

How Austrians bank and pay in an increasingly digitalized world – results from an OeNB survey

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The digital transformation in banking and payments has important consequences both for the financial industry and for consumers. Nevertheless, there has been limited empirical evidence about the diffusion of financial innovations among consumers in Austria. This paper presents the results of a nationally representative survey. The survey covers questions about how Austrians conduct banking, their use of innovative payment methods and services/products in the realm of financial technologies (fintech) as well as their ownership and awareness of crypto assets. Regression analyses are conducted to identify drivers of adoption of such services and products. The key variables across products are trust in the safety of a product, age, financial risk tolerance and interest in technology. Overall, the results reveal that the way Austrians bank and pay has been changing considerably. In particular, 58% of Austrians aged 14 or over use online banking and 36% use their mobile devices for banking activities. Contactless payments (without entering a PIN) are conducted by roughly one-half of Austrians. The use of several fintech services/products and ownership of crypto assets (2%) is confined to a much smaller share of Austrians. Despite the relatively widespread use of digital banking and payment products/services, the results also show that a sizeable share of the population does not use innovative financial products, still visits bank branches and has a preference for using cash for daily purchases. Also, an overwhelming majority of Austrians (including those who use financial innovations) want cash to remain.

JEL classification: E41, G20, O31, O52

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The history of digital financial innovations in banking and payments is relatively short. In Austria, wages were paid out in cash up until the mid-1970s, the first ATMs were installed in the 1980s and the use of payment cards gained ground only in the early 2000s. Studies of the payment behavior of Austrian consumers show that the vast majority of consumer purchases are still settled in cash (Bagnall et al. 2016; Esselink and Hernandez, 2017). Moreover, several studies have shown that payment behavior changed only slowly over the past 20 years, despite the increased availability of cashless payment options (Mooslechner, Stix and Wagner, 2012; Rusu and Stix, 2017).

Over the past few years, the pace of financial innovation accelerated on the back of two developments which have reinforced each other: (1) the development of new financial technologies and services and (2) the ubiquity of mobile phones along with fast Internet connections. The scope of digital innovation is broad, ranging from new forms of access to existing services/products (e.g. mobile

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banking), new financial services (e.g. automatized financial advice) to new payment methods (e.g. by mobile phones). These innovations (e.g. banking apps to make instant payments) increasingly blur the dividing line between the once quite distinct fields of financial services on the one hand and payments on the other. Some of these innovations are initiated by banks, some are driven by small start-up companies and some are pushed by tech giants like Google or Apple, which have also entered the payments market. So-called cryptocurrencies have been advanced by the Internet community and do not require any trusted third parties at all. Some observers conjecture that this overall development has the potential to fundamentally change the banking and payment services industry.²

The development of online banking exemplifies how new technologies have triggered profound changes in the financial industry. According to results of OeNB surveys, 7% of Austrians used online banking at the beginning of this century, compared to 58% today. This new technology has had profound implications for the organization and the business conduct of banks (e.g. re-dimensioning of the branch network, investments in technology, development of new channels to communicate with online customers). Moreover, new players have entered the market, e.g. online banks or providers of apps for financial services, and banks have been faced with the threat that segments of their businesses are being taken over by new competitors. For example, Deutsche Bank has classified bank segments and products according to their risk of being challenged (Forest and Rose, 2015, referring to a survey among banks conducted by Roland Berger; Streissler, 2016): The payment sector is exposed most, followed by simple saving products and a normal bank account. Products with the lowest risk are loans and specialized saving products.

How far has digitalization in banking and payments already progressed? The empirical evidence on the adoption and use of digital financial services and products by consumers is limited. Often, assessments about the market potential of a service/product are based on observed growth rates (which can be very high, in particular when their overall importance is still modest). Published adoption rates of digital financial innovations are often based on surveys of a subsample of the population (e.g. Internet users), and survey details (which can be very important) are often not well documented. Moreover, published survey results are often confined to narrow market segments, which renders it difficult to assess the overall situation.

Against this backdrop, the Oesterreichische Nationalbank (OeNB) has commissioned a nationally representative survey among Austrian consumers about their use of and their attitudes toward digital financial services (see box 1 for details about this survey, the OeNB-Barometer Q2/2018). The survey offers a stocktaking of consumers' use and awareness of technological innovations in the field of banking and payments. This view is contrasted with information on consumers' attitudes toward cash, a comparison that is crucial because cash still plays an important role in Austria and in many other European economies despite the availability of a multitude of cashless options (Bagnall et al. 2016; Esselink and Hernandez, 2017). As cash plays a less important role in other European economies, we would like to

² *Digitalization can be defined as the “use of digital technologies to change a business model and provide new revenue and value-producing opportunities, it is the process of moving to a digital business” (www.gartner.com/it-glossary/digitalization, accessed July 24, 2018).*

analyze whether the prevalence of cash in Austria is associated with a low uptake of digital financial products. The broad perspective of the survey allows us to determine the share of Austrians that already use innovative products/services and also the share of those who have not got in touch with innovations at all so far. Finally, person-specific information on important background variables, like age or risk attitudes, provides insights into the drivers of adoption.

The paper is structured as follows. Section 1 discusses important prerequisite for the use of financial innovations, such as the ownership of technical devices, Internet usage and interest in technology. In section 2 we look into how Austrians conduct banking activities. To ease comparison across different financial innovations, we express most results in percent of the population aged 14 or over.³ The adoption and use of payment instruments is discussed in section 3. Results on the use and awareness of new financial technologies (fintech), which stand between banking and payments, are the focus of section 4. Section 5 discusses ownership of and attitudes toward crypto assets. Information on the socioeconomic drivers of adoption are presented in section 6. In section 7, we discuss the role of cash, and section 8 concludes. We wish to point out that our focus of attention, in general, is on the overall pattern of results and not on exact values. This is justified as specific questions might have been difficult to understand for some respondents. The overall pattern of results should not be affected by such difficulties.

Box 1

Description of the OeNB survey on the use of financial innovations by Austrian consumers (OeNB-Barometer)

Our study's results are derived from the "OeNB-Barometer Q2/2018," a survey commissioned by the Oesterreichische Nationalbank (OeNB) and conducted by the polling company IFES. The sample consists of 1,381 persons that were selected randomly via a multi-stage clustered random sampling procedure. Interviews were carried out face-to-face (computer-assisted) from April 11 to May 22, 2018. All reported results in this paper are weighted to render them representative of the Austrian population aged 14 or over with respect to region, age, gender and size of respondents' home town.

As these sociodemographic aspects are not necessarily the only important variables driving financial and payment innovations, we verified that the sample is not biased with respect to other important variables by conducting a series of comparisons with external information.

Internet usage: *In our sample, 83% of the population uses the Internet for private purposes. This number compares to 86% found in the Austrian Internet Monitor (Barth and Cerny, 2017) and 80% according to the Eurobarometer 464a (European Commission, 2017); both these studies are based on survey data. In our sample, 72% of the population uses the Internet at least daily. This compares to 71% in the Austrian Internet Monitor and 70% in the Eurobarometer 464a (European Commission, 2017).*

Ownership of technical devices: *85% of Internet users in the OeNB-Barometer and the Eurobarometer (ibid.) use a desktop computer/notebook and 86% of Internet users in both surveys use a smartphone (tablet: 31% in the OeNB-Barometer and 43% in the Eurobarometer (ibid.).*

³ Whenever we refer to percent of Austrians or percent of the population, we refer to the Austrian population aged 14 and over.

Online banking: In the OeNB-Barometer, 70% of Internet users (or 58% of the population) conduct online banking, which compares with 70% in the Euro-Barometer (*ibid*). A recent survey of Erste Bank¹ reports that 58% of the Austrian population conducts online banking.

Banking relations and card ownership: Banking relations are difficult to compare with external information as external data often refer to households while the OeNB-Barometer refers to individuals. According to the Household Finance and Consumption Survey (European Central Bank, 2017), 5.4% of Austrian households own shares, which compares with 7.3% of respondents in our sample. 41% of the population owns a credit card according to the OeNB-Barometer, which compares to 39% in the Eurobarometer.

Overall, this cross-validation with other surveys suggests that the sample of the OeNB-Barometer Q2/2018 is broadly comparable to results from other surveys with respect to several important background variables of financial innovations.

In this paper, we present statistics for socioeconomic groups or other subsamples. For some of these groups, the number of observations is rather low (see table A2 in the annex for descriptive statistics and for group sizes). Hence, it is necessary to exert some caution when interpreting these results. In such cases, we focus on the pattern of results (e.g. differences across groups) rather than on exact values. In general, some of the financial innovations are used by a small share of respondents, which further calls for some caution when interpreting results. For ease of exposition, the tables and charts will not present confidence intervals for mean values; we will mention them in the text for key variables instead.

¹ <https://futurezone.at/digital-life/erste-bank-oesterreicher-finden-fintechs-nicht-interessant/400064768>, accessed 11.7.2018.

1 Use of the Internet, mobile devices and interest in technology

The most important prerequisite for using new mobile payment and banking services is the adoption of the underlying technologies. Table 1 shows that almost three-quarters of the Austrians over 14 possess a smartphone, one-quarter has a tablet and almost one-fifth has a smart TV. Smartwatches, which have a potential for mobile payments, are currently only owned by 3%. Similarly, Internet usage is high. About 83% use the Internet, 72% access the Internet at least daily and 8% at least weekly (but less frequently than daily).

According to the Digital Economy and Society Index of the European Commission (2018), Austria ranks close to the EU-28 average with respect to Internet usage.⁴ An international comparison shows that smartphone ownership in Austria is slightly lower than in the U.S.A. (77% in 2015) and slightly higher than in Germany (Austria: 86% of Internet users; Germany and EU-28: 79%).⁵

When discussing the future of payments and a society which uses cash for payments much less than today, universal access to electronic devices which enable such payments is a precondition (abstracting from payment cards). How

Table 1

Ownership of technical devices and Internet usage

	% of the population
Ownership of technical devices	
Notebook or desktop computer	70.6
Tablet	25.7
Smartphone	73.2
Smartwatch	2.8
Smart TV	19.8
None of above	15.2
No tablet, smartphone, smartwatch	24.9
Internet usage	
Several times a day	56.2
Once a day	15.6
At least once a week	8.1
Less often	2.5
Never	17.5

Source: OeNB-Barometer Q2/2018.

⁴ In Germany 85% of the population are Internet users, which compares with 80% in Austria and 79% in the EU-28 (European Commission, 2017). Luxembourg, Denmark, Sweden and the Netherlands reach values above 90%.

⁵ Sources: Federal Reserve Board (2016) and European Commission (2017).

far away are we from universal access? Currently, 15% of Austrians possess none of the technical devices listed in table 1, and 25% possess no mobile device (tablet, smartphone or smartwatch). For some sociodemographic subgroups, the non-possession rates of mobile devices are high: 33% for respondents in the lowest income tercile, 50% for respondents with a low level of education, 28% for those aged between 51 and 65 and 72% for those aged 66 and over (the sociodemographic variables are defined in the annex). A very similar picture emerges for nonuse (or infrequent use) of the Internet, with quite high rates for respondents with low incomes or a low level of education and older survey respondents.

