard about credit platforms state that they might be willing to borrow in the future. Among those, about one third say that they would consider online platforms for at least one of a number of stated credit purposes.[117]

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[116] Households without internet access were not asked about their awareness and use of fintech services. However, they were asked about whether they would be willing to take out a loan (see below) and whether they consider online loans as an option.

[117] This may not be considered as a potential market share since there are several purposes and the propensity to consider credit platforms is associated with smaller credit values.

Three household-level digitalisation indicators (DIs) Table 1

DI 1: Ad hoc grouping

- Level 2 internet several times a day, online banking as a rule, plus either the respondent states s/he is typically ordering securities online or likes very much doing business online.
- Level 1 Internet use at least several times a week and not level 2.
- Level 0 internet use once a week or less, or no internet access.

DI 2: Cluster analysis groupings

Respondents are grouped according to the similarity of their digitalisation data using cluster analysis. We choose a hierarchical clustering that results in 4 groups.

DI 3: Predicted fintech adoption probability

We regress actual fintech use on all of the four indicators described above (and nothing else) and compute predicted probabilities from that regression for each household. DI 3 implicitly weights the answers on the digitalisation questions by relevance for fintech use, which is very convenient. It has the added advantage that it is continuous and bounded between 0 and 1. Note that DI 3 is to be treated as a generated regressor in the context of regression analysis.
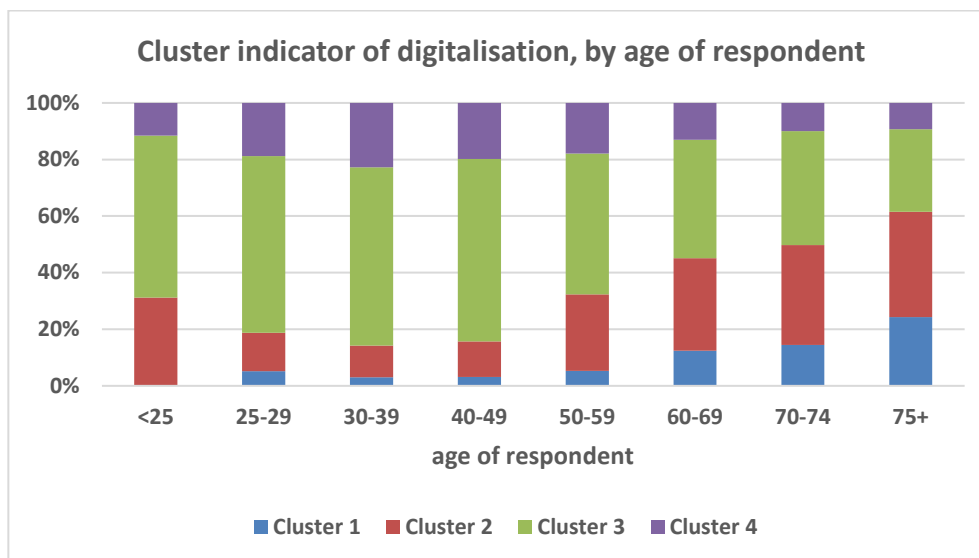

Source: Authors' elaboration.

b. Digitalisation

In order to describe the adoption process, we need to look at digitalisation levels of the respondents, and we present some population-weighted figures first. More than 60% of German individuals with at least 16 years of age use the internet several times a day, around 13% do not use the internet at all or do not have access. Online banking is the main mode of operation for around 64% of adults, and around 31% of individuals use it rarely or (mostly) not at all. Only one third of users with internet access have a securities deposit. Among those, around one-third usually order online, and another 10% sometimes. Almost 20% like to settle transactions online very much, around 15% never do so. "Settling transactions" refers not only to finance, but quite generally also to purchases, applications, taxes and municipal matters.

Graph 2 shows the age profile of digitalisation according to DI 2, the cluster-based measure yielding a partitioning into four groups. Cluster 1, the lowest-ranking cluster, happens to be equivalent with level 0 of DI 1: it comprises people that have either no internet access at all or use it less than once per week. Cluster 4 is the highest level, with the unweighted frequency of 14.8% in the sample. The pattern of digitalisation according to age is U shaped in the unconditional tabulations. The initial increase is due to the fact that a number of the underlying digitalisation characteristics become relevant only at a higher age and income.

Ordered probit models regressing the cluster digitalisation indicator DI 2 on socio-demographic characteristics show that digitalisation varies strongly with major socio-demographic characteristics of households and individuals. Controlling for other characteristics, such as income, gender and education, the relationship of digitalisation to age is no longer inverted U shaped, but rather monotonously decreasing. Women are clearly less digitalised. The relationship with education, measured by ISCED attainment, and with household income is positive. The income of the reference group – "your acquaintances" – is very important; it is even more informative than the income of the respondent's own household.

Cluster indicator of digitalisation, by age of respondent

Source: Authors' elaboration.

c.   Awareness

Awareness of credit platforms covaries strongly with the level of digitalisation as measured by DI 2. Interestingly, and somewhat unexpectedly, with digitalisation and some other socio-demographic control variables given, no additional influence of education (ISCED) on awareness is detectable. On the other hand, we can see strong social network effects in various dimensions.

By means of a standard probit model not controlling for endogeneity, we learn that awareness regarding credit platforms varies strongly with digitalisation – the influence is exceedingly high. Women are generally less aware of credit platforms, even after controlling for age. The pattern of awareness according to age group shows an inverted U shape: an increase in the younger decades and a decrease in older age. Awareness increases with household income and – again – quite strongly in the income of the reference group. The covariation with household wealth is clearly negative. This may indicate that credit platforms are interesting for people who are not (yet) settled financially – consistent with this, the existence of a house bank relationship decreases awareness. The availability of credit from friends and relatives is positively related to awareness.