Another factor driving the adoption of financial innovations is people's interest in technological developments. Therefore, the survey posed the following question: "How would you assess yourself in relation to technological developments, e.g. new devices or applications? Which of the following statement best applies to you?" Respondents could choose between "Highly interested, I would like to try new devices or applications immediately," "I am interested but would not want to buy or try new devices or applications immediately," "I buy new devices or applications only if I see a benefit," "I am not interested in technological developments and only buy new devices when I need them."

Table 2

Interest in technology

	Highly interested, I would like to try new devices or applications immediately	I am interested, but would not want to buy or try new devices or applications immediately	I buy new devices or applications only if I see a benefit	I am not interested in technological developments and only buy new devices when I need them
<i>% of the population</i>				
Total	11	34	28	27
Gender				
Female	6	29	33	33
Male	16	39	23	21
Age				
14 to 35	23	42	24	11
36 to 50	9	44	32	16
51 to 65	6	31	36	27
66 and over	3	14	19	64
Household income terciles				
Lowest	10	22	28	39
Middle	9	34	28	29
Highest	14	48	29	10
Level of education				
Low	7	24	14	56
Medium	9	33	32	27
High	18	42	27	13
Size of respondent's home town				
< 5,000 inh.	10	34	27	30
5,000 to 50,000 inh.	9	34	29	28
>50,000 inh.	14	34	28	24

Source: OeNB-Barometer Q2/2018.

Note: The table shows the answers to the question „How would you assess yourself in relation to technological developments, e.g. new devices or applications? Which of the following statement best applies to you?“ (1) for all respondents (total) and (2) for sociodemographic groups. Possible answers are shown in columns, hence each row summarizes to 100%.

Table 2 summarizes the responses for all respondents as well as for selected sociodemographic subgroups. 11% of the population says they have a high interest in technological developments, 34% have some interest (even if they do not see a clear benefit), 28% have an interest only if they can expect a benefit from a new technology and 27% have no interest unless they really need a new service/product. For ease of exposition, we aggregate the first two categories in the following analyses (termed as “high interest” applying to 45%). As expected, answers strongly depend on income, age and education. For example, 56% of those with a lower level of education as well as 64% of those aged 66 or over are not interested. A sizeable difference can also be discerned between genders, with men being more inclined to early adoption than women.

Overall, these results reveal that a sizeable share of the population is either not interested in adopting new technologies or does not possess the respective technical devices. This applies, in particular, to respondents who are older, who have a lower level of education and who have lower incomes. As a result, a significant part of the population is excluded from the current trend of digitalization and will remain so in the coming years. At the same time, we observe much higher adoption rates and interest in technology among respondents who are younger, who have a higher level of education and higher incomes.

How does overall digitalization in Austria compare to other countries? The DESI report of the European Commission (2018) tracks the progress made by Member States in terms of their digital performance. It is structured in five chapters: connectivity, human capital, use of Internet services, integration of digital technology and digital public services. Over the last years, Austria has, overall, progressed roughly in line with both the EU average and the average of the cluster of medium-performing countries, ranking 11th in 2017. Its main strengths remain human capital and digital public services, but Austria also improved its relative position regarding to both the use of Internet services by citizens, where it had been lagging behind, and the integration of digital technology by businesses, where Austria scored significantly above the European average. These improvements were achieved despite a connectivity ranking in the lower half among EU countries (although Austria’s score improved considerably also in this category).

2 Do Austrians still visit bank branches? And for what reason?

With the proliferation of fast Internet connections and improvements in the safety of connections, remote access to bank accounts, i.e. online banking, has increased in importance. For consumers, online banking can improve the ease of use of banking services and can reduce time costs. For banks, online banking allows to reduce the costs of the branch network, but at the same time requires high IT investments. According to OeNB statistics, the number of bank branches has decreased considerably, falling from 4,556 in the year 2000 to 3,677 in the second quarter of 2018. This implies that today, in Austria a bank branch serves about 2,300 inhabitants on average compared with 2,400 in Germany, 5,200 in Finland and 9,600 in the Netherlands.⁶ During about the same period, the share of

⁶ See also https://www.oenb.at/dam/jcr:f06dd85f-6732-4593-aa9d-46157a4559ec/facts-on-austria_april_2018.pdf and a speech by OeNB’s Vice-Governor Ittner, cited in <https://kurier.at/wirtschaft/seit-finanzkrise-fast-ein-viertel-weniger-banken-in-oesterreich/257.725.758> (April 11, 2017).

Austrians (aged 14 or over) using online banking increased from about 7% in 2000 to 27% in 2008 (according to previous OeNB surveys) and to 58% today. About 23% of Austrians state that they have been affected by the closing of bank branches over the past five years (70% of this group say this was because they used the branch and 30% because they used an ATM at a branch that was closed). The share of affected persons ranges from 15% in towns with fewer than 5,000 inhabitants to 35% in cities with more than 50,000 inhabitants, reflecting that the concentration process occurred mainly in cities.

2.1 Use of online banks, online banking and access modes

In the sample, 96.2% of respondents have a current account, 1.2% use their partner's account and 2.6% have no current account. Among the persons who have a current account, about 2% have their main account with an online bank (called "Direktbanken" in German, i.e. banks which operate mainly online and which do not have a traditional branch network; in Germany this applies to 3% of the population (Deutsche Bundesbank, 2016)).

Table 3

Online banking

	% of the population
Use of online banking	58.1
	% of online banking users
Access only with desktop computer/notebook	38.3
Access also with smartphone/tablet	61.7
	% of online banking users
Access only via web browser	51.7
Access only via app	11.4
Access both via web browser and app	33.1
Access via specialized computer program	3.8
	100.0
	% of online banking users, multiple devices possible
Use desktop computer for online banking	81.8
Use tablet	16.2
Use smartphone	53.7
Use other device	1.3

Source: OeNB-Barometer Q2/2018.

Currently, about 58% of the population uses online banking (the 95% confidence interval ranges from 55% to 62%). International comparisons on the dissemination of online banking typically refer to percent of Internet users: According to our results, 70% of Austrian Internet users conduct online banking, which compares with 61% in Germany, 61% in the EU-28 (European Commission, 2018, values refer to 2017). The top EU countries in this respect are Finland, the Netherlands, Denmark, Estonia and Sweden, with values at or above 90%.⁷

Among online banking users, the use of mobile devices has gained prevalence: 38% of online banking users conduct online banking only via a desktop computer or a notebook while already 62% also use a smartphone or a tablet to interact with their bank. In terms of point of access, the survey shows that 52% of online banking users

⁷ In this study, we define online banking as follows: First, respondents were provided with a list of technical devices and asked whether they personally use any of those (ranging from desktops and smartphones to game consoles). Only if respondents used at least one of these devices, they were asked whether they use online banking. Thus, the variable is based on a filtered question. The results are very similar, however, if respondents are directly asked about the frequency with which they conduct online banking (without prior filter).

access online banking services only via a web browser (independent of the specific device), 33% use a web browser and banking apps and already 11% exclusively use banking apps. Another 3.8% use specialized programs, e.g. banking or accounting software.

Online banking users who do not use a mobile device for online banking were asked about the reasons for nonuse. The three most important reasons provided were that their mobile phone’s screen is too small, that banking needs are met without the smartphone and concerns about security. Interestingly, the ranking of these three reasons is the same regardless of respondents’ age and income.⁸

2.2 Frequency of visits to bank branches and online banking

How does the use of online banking affect the use of conventional banking, i.e. actual visits to bank branches or self-service counters? Table 4 shows the proportion of respondents who use various bank services (1) at least monthly and (2) once a year or less frequently.

The results reveal a clear dividing line: While 43% of the population still visits a bank desk at least monthly, 32% do so only once a year or less frequently. Over the last few years, self-service counters (e.g. in bank branches) have become more relevant, and this is reflected in our results. 58% of Austrians visit a self-service counter at least monthly, which is a higher value than that for bank desk visits. The highest value is found for ATMs, which are used by 88% of the population at least monthly. Table 4 also shows interaction frequencies for online banking via desktop/notebook and via smartphone/tablet. The results reveal that 51% of Austrians conduct online banking via desktop/notebook at least monthly, a value that is also higher than for bank desks. Thus, we find a higher share of the population interacting (on a monthly basis) with their bank either online or through a self-service counter than at a bank desk.

Chart 1 shows that there are marked differences in banking preferences across sociodemographic groups. Overall, 47% of the population banks more frequently online than at a bank branch or at a bank’s self-service counter (95% confidence interval: 43% to 51%).⁹ Among younger respondents (aged 14 to 35), 69% bank more frequently online, while for older respondents (aged 66 and over) this share stands only at 12%.¹⁰ Strong differences are also found between education groups

Table 4

Usage frequency of different banking channels

	At least monthly	Once a year, less often or never
	% of the population	
Bank desk	43.3	32.1
ATM	88.5	8.2
Self-service area at bank branch	58.2	29.9
Contact with bank branch via phone	9.0	73.2
Online banking with desktop computer/notebook	51.1	48.9
Online banking with smartphone/tablet	34.4	65.6

Source: OeNB-Barometer Q2/2018.

Note: The table shows the percentage of survey respondents that use the services mentioned (1) at least monthly and (2) once per year, less often or never.

⁸ In the U.S.A., the major reasons for not using a mobile phone are rather similar (Federal Reserve Board, 2016), albeit in a different order. The U.S. sample ranks “no reason, banking needs are met without mobile banking” first, followed by concerns about security and the size of the screen.

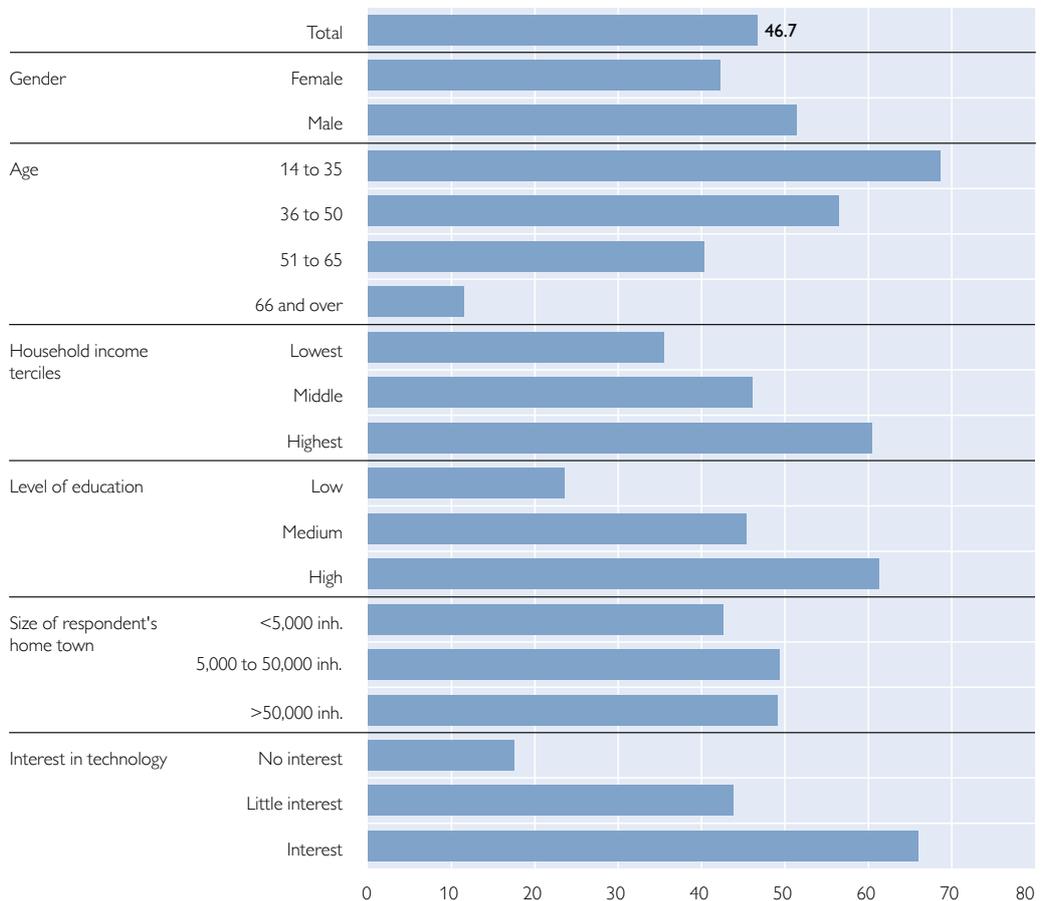
⁹ To be precise: We translate qualitative survey responses on the frequency of use (e.g. “several times a year”) into a quantitative measure (e.g. a frequency per time period). This computation relies on specific assumptions (e.g. how often do respondents visit a bank if they answer “several times a year”).

¹⁰ Confidence intervals range from 62% to 75% for younger respondents and from 8% to 15% for persons aged 66 or over.

Chart 1

Share of respondents using online banking more frequently than branch services

% of the population



Source: OeNB-Barometer Q2/2018.

Note: The chart shows the share of survey respondents that use online banking more frequently than desk services or self-service areas at bank branches (1) for all respondents (total) and (2) for socio-demographic groups.

and income groups.¹¹ The chart also shows that there are large variations of relative interaction frequencies by respondents' interest in technological innovations: Among those with no interest in technological developments, just 18% bank more often online than at a bank branch, which contrasts with a share of 66% for respondents with an interest in technological innovations. Finally, the chart shows that there are no sizeable differences between big cities and small towns.

How does the use of online banking in general and the use of mobile devices for banking in particular impact on bank desk visit frequencies? This question is important for assessing the future trend (given that the use of mobile phones for banking activities can be expected to increase) and hence for banks' strategic behavior (e.g. regarding their branch network). Chart 2 summarizes visit frequencies for three types of bank customers: (1) those who do not use online banking, (2) those who only use a desktop/notebook for online banking ("traditional online

¹¹ These differences are statistically significant.

Chart 2

Frequency of visits to bank desks by groups of online banking users



Source: OeNB-Barometer Q2/2018.

Note: The chart shows the frequency of visits to bank branches by groups of online banking users: (1) no online banking, (2) online banking only with a desktop computer/notebook or (3) online banking with a desktop computer/notebook and a smartphone or tablet.

banking users”) and (3) those who also use their smartphone or tablet for banking (“mobile banking users”). Among nonusers of online banking, 62% visit a bank desk at least monthly (17.3% at least weekly plus 44.7% at least monthly, but less often than weekly). This share is smaller among online banking users: 37% for traditional online banking users and 26% for mobile banking users. On the other hand, the proportion of those who visit a bank desk very seldom (less than once a year or never) increases across the three types of bank customers, up to 32% for mobile banking users.¹²

Not surprisingly, these results confirm that online banking is associated with a lower number of visits to bank desks.¹³ If we presume that online banking will continue to grow in importance over the coming years (e.g. due to an increased use of mobile phones for this purpose), we can expect the number of visits to bank branches to decrease significantly.

2.3 Bank services and access mode

If persons state that they conduct online banking, this does not necessarily mean that all of their banking activities are conducted online. Therefore, the survey asked how respondents have conducted several typical banking activities over the past twelve months. The upper panel of chart 3 depicts the proportion of all respondents who have conducted the respective banking activity exclusively remotely (i.e. via desktop, notebook, smartphone, tablet, e-mail or telephone), exclusively nonremotely (i.e. at the bank branch or the self-service counter) or whether they have used both access modes over the past year. We see that the share of Austrians that have accessed banking services exclusively remotely is already higher than the share of those who use only nonremote access for checking

¹² The differences across the three groups are statistically significant.

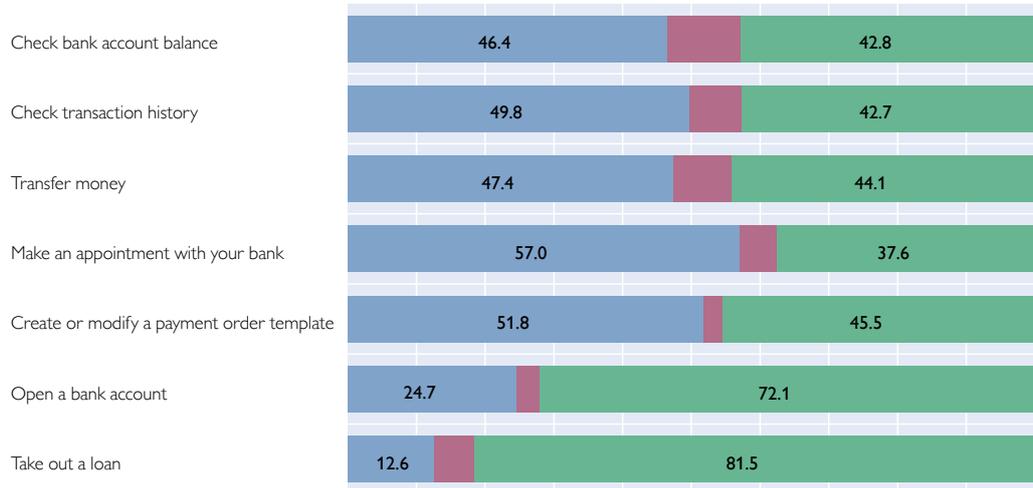
¹³ The results suggest that mobile banking reduces the number of visits to bank desks even further than online banking. While this seems plausible, one has to be cautious about making such a causal statement. One plausible alternative explanation for this result is that mobile banking is mainly used by younger and better educated people and that these persons would visit a bank desk very rarely even without mobile banking. A detailed analysis of the effect of mobile banking on visit frequencies is beyond the scope of this paper.

Chart 3

Access modes for various banking services

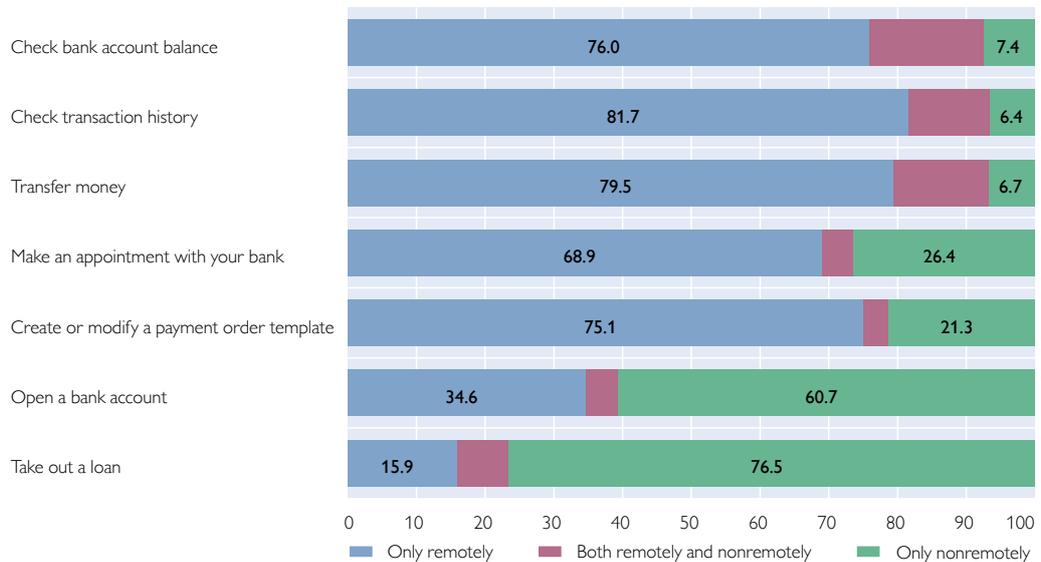
All respondents

% of respondents who have used the service within the past 12 months



Online banking users

% of online banking users who have used the service within the past 12 months



Source: OeNB-Barometer Q2/2018.

Note: The chart shows how each of the banking services was accessed (1) only remotely (via desktop computer/notebook, smartphone/tablet, e-mail or telephone), (2) only non-remotely (via bank desk, self-service or ATM) or (3) both remotely and non-remotely. The upper panel shows the results for all respondents, the lower panel shows results for online banking users. The underlying survey question referred to respondents' behavior over the past 12 months. For each activity, only respondents are included who have accessed the respective banking service over the past 12 months. The number of respondents who have taken out a loan over the past 12 months is rather low (n=270 for all respondents), implying that these results must be treated with caution.

their account balances and transaction histories, money transfers and creating or modifying a payment order template. In line with expectations, opening a bank account or taking out a loan is conducted predominantly nonremotely.

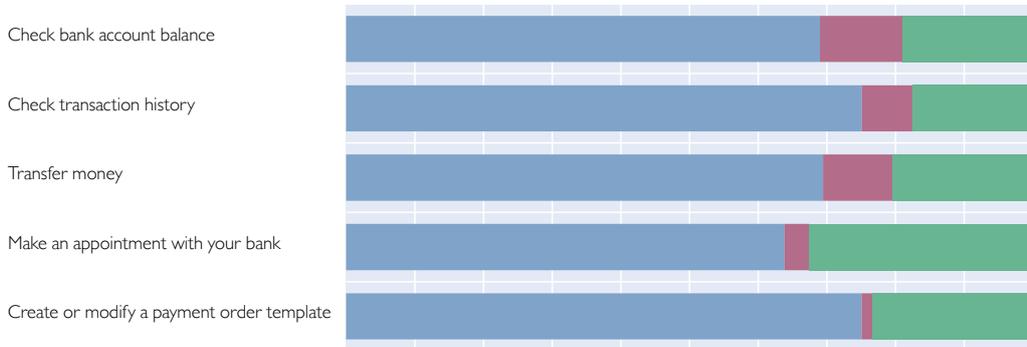
The share of Austrians that have used both a remote and a nonremote channel to contact their bank is rather low. This already indicates that online banking users

Chart 4

Access modes for various banking services by age groups

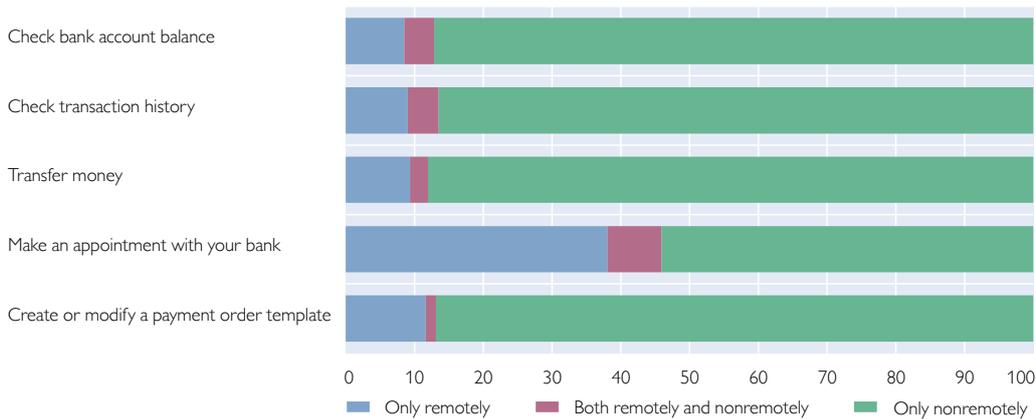
Age 14 to 35

% of respondents who have accessed this service over the past 12 months



Age 66 or older

% of respondents who have accessed this service over the past 12 months



Source: OeNB-Barometer Q2/2018.