Social networks – friends and relatives on the one hand, and the reference group of personal acquaintances on the other – are important for both digitalisation and awareness of credit platforms.[118] For awareness, financial networks (the house banking relationship) are also important.

[118]   We ask for the distribution of income among "personal acquaintances" and use the median to characterise the income of the reference group. Furthermore, as part of the ordinary panel survey, we have information on whether a household is able to borrow from friends and relatives.

d. Latent adoption and actual adoption

Regarding stages 2 and 3 of the adoption process sketched in Graph 1, it is necessary to keep the effects of conditioning in mind. Of the 4,172 respondents, 446 drop out, mainly because they lack internet access. For the remaining 3,712 respondents, awareness regarding online credit platforms can be measured. 2,108 respondents (56.8%) are aware of online credit platforms, the rest is not. Out of those, 1,162 respondents (72.5%) express willingness in principle to borrow. Of these, 518 consumers (44.6%) turn out to be potential adopters, 644 (55.2%) are not. The observational basis for analysing adoption conditional on awareness is thus much smaller than for awareness itself.

Our analysis of the factors influencing latent and actual adoption is yet inconclusive and preliminary. According to the theory of innovation diffusion, the adoption decision will result from the interplay of consumer preferences and the (perceived) characteristics of traditional loans versus loans from online credit platforms, as well as from the cost and benefit factors related to the socio-demographic situation of the individuals. Looking at later stages of adoption, we need to keep the earlier stages in mind. Individuals aware of the possibility to take out a loan from an online credit platform state that data protection and confidentiality, collateral requirements as well as convenience and speed are important factors they consider when making a decision between online credit platforms and other means of acquiring a loan. Actual users are much more interested in speed and convenience, and worry less about data privacy and anonymity than those who have not yet adopted, and they believe that online credit platforms are superior in terms of convenience and speed.

Interestingly, latent adopters exhibit digitalisation levels very similar to those of actual adopters, even in terms of distribution, see Graph 3. This confirms the value of the analytical concept of latent adoption, and we may infer that, *given latent adoption*, the decision to actually take out a loan via an online credit platform is driven by factors other than digitalisation.

In a regression with fintech adoption (either latent or actual) as a left-hand side variable, digitalisation clearly needs to be considered as endogenous: in parts at least, the two attributes are likely to be driven by the same unobserved characteristics. In our analytical work ahead, we will rely on multivariate probit and instrumental variable techniques to take account of this basic underlying simultaneity.[119]

## Projecting the future diffusion of fintech services

We have seen that key preconditions for the use of credit platforms are awareness and digitalisation. Further, propensity of usage is higher among younger people. Awareness is partly endogenous. Thus, if credit platforms continue to be a success, awareness will cease to be a limiting factor.

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[119] See von Kalckreuth, Stix and Schmidt (2014) for solutions in a similar analytical context: in a study on payment behaviour, the decision to adopt a credit card and its later use in payment are interdependent.

Kernel-Density Estimation of digitalisation levels for different types of households

Kernel density estimate   Graph 3

Kernel density estimate

kernel = epanechnikov, bandwidth = 0.0200
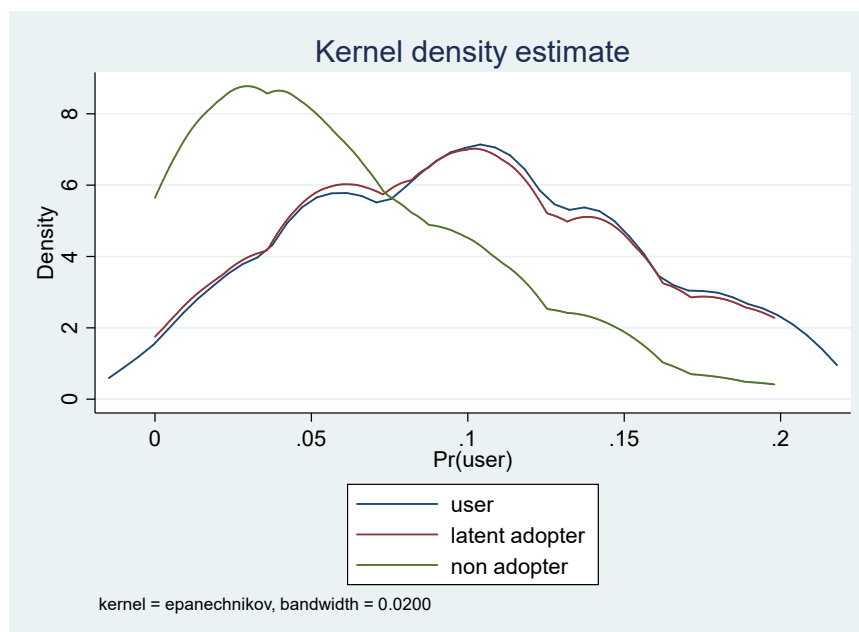
Source: Panel on Household Finances (PHF) – intermediate survey 2019 - unweighted, own calculations.

Second, digitalisation will be increasingly universal in the coming years and decades. Attitudes of younger people today will become typical also for the older digitalised. In spring 2020, as a result of measures taken by the German government in response to the Covid-19 pandemic, many people had to stay at home, for several weeks. Schools, shops, and banks were closed down. All of a sudden, traditional offline solutions were simply not available anymore or only to a limited degree. This may be expected to have a strong effect on digitalisation levels, both on the supply and on the demand side.

For these reasons, the prevalence of fintech services among German households is likely to increase. Fintech solutions are not necessarily associated with fintech companies. Commercial banks are likely to adopt the new modes of providing access to financial services, since they may otherwise risk losing market shares.

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