Note: The chart shows for each service how it was accessed: (1) only remotely (via desktop computer/notebook, smartphone/tablet, e-mail or telephone), (2) only nonremotely (via bank desk, self-service or ATM) or (3) both remotely and nonremotely. The upper panel shows the results for respondents aged between 14 and 35, the lower panel shows the results for respondents aged 66 or over. The underlying survey question referred to respondents' behavior over the past 12 months. For each service, only respondents are included who have accessed the respective banking service over the past 12 months. The number of services for each age group is relatively small; hence, the results should be treated as indicative. The number of observations per service ranges from 180 to 335 for the top panel and from 141 to 303 for the bottom panel.

conduct their various banking activities mainly online. The lower panel of chart 3 confirms this by presenting a separate analysis only for online banking users. Depending on the activity (from checking the bank account balance to creating a payment order template), between 7 and 8 out of 10 online banking users contact their bank exclusively remotely, which implies that they actually do not need a bank branch. Only for opening a new bank account or for taking out a loan does a clear majority of online banking customers still visit bank branches. With regard to the starting question about which types of banking activities are conducted online, the results are unambiguous: Online banking users conduct, on average, all of their typical regular banking activities online and need their bank branch only for infrequent banking activities, which are service intensive and/or require their physical presence at the bank, like taking out a loan or opening an account.

Finally, chart 4 contrasts the behavior of older and younger respondents. The overwhelming majority of persons aged between 14 and 35 get in touch with their bank only via remote channels. The reverse picture emerges for persons aged 66 or over.¹⁴

2.4 Assessing the future trend

Austrians' use of online banking (58%) is above the EU-28 average but not as high as in some Nordic countries and the Netherlands. Already a substantial number of Austrians is using a mobile device for online banking (about 36% of the population or 62% of online banking users). The fact that the share of persons who possess a smartphone (73% of the population) and the share of persons who use the Internet (at least) once a week (80%) are above the share of online users suggests that online and mobile banking has potential for growth given consumers' current technical equipment. In addition with younger cohorts being more inclined toward online banking in general and mobile banking in particular, we can expect a growing share of bank customers who conduct their banking activities mainly remotely and visit a bank desk only occasionally or for specific purposes (e.g. a loan request).

3 Use of payment innovations at the point of sale

The proliferation of cashless payments requires that consumers have access to new payment methods and that they are also willing to use them. Adoption and use are economic decisions made by consumers that are influenced by a multitude of factors, like the relative costs of payment instruments (e.g. cash versus cards) and how consumers rate the attributes of payment instruments (e.g. safety, ease of use, expenditure overview). The choice of payment instruments also depends on the payment options offered by merchants, which, for a specific point in time, are given from an individual consumer's perspective, e.g. whether card payments are accepted for low-value purchases. The behavior of both consumers and of merchants each depends on each other and will change over time. The existence of network effects (e.g. if people want to pay in cash, there is no incentive for merchants to accept cards, and given the low level of card acceptance, people continue to use cash) implies that payment behavior tends to change only rather slowly (Huynh, Schmidt-Dengler and Stix, 2014). Aside from these factors, the literature (Bagnall et al., 2016; Esselink and Hernandez, 2017) has also documented large

differences across countries which might be related to institutional differences (e.g. the costs of ATM withdrawals), cultural differences and social norms.

Austria is still a cash intensive country: in 2016, about 80% of consumer transactions (at the point of sale) were settled in cash (Rusu and Stix, 2017). Against this backdrop, it is of particular interest how payment innovations are used by Austrians and how usage rates compare internationally.

Table 5

Ownership of payment devices

	% of the population
Debit card	90.6
Credit card	41.3
Prepaid card	4.2
Other card	2.4
Debit card contactless	64.3
Credit card contactless	15.0

Source: OeNB-Barometer Q2/2018.

¹⁴ For this comparison, we omit taking out a loan and opening an account as the number of observations is very low.

Table 5 summarizes Austrians' ownership of payment cards according to the survey data. 91% of Austrians possess a debit card and 41% possess a credit card. Prepaid cards are owned by 4% of Austrians and 2.4% state that they own other payment cards, like cards used in soccer stadiums or in workplace canteens or cafeterias. Almost two-thirds of respondents are aware that their debit card is equipped with an NFC chip for contactless payments and 15% know that they own a contactless credit card.^{15,16}

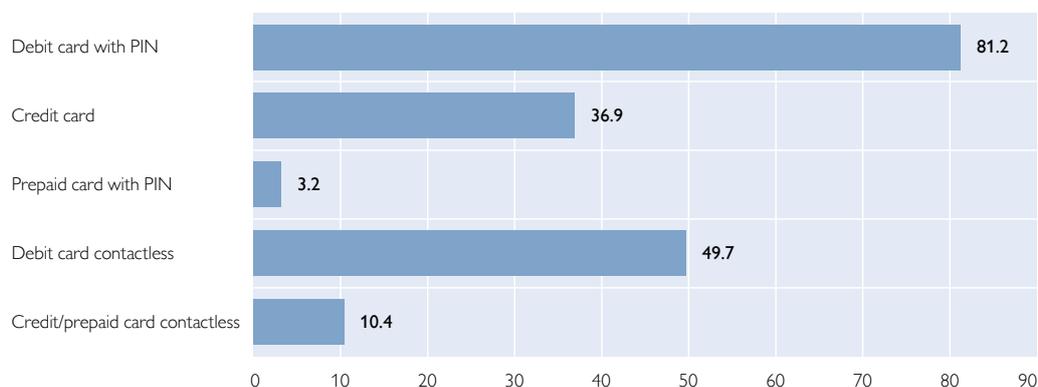
Although ownership and use of payment instruments are typically very closely related for many payment cards (e.g. someone who pays a fee for a credit card will also use it), this does not necessarily apply for other cards. For example, debit cards may be used for ATM withdrawals but not for payments. Moreover, some people may use debit cards only for larger (and seldom) purchases but prefer to pay in cash for all other purchases, etc. Therefore, chart 5 displays the share of respondents who use their card for payments at least once a year. 81% of the population uses their debit card with entering their PIN at least once a year, already 50% of the population uses their debit card contactless without entering a PIN (payments up to EUR 25) and 10% of Austrians use a contactless credit or prepaid card.¹⁷

The dissemination of contactless payment only a few years after its market introduction in 2013 is remarkable given that in the past new payment instruments used to gain market share only rather slowly. Most likely the fast uptake can be explained by the fact that the contactless technology has been implemented on

Chart 5

Use of payment cards (at least once a year)

% of the population



Source: OeNB-Barometer Q2/2018.

Note: The chart shows the share of the population who use the respective payment cards at least once a year. "Contactless" refers to the use of the respective card without PIN. "Credit card" refers to credit card use with signature, PIN or TAN.

¹⁵ According to unpublished data, about 84% of all Austrian debit and credit cards were equipped with an NFC chip in the second quarter of 2018. This compares with about 66% of respondents, according to the survey, who are aware that their debit or credit card is equipped with an NFC chip.

¹⁶ 95% confidence intervals: debit card: 88.3% to 92.9%, credit card: 37.7% to 44.8%, prepaid card: 3.0% to 5.4%, other card: 1.4% to 3.4%, debit card contactless: 60.5% to 68.1%, credit card contactless: 12.2% to 17.8%.

¹⁷ We use the term "contactless" for cards with an NFC chip and the term "contactless payments" for payments up to EUR 25 for which no PIN is necessary. The survey questionnaire distinguishes between PIN-based payments and payments without a PIN. We cannot exclude that some respondents have misunderstood the separation of payments into payments with and without PIN. If this is the case, the true value for "contactless payments" might be somewhat lower.

cards which were already well known and frequently used by Austrians and on an existing dense network of point-of-sale terminals.¹⁸ Available evidence suggests that in the second quarter of 2018, about 3 out of 4 payment terminals in Austria already allowed for contactless payments.¹⁹ Mooslechner, Stix and Wagner (2012) have shown the close co-movement between the number of payment terminals and the number of debit card transactions. However, the fast adoption could also indicate that the adoption speed itself has accelerated.

Aside from information on the incidence of use of contactless payments, we are also interested in the intensity of use. As survey respondents also indicated the broad frequency with which they use their debit and credit cards, we can compute a rough estimate of the share of debit and credit card transactions that are conducted contactless. However, we note that this computation relies on respondents' recollection and is based on a series of assumptions that are difficult to verify and hence the results should only be seen as indicative. According to this estimate, roughly 40% of all card transactions are conducted contactless without a PIN. This result is roughly in line with actual transaction data from the second quarter of 2018, which show that 50% of all Austrian debit and credit card transactions and about one-third of transactions in terms of value were initiated contactless.²⁰ However, the actual transaction data are not directly comparable with the survey information as the former counts as contactless all card payments that were initiated contactless, regardless of whether a PIN is required or not. In contrast, the survey differentiates between PIN and non-PIN transactions. Given that the number of contactless transactions without a PIN must be lower than the figure arising from the transaction data, the estimated share seems at least plausible.

How does the use of contactless payments in Austria compare with that in other countries? According to a study by the European Central Bank conducted in 2016 and early 2017, Austria ranked third among 17 euro area countries in the use of contactless payments (Esselink and Hernandez, 2017). Nevertheless, the share of contactless payments (<EUR 25) then was still low at 2.5% of all transactions. The rapid growth of contactless payments suggests that this share has increased in the meantime. In other countries, contactless payments already make up a considerable share of transactions. As a case in point, they accounted for one-third of all point-of-sale transactions in 2016 in Australia, having tripled from 2013 to 2016 (Doyle et al., 2017). In 2016, nearly 60% of Australians made at least one contactless card payment per week, compared with about one-third in 2013. While contactless payments replaced both cash and card payments, in general, they replaced mainly cash for low transaction values. From 2013 to 2016, the share of cash declined from 47% to 37%. An increasing trend for contactless payments can be observed also in many other countries.

One segment of point of sale payments which is likely to grow in the coming years is mobile payments, e.g. via mobile phones, tablets, smartwatches, bracelets, etc. As of now, the payment methods for mobile point-of-sale payments available to Austrian consumers range from contactless NFC payments to payments via text

¹⁸ The electronic purse "Quick" was launched under similar conditions (implementation mainly on debit cards and use of an existing terminal network) but did not gain a comparable market share.

¹⁹ According to unpublished OeNB payment statistics Q2/2018.

²⁰ According to unpublished OeNB payment statistics Q2/2018.

message or a confirmation call (e.g. Paybox) or via a bar code (e.g. Blue Code). The survey questionnaire did elicit information on payments with mobile devices, however, we doubt that the questionnaire was clear enough for respondents to provide consistent answers. About 7.4% of respondents stated that they use a mobile phone for payments in a shop or at a vending machine. The Deutsche Bundesbank reports that 2% of respondents (18 years or older) used a mobile phone for payments at the point of sale in 2017 and 6% used a mobile phone for a payment outside a shop (Deutsche Bundesbank, 2017). At the end of 2015, about 8% of U.S. citizens had used their mobile phone “to pay for something in a store in the last 12 months” (Federal Reserve Board, 2016). Given this comparison, we suspect that the share found for Austria is too high and that respondents might have also included the purchase of pay-and-display parking tickets, public transport tickets or of other non-point-of-sale transactions.²¹ At least, this finding suggests that mobile payments at the point of sale deserve further attention in future surveys.

Apps with which money can be transferred to other persons or to merchants have reached a considerable diffusion in some countries. In Austria, several solutions allow consumers to send money to other people or abroad (e.g., most Austrian banks operate “Zoin,” which allows for transfers of bank deposits between persons within seconds). We find that 3.9% state that they use one of these apps “on a mobile phone or tablet to send money to other persons” at least once a year (95% confidence interval from 2.6% to 5.2%). This compares with 5% in Germany (Deutsche Bundesbank, 2017).

3.1 Payment preferences: contactless payments already important

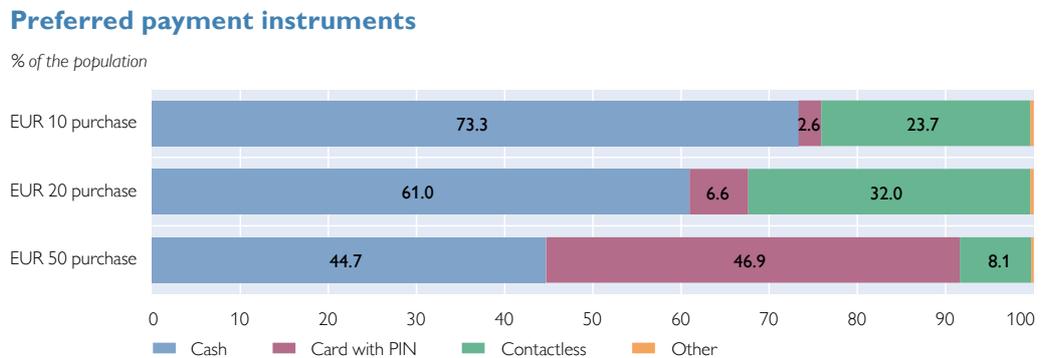
As the actual use of payment instruments by consumers might be constrained by the payment options available, the survey included a question on payment preferences. Specifically, respondents were asked how they would prefer to pay for a purchase worth EUR 10, EUR 20 and EUR 50, e.g. in a supermarket, assuming that cash, cards (with PIN) and contactless payments (without PIN) are accepted and that they have enough cash at hand to make the payment.²² Chart 6 summarizes the responses: for a hypothetical EUR 10 payment, almost 3 out of 4 Austrians state that they would prefer to pay in cash. For a EUR 50 purchase, still 45% prefer to use cash. In turn, already almost one-quarter of respondents would prefer to make the EUR 10 payment contactless. For a EUR 20 payment, this share is one-third.

We think that there are two messages that can be deduced from chart 6. First, a sizeable share of Austrians still prefer to pay in cash, regardless of the availability of other payment options. Second, given that the contactless payment option is relatively young, it has already reached a remarkable share of the population. In the next section, we therefore take a closer look at the users and nonusers of contactless payments.

²¹ The Deutsche Bundesbank reports that in 2017, 2% of German respondents used a mobile phone for a payment in a shop and 6% used a mobile phone for a payment outside a shop (Deutsche Bundesbank, 2017).

²² The question asked respondents to assume that they have enough cash at hand. This assumption might, on the one hand, bias results in favor of cash as some respondents who prefer not to use cash might want to get rid of it in this hypothetical scenario. On the other hand, some people who would like to use cash might typically carry too little cash with them. Regardless of these subtleties, we think that the question is useful for revealing preferences given the specific scenario.

Chart 6



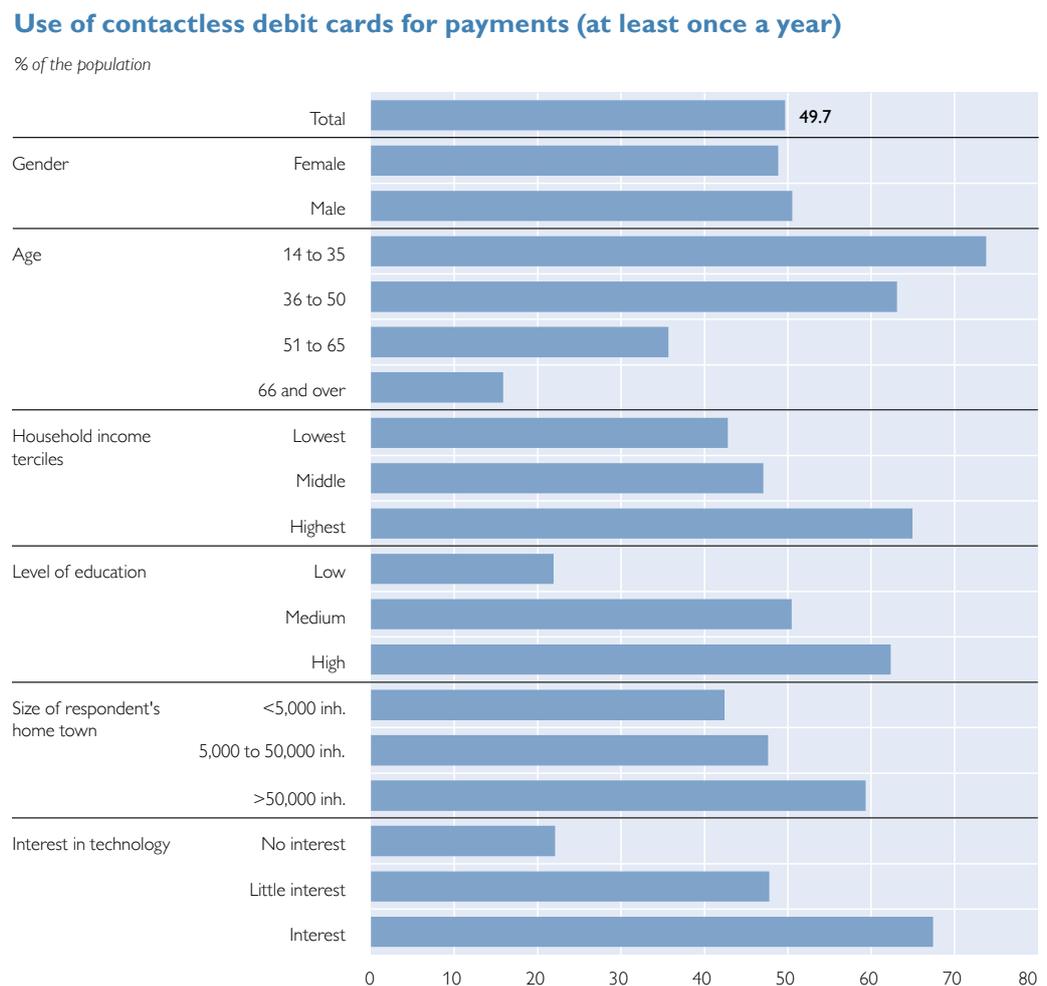
Source: OeNB-Barometer Q2/2018.

Note: The chart summarizes the answers to the question: "Suppose you make a EUR 50 (20) (10) purchase in a supermarket. You have enough cash at hand and the shop accepts both card payments and contactless payments. How would you prefer to pay for this purchase?"

3.2 A closer look at the use of contactless payments

Chart 7 summarizes the use of contactless debit cards without PIN (at least once a year) by sociodemographic groups.

Chart 7

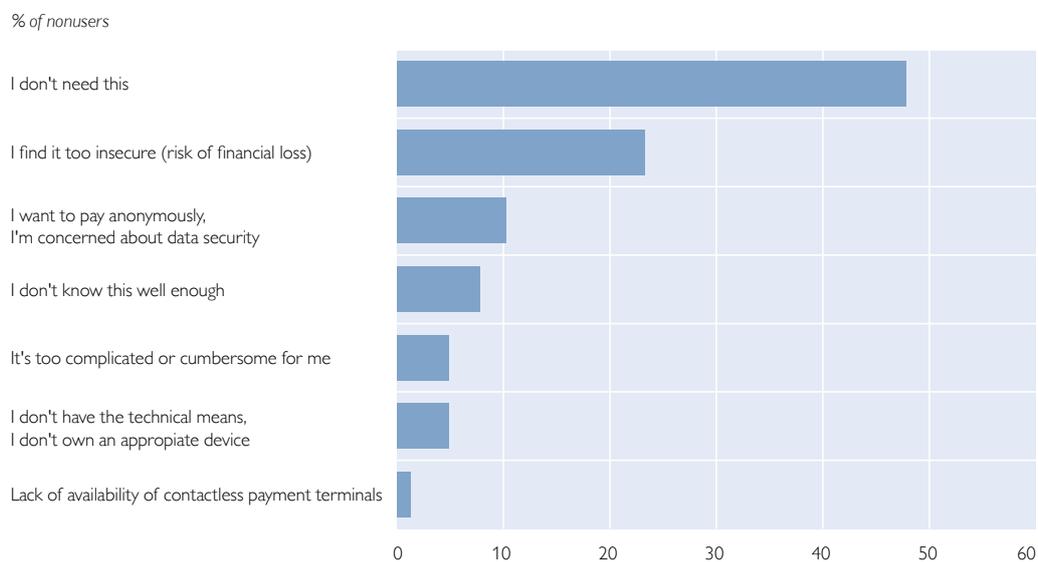


Source: OeNB-Barometer Q2/2018.

Note: The chart shows the share of the population by socio-demographic groups that uses a contactless debit card.

Chart 8

Reasons for not making contactless payments



Source: OeNB-Barometer Q2/2018.

Note: The chart summarizes a list of reasons provided as responses to the question why respondents do not make contactless payments. Multiple answers were possible. Base: Nonusers of contactless payments (and who know about contactless payments). Respondents who did not provide an answer were omitted.

The pattern of results mirrors the patterns found for online banking, despite the obvious differences in levels: The use of contactless payment cards decreases with age, increases with income, level of education and interest in technology. For some of these sociodemographic groups, usage rates are already quite high, for others they are still rather low. For example, 74% of persons aged 14 to 35 use contactless cards without PIN; for persons aged 51 to 65, this share is 36% and for persons aged 66 or over, it is 16%. 84% of users of contactless card payments see the fast transaction speed as one advantage of this technology.

So what are the reasons why people do not use contactless debit cards? Chart 8 shows that there are two dominant reasons: “I don’t need this payment instrument,” followed by concerns about security.

4 Awareness and use of fintech at an early stage of diffusion

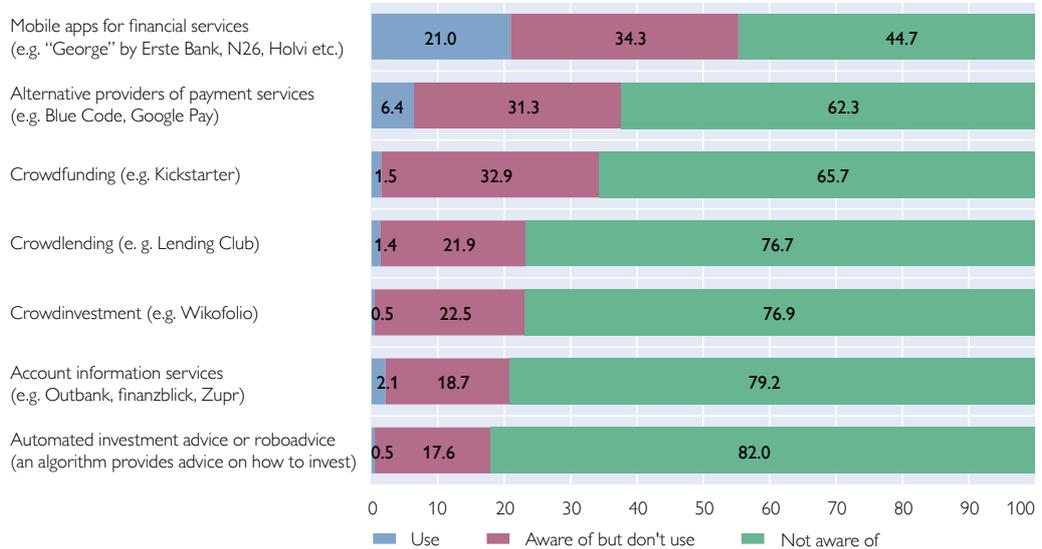
Fintech, short for financial technology, a concept that denotes both new companies that offer innovative financial services and products as well as the technology underlying these services and products, has been attracting much attention. Fintech offers new financial products/services and/or easier access to existing products (often through mobile access) and, as a result, has been identified as potentially disruptive to traditional banking.

Chart 9 summarizes awareness and use of various fintech services/products in descending order, from respondents’ highest to lowest awareness. The products/services were clustered into broad categories, with some services being provided (also) by banks (e.g. online apps for financial services). To make it easier for respondents to understand the question, the questionnaire provided examples for each category. As a validation of survey responses with external information is not

Chart 9

Awareness and use of fintechs

in % of respondents



Source: OeNB-Barometer Q2/2018.

Note: The chart summarizes the responses to the question about whether respondents use, are aware of (but don't use) or aren't aware of various fintech services.

possible, we cannot assess whether the respective survey responses are accurate. Therefore, these results should be seen as indicative only.

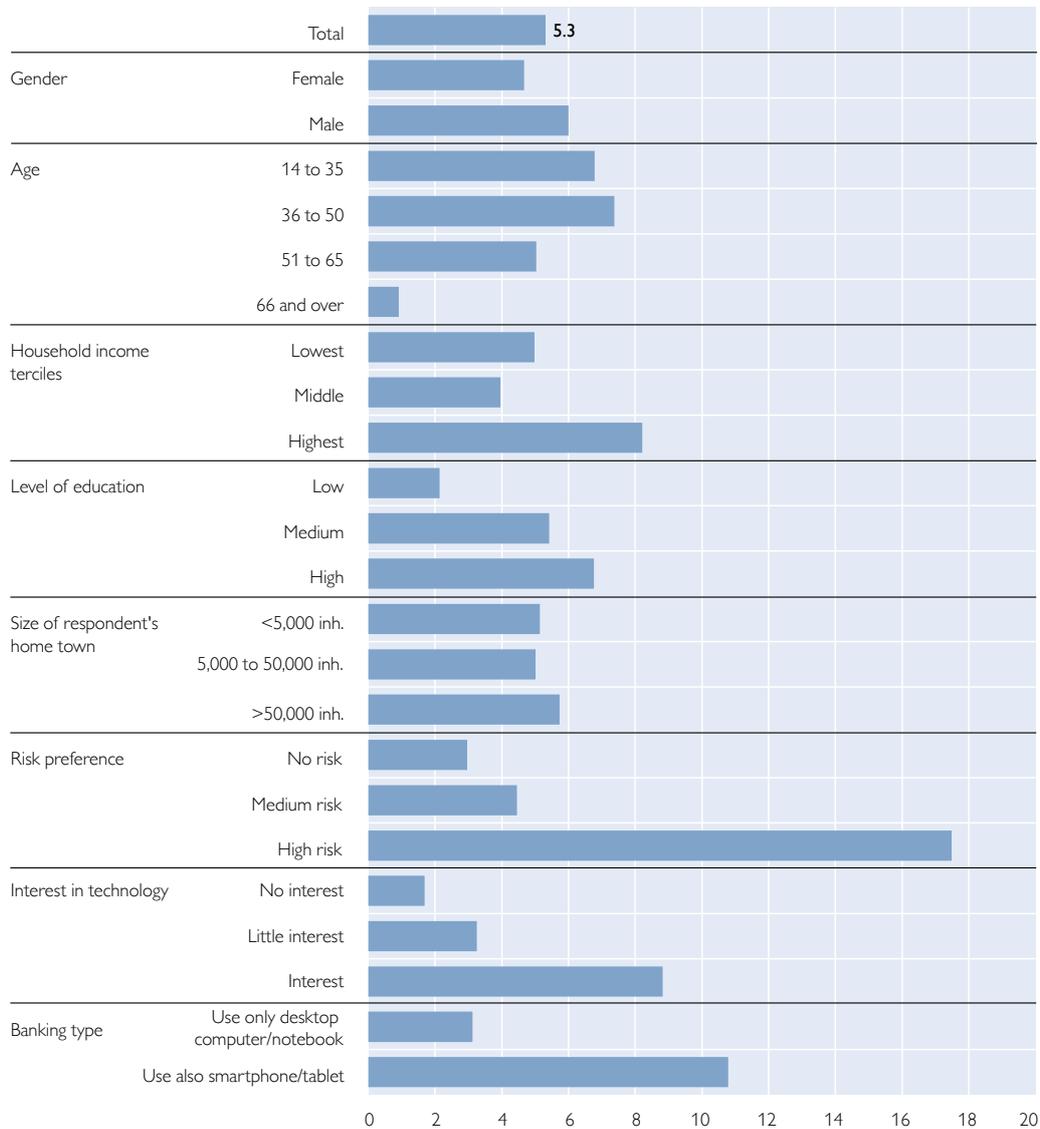
When we look at individual fintech products/services, use is low among the Austrian population, with two exceptions: mobile apps for financial services are used by 21% of Austrians, and alternative payment providers are used by 6.4% (95% confidence intervals: 17.3% to 25.3% and 4.7 to 8.8%, respectively). For the remaining items, a broad majority of Austrians is unaware of their existence. However, given that the factual diffusion of several fintech products/services is very modest (e.g. Pointner and Raunig on lending platforms in this volume; or Stern, 2017) one can also interpret this result differently, namely that it is remarkable that between 18% and 34% (depending on the product) have already heard about these services.

We also looked into how many respondents use any of these products. Overall, we find that 25% of Austrians use at least one of the products/services listed in chart 9. If we leave banking apps aside, there are still 10% of Austrians that use at least one of the remaining products (confidence interval: 7.5% to 12.5%). If we also disregard payment service providers, we find that 5.3% (95% confidence interval: 3.7% to 7.0%) state that they use fintech. These results demonstrate that the adoption of these services is not negligible, with the important qualification that we have no information on the amounts involved. In contrast to previous results, for which the highest usage rates were among persons aged between 14 and 35, we find the highest use of fintech among persons in the age group of 36 to 50 years. In our view, this reflects that users need financial resources to be able to use fintech (chart 10). Chart 10 also shows fintech use by respondents' financial risk attitude. In the small group of respondents who are willing to accept financial

Chart 10

Use of fintech (disregarding mobile apps for financial services and alternative providers of payment services)

% of respondents



Source: OeNB-Barometer Q2/2018.

Note: The chart shows the share of respondents that use any of the following fintech services/products in the overall population (total) and by sociodemographic groups: crowdfunding (e.g. Kickstarter), crowdlending (e.g. Lending Club), crowdinvestment (e.g. Wikofolio), account information services (e.g. Outbank, finanzblick, Zupri), automated investment advice or roboadvice (an algorithm provides advice on how to invest) and "other" (open question).

risks (e.g. losses), the use of fintech is largest by far. Finally, chart 10 depicts the results for online banking users who only use their desktop/notebook and online banking users who also use a mobile device. Adoption rates are much higher in the latter group than in the former group (the difference is statistically significant). We can only presume that this difference reflects the degree to which people are willing to handle financial matters on a technical device.

Table 6

Expected importance of fintech in five years' time

	Respondents who know at least one fintech service/product	Respondents aged 14 to 35	Respondents who use online banking via smartphone/tablet	Respondents with financial risk tolerance
<i>% of respondents who are aware of fintech</i>				
I don't think I'll ever use fintech for my banking transactions	59.6	52.2	49.7	33.6
I'll try some fintech sometime	20.9	25.9	23.9	32.6
I'll use fintech regularly	5.3	8.7	9.3	12.9
I'll conduct most of my banking transactions via fintech	2.0	3.3	3.8	4.0
I'll conduct all my banking transactions via fintech and won't have a traditional bank account	0.1	0.1	0.1	0.3
Don't know	12.1	9.8	13.3	16.7

Source: OeNB-Barometer Q2/2018.

Note: The table shows the responses to the following question: "Do you think that in five years' time fintech will be important for your personal finances?" Answer categories are in rows. The columns refer to different subsamples of the population.

At this early stage of adoption, it is impossible to assess the extent to which banks will be challenged by fintech; all we can do is look at respondents' views. Currently, only a small share of 2.1% respondents (who are aware of at least one fintech product/service and who provided an answer) can imagine that they will conduct most or all of their banking activities via fintech. A share of 26% states some willingness to try out fintech services or to use them regularly. Finally, about 60% of respondents state that they will never use fintech for their banking transactions. For the sake of comparison, table 6 shows responses for three subgroups that are keener on adopting newer technologies than other groups. The results indicate that younger persons aged 14 to 35 and those who conduct online banking are also more open to trying out fintech services.²³ The last column shows respondents who are risk tolerant, i.e. who are willing to accept high financial risks if high profits can be expected. This subgroup has the lowest loyalty to traditional banks: 50% of this (rather small) group can imagine trying out a fintech product at least some time.

5 Crypto assets – just a hype?

Over the past few years, so-called "cryptocurrencies" (in the following referred to as crypto assets) have received considerable attention.²⁴ These assets (or tokens) are privately issued without the involvement of a central institution; trust is established via the mechanism design, mainly cryptography and economic incentives for miners. Miners provide the computing power to conduct cryptographic computations and are rewarded with newly issued tokens. The current systems, most prominently Bitcoin, have implemented a system of economic incentives which makes it costly for miners to be dishonest. Double spending of digital tokens is

²³ As this analysis is mostly explorative, we have not tested whether these differences are significant.

²⁴ Up to now, crypto assets lack the characteristics of currencies, i.e. mainly with regard to their instability in value and their usability for day-to-day transactions.

prevented as the whole history of transactions is stored in a public register (blockchain), which can only be manipulated ex post at exorbitant costs (unless miners own more than 50% of the computing power). In this way, any transaction between two parties can be conducted without the need of a trusted third party (Weber, 2018).

Again and again, crypto assets have attracted enormous media attention – partly due to stories that crypto assets have the potential of replacing central bank-issued money, partly due to stories about people getting very rich, and partly due to stories about fraud and theft. As a consequence several questions which are important to policymakers and regulators have emerged, for instance: How widespread is the ownership of crypto assets? Should the market be regulated? To what extent are crypto assets used for legal and for illegal transactions?

To enrich this debate, the OeNB-Barometer Q2/2018 contained questions about the ownership of crypto assets (table 7). Accordingly, 2% of Austrians owned crypto assets at the time of the survey (with a 95% probability the mean is in a range from 1% to 2.9%). About 1.5% owned Bitcoin and 0.09% owned other crypto assets. 1.1% had owned crypto assets in the past but sold them before the interview.

The survey also asked respondents about their motives to hold crypto assets. As an ownership rate of 2% implies that only 25 persons in the sample owned crypto assets, we stress that the results can be seen only as indicative. The most commonly cited reasons are “I see [crypto assets] as an investment with prospects of capital gains” (70% of owners stated this reason, multiple answers were possible) and “interest in technology” (59%). This motivation conform with findings for Canada (Henry, Huynh and Nicholls, 2018b). Almost half of crypto asset owners use these assets to pay for goods or services at least once a year. The relative majority has acquired their digital tokens via a domestic (35%, multiple answers possible) or international platform (35%), followed by systems that invest on behalf of their customers (25%) – only a small proportion has acquired their crypto assets via a vending machine or retail outlet (again, these findings are very unreliable due to the low number of observations).

How do our findings regarding ownership compare to other studies? For Austria there are two other recent surveys that report ownership rates of crypto assets. According to a survey by ING-DiBa (ING International Survey), about 8% of Austrians owned crypto assets in March/April 2018.²⁵ According to the survey company Market, 4% “have already used [crypto assets] for a payment or for

Table 7

Ownership and awareness of crypto assets

	% of the population
1. I currently own crypto assets (Bitcoin or other)	2.0
2. I owned crypto assets in the past	1.1
3. I've never owned crypto assets but I'm interested in crypto assets	7.9
<i>Interest in crypto assets (1+2+3)</i>	<i>11.0</i>
4. I know crypto assets only by name	24.6
5. I know crypto assets by name but have absolutely no interest in such assets	41.5
6. I've never heard of crypto assets	22.9

Source: OeNB-Barometer Q2/2018.

Note: The table summarizes the responses to two questions about respondents' ownership of crypto assets. The first question asks whether respondents have heard of „Bitcoin or of other so-called cryptocurrencies“. For those respondents that have heard of crypto assets, another question asks whether respondents (1) currently own Bitcoin, (2) currently own other so-called cryptocurrencies, (3) owned them in the past, (4) have never owned such assets but are interested in them, (5) know of and (6) know of but have absolutely no interest in such assets. Answers (1) and (2) are summarized in one category („owns crypto assets“).

²⁵ ING International Surveys Mobile Banking 2018: <https://think.ing.com/reports/cracking-the-code-on-crypto-currency/>.

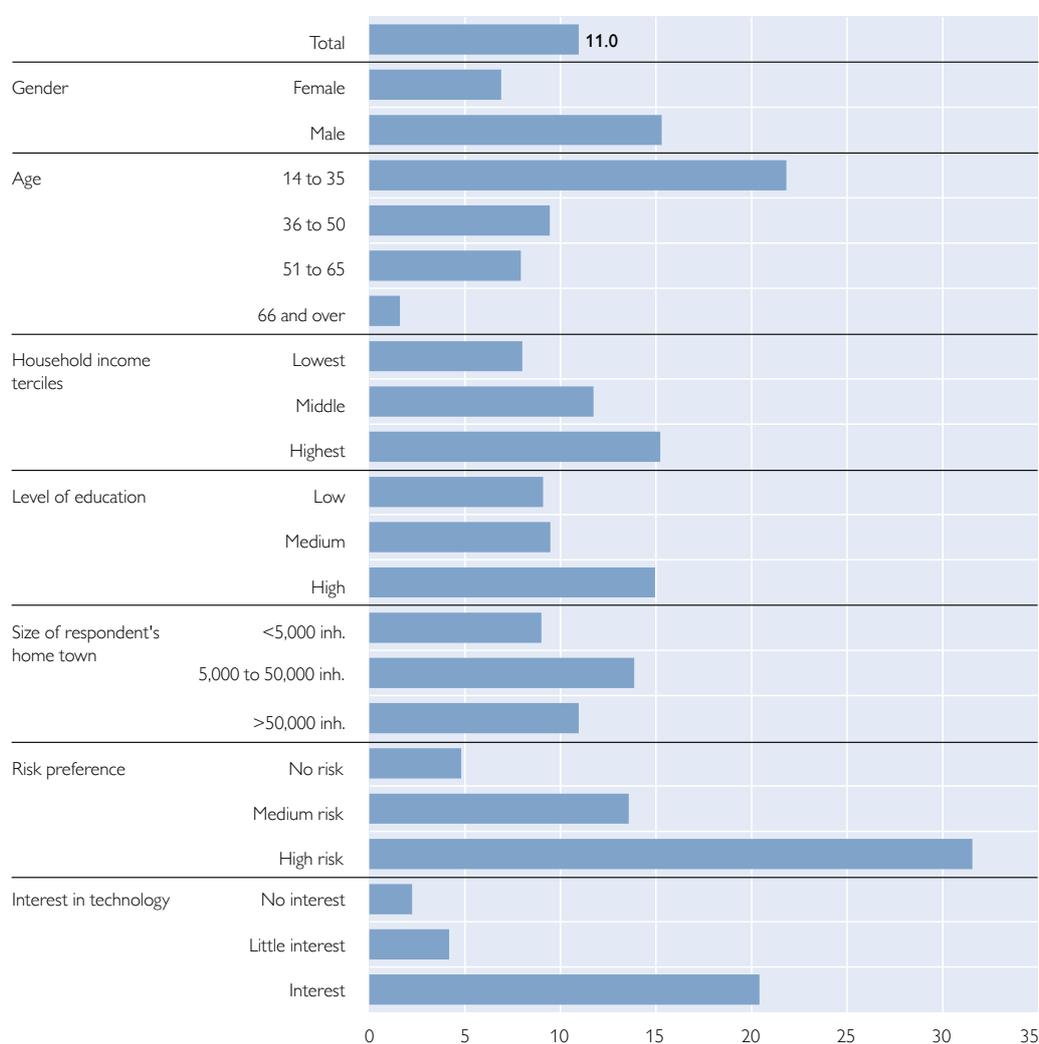
speculation” (interviews were conducted in December 2017).²⁶ As this survey refers to current and past ownership, the OeNB-Barometer’s result (2% current and 1.1% past ownership) is in the confidence interval of Market’s result, and the difference might be attributable to a different sampling and/or differences in the interview dates.²⁷

Austrians’ ownership rate of crypto assets of 2% according to the OeNB-Barometer compares with an ownership rate of 4% for Germany, based on a survey

Chart 11

Interest in crypto assets

% of respondents



Source: OeNB-Barometer Q2/2018.

Note: The chart shows the share of respondents with an interest in crypto assets, i.e., persons who either owned such assets at the time of the interview, had owned them before or said that they have an interest in crypto assets.

²⁶ “Große Skepsis gegenüber Bitcoin & Co. Aber für die junge Generation geht der Hype weiter“ (www.market.at). (Both results are based on samples that are drawn from online users (n=1009 for ING and 608 for Market) while the OeNB-Barometer is based on personal interviews.

²⁷ In our survey, the 95% confidence interval for current or past ownership ranges from 2.0% to 4.1%.

conducted by the industry association Bitkom in 2018.²⁸ In Canada, the Bank of Canada has conducted specialized surveys, reporting Bitcoin ownership of 3% for 2016 and 5% for 2017 (Henry, Huynh and Nicholls, 2018a and 2018b). For the U.S.A., the Federal Reserve Bank has conducted surveys on payment behavior, reporting that 0.7% of the U.S. population held “virtual currencies” in 2017 (Greene and Stavins, 2018).

For policymakers, a key question is the “market potential” of crypto assets, e.g. the number of persons that have already invested or could potentially invest in these assets. Table 7 shows that 7.9% of the population does not own crypto assets but is interested. Thus, a total of about 11% can be viewed as being very interested, either due to current or past ownership or because they expressed interest (confidence interval: 8.9% to 13%). A further 25% of respondents know of crypto assets, and 42% know them but have absolutely no interest. Finally, 23% have never heard of crypto assets.

Chart 11 summarizes respondents’ interest in crypto assets by socioeconomic groups. The pattern is very similar to previous findings with respect to age and interest in technology. Interestingly, the differences are not as strong as for the other financial innovations discussed earlier with respect to income and education but stronger for gender, with men being on average considerably more interested than women. To assess the impact of risk attitudes of interested people, we also show interest in crypto assets according to different levels of risk aversion. Our findings suggest that interest is much higher when persons state that they are willing to accept financial risks if they can expect an above-average profit from an investment.²⁹ This also holds for current owners of crypto assets (among the 25 owners, 14 are risk tolerant and just 2 are risk averse, the remaining 9 cases have a medium risk tolerance – if the risk attitudes of the overall population were applied to current owners, then we should observe that 14 out of the 25 persons are risk averse).

To find out more about people’s attitudes about crypto assets, survey respondents who are aware of crypto assets and who are not completely uninterested were asked whether they agreed or disagreed with a number of statements.³⁰ Chart 12 summarizes the results as balance statistics, expressing a voting result, i.e. whether and how strongly respondents agreed with a statement or an associated opposing statement. For example, a value of 40 means that the group that agrees with a statement is 40 percentage points larger than the group that agrees with the opposing statement. It should be kept in mind that the results pertain to a subsample of the population and that item nonresponse was considerable for some statements.

We find that a substantial majority considers crypto assets to be volatile (in terms of their value in euro), and a (smaller) majority considers crypto assets as an unattractive investment. Accordingly, a majority does not consider purchasing

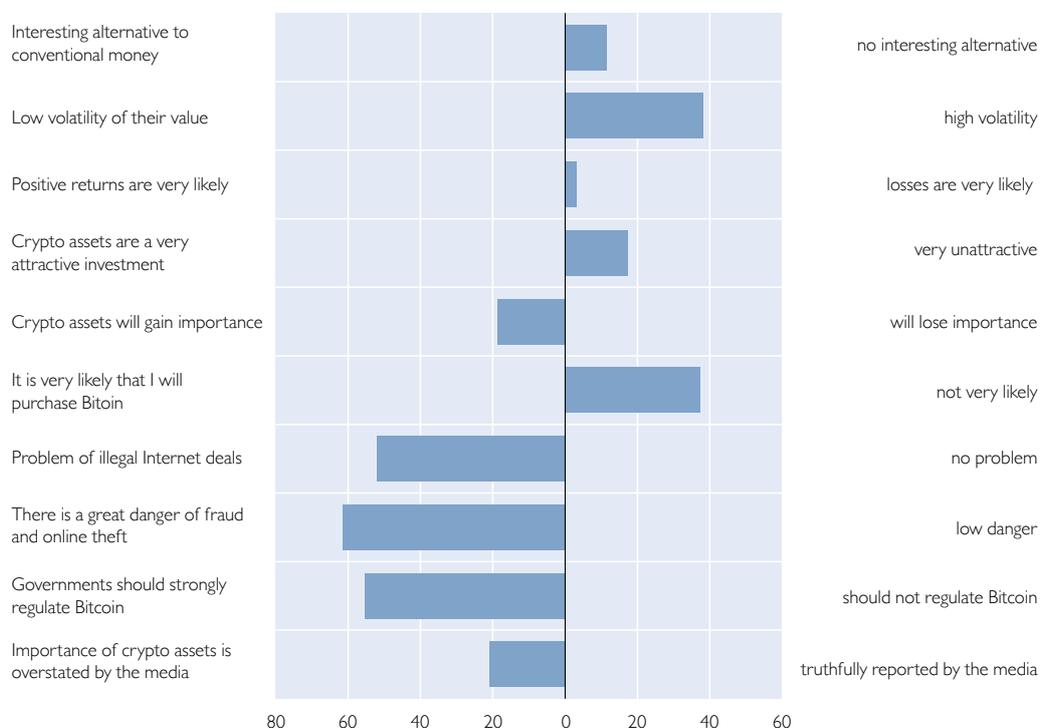
²⁸ Sample of about 1,000 persons aged 14 or older (<https://www.bitkom.org/Presse/Presseinformation/Inzwischen-kennen-zwei-Drittel-der-Bundesbuenger-Bitcoin.html>). Further details on the sampling are not available.

²⁹ The differences according to gender and risk attitudes are statistically significant. To assess whether the other differences are statistically significant, the reader is referred to the estimation results in section 6.

³⁰ The question was asked for respondents who belong to line 1, 2, 3 and 4 of table 7.

Attitudes toward crypto assets

Balance statistics (percentage share of respondents who agree minus percentage share of respondents who disagree)



Source: OeNB-Barometer Q2/2018.

Note: The chart shows respondents' agreement with various statements about crypto assets. Values left of the vertical line indicate agreement with the statement, values on the right-hand side indicate disagreement. In the survey each statement was presented with an opposing statement and respondents could indicate whether they agree with the first statement or with the opposing statement or whether they agree with neither. The bars represent the share of respondents who disagree minus the share who agree. Basis: respondents who are aware of crypto assets and who have a little interest in such assets (and who provided an answer to the respective statement).

crypto assets. However, a majority also thinks that crypto assets will increase in importance in the future.

A vast majority agrees with the statement that crypto assets facilitate illegal activities and that they involve a great danger of fraud and online theft. The statement that the government should regulate Bitcoin receives strong support.

These answers are informative as they reveal the overall assessment of crypto assets by informed parts of the population. As the majority of informed people do not hold crypto assets, some of the results might not come as a surprise. To look into attitudes in more detail, we analyze the balance statistics separately for three groups: (1) owners (n=25), (2) nonowners with a high interest (either because they owned crypto assets in the past or because they say that they are interested) (n=105) and (3) nonowners who are aware of crypto assets but who are neither interested nor disinterested (“know by name”) (n=326).

Again, the group of owners is very small, which requires caution when interpreting findings. With this in mind, the analysis reveals marked differences between the three groups:

- Owners see crypto assets as an attractive investment, they have a relatively better assessment of their volatility than the other groups, they think that crypto assets will increase in importance and they are likely to further invest in these assets.

- The group who knows crypto assets only by name does not view crypto assets as an attractive investment; on average these respondents do not expect profits, they think that crypto assets are volatile and they do not intend to buy them.
- The group of current nonowners with a stated interest is particularly interesting as this group is closest to investing. The majority among this group regards crypto assets as volatile but nevertheless considers crypto assets an attractive investment. Moreover, the majority in this group believes that crypto assets will rise in importance.

As regards the other statements, we find that a majority in all three groups (1) considers crypto assets a problem because of illegal activities, (2) sees a great danger of fraud and online theft and (3) thinks that their importance has been overstated by the media. Nonowners are in favor of regulation while among owners there is an equal number of those in favor of and those against regulation.

6 Digital natives und technology skeptics – socioeconomic aspects of the use of banking and payment innovations

The previous results suggest that the use of newer banking and payment technologies follows a similar pattern across socioeconomic groups, e.g. that risk tolerant persons are more likely to adopt digital financial products than risk averse persons. While being indicative, such findings can also be misleading as many of these apparently important characteristics are correlated; therefore, we would like to identify those socioeconomic factors that matter most. The effect of age is of particular interest. If age still exerted an effect once other potentially important variables are controlled for (e.g. education, income, risk tolerance), this would have implications for predictions about the future course of adoption and use of financial innovations.

In this context, we conduct regressions which control for a broad range of potentially important variables. Again, we take a broader perspective and juxtapose the results for various technologies, from banking to payments, with each other. Specifically, we define various types and assign survey participants to whether they belong to a specific consumer type (if so, the respective variable is coded as 1, and as 0 if they do not belong to this type). The types themselves follow the discussion in this paper, i.e. whether (1) consumers bank more frequently online than at a bank branch, (2) use their debit card at least monthly, (3) pay contactless at least monthly and (4) have an interest in crypto assets (see table 8 for the definition of consumer types). To assess nonuse of financial innovations we define a (5) cash type, i.e. persons who have a strong cash preference.

For each consumer type, we estimate a separate probit regression. As explanatory variables, four groups of variables are considered. The first group consists of sociodemographic variables (gender, income, age, education, size of home town). The second group consists of background variables that measure interest in technology as well as risk preferences regarding financial decisions (see the annex for definitions of variables). The third group consists of variables that measure respondents' assessment of the safety of a given innovative product or service with respect to financial losses or the unwanted disclosure of personal information. Finally, the fourth group consists of additional variables that could have an impact on the use of payment/banking instruments (see the annex for variable definitions). In particular, we include the dummy variable "financially literate," which measures respondents' self-assessed knowledge of financial matters (Lusardi and Mitchell, 2014).

Table 8

Definition of consumer types used in regressions

	Definition	Mean	Confidence interval
Types		(% of the population)	(95%)
Type: online banking	= 1 if a person banks more frequently online than going to a bank branch (at a bank desk or self-service area), 0 otherwise.	46.7	42.8–50.6
Type: debit card PIN (monthly)	= 1 if a person pays at least once a month with a debit card by entering a PIN code, 0 otherwise.	75.1	71.3–78.8
Type: contactless card payment w/o PIN (monthly)	= 1 if a person pays at least once a month with a contactless debit or credit card (without a PIN code), 0 otherwise.	48.5	44.8–52.3
Type: uses at least one fintech service or product	= 1 if a person uses at least one of the following fintech services or products: alternative provider of payment services, crowdfunding, crowdlending, crowdinvestment, account information services, automated investment advice, “other”, 0 otherwise. Mobile apps for financial services were excluded.	10.0	7.5–12.5
Type: interest in crypto assets	= 1 if a person owns or owned crypto assets or expresses interest in crypto assets, 0 otherwise.	11.0	8.9–13.0
Type: cash preference	= 1 if a person states that he or she prefers to make a EUR 50 payment in a supermarket in cash although cards are accepted and the person has enough cash at hand, 0 otherwise.	44.7	41.2–48.2

Source: OeNB-Barometer Q2/2018.

“Think before buying” measures whether respondents need to or want to keep track of their expenses (i.e. whether they agree to the statement “before I buy something, I consider very carefully whether I can afford it”). Finally, the regressions contain a variable which measures whether respondents have no trust in domestic banks as well as variables for the perceived safety of a given innovation (if such variables are available).

The regression results are summarized in table 9. For ease of exposition, only the direction of the effect is symbolized by a plus or a minus symbol (only for point estimates that are significant at the 5% level), which indicates whether the odds of a person belonging to a specific type are higher or lower than the odds of a person belonging to the base category.³¹ In the following we do not discuss the results in detail but focus on the bigger picture:

- The perceived safety of an innovation is, not surprisingly, an influential driver of adoption. If a person considers online banking or a payment instrument as being not safe, the likelihood that this person uses this financial product or service will be very small. In contrast, a person who considers cash to be safer than other payment instruments, is more likely to have a preference for cash.
- Age is an influential determinant of use of financial innovations even if other variables are being controlled for. For all but one innovative product or service, the youngest age group has the highest adoption rates. In contrast, the likelihood that someone has a preference for cash increases with age. Differences between age groups fade for the most mature payment innovation (i.e. debit card payments with PIN), where only the oldest age group is significantly less likely to use it than all other age groups.

³¹ Odds represent the chances of belonging to a specific type.

Table 9

Regression results: determinants of different consumer types

		Type: online banking	Type: debit card PIN (monthly)	Type: contactless card payment w/o PIN (monthly)	Type: uses at least one fintech service or product	Type: interest in crypto assets	Type: cash preference
		(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable							
Gender	(relative to Female)						
	Male					+	+
Age	(relative to age 16 to 35)						
	Age 36 to 50	–		–	–	–	
	Age 51 to 65	–		–	–	–	
	Age 66 and over	–	–	–	–	–	
Household income	(relative to Household income lowest)						
	Household income middle						
	Household income highest						
Level of education	(relative to Low)						
	Medium			+			–
	High		+	+			–
Size of respondent's home town	(relative to >50,000 inh.)						
	<5,000 inh.			–			+
	5,000 to 50,000 inh.					+	
Risk preference	(relative to Low financial risk)						
	High financial risk	++	++	+	++	++	–
	Medium financial risk	+		+			–
Interest in technology	(relative to Very low)						
	High	+	+	+	+	++	–
	Low		+				–
Financial literacy							
	Quality news		+			+	
	Financially literate			+	+		
	Think before buying		–	–			
Trust/safety							
	Rel. trust safety online banking	++	.	.	.	.	.
	Rel. trust safety cards with PIN	.	++	.	.	.	.
	Rel. trust safety contactless cards	.	.	++	.	.	.
	Rel. trust safety cash	.	.	.	.	.	++
	No trust domestic banks	.	.	.	+	.	.
	Observations	945	1,008	1,002	1085	1109	1,013
	Sample mean of dependent variable	0.52	0.79	0.53	0.10	0.10	0.40
	Log likelihood	–461.11	–412.94	–478.81	–277.52	–286.2	–544.92

Source: OeNB-Barometer Q2/2018.

Note: The table represents regression results from probit estimations. The sample comprises only respondents with a transaction account and who provide a safety ranking for at least 4 out of 6 payment instruments. Results are not weighted. For each dependent variable in columns, the indicated model is estimated. The symbols denote whether a particular variable is found to be statistically significant at the 5% level. A plus or minus symbol denotes the direction of the effect relative to the base category. A double „++“ (or „–“) denotes that the odds ratio of a variable is higher than 2 (lower than 0.5). A „+“ (or „–“) denotes that the odds ratio is between 1 and 2 (0.5 and 1) relative to the base category. „.“ indicates that a variable has not been included in a specific regression. The model in column 4 omits persons aged 66 or over as the sample does not contain persons in this age group who use a mobile phone for payments at the point of sale. The symbols are based on robust standard errors. Variable definitions and descriptive statistics are presented in the annex.

- The willingness to accept risks of losses in financial decisions is a strong predictor for the use of digital financial products. The small group of risk tolerant respondents (13% of the sample) has a much higher likelihood of using financial innovations. The reverse holds for cash preferences: The large group of people who do not want to take any risk when making a financial decision (57% of the population) is more likely to prefer cash than the group who is willing to take medium risk.

- Interest in technological innovations exerts a significant impact on the adoption of innovations and has a particularly strong effect on interest in crypto assets. Those who are interested in technology are also less likely to use cash.
- Respondents who have a desire to keep track of their expenses (either because they want to or because they have to for financial reasons) are less likely to use payment cards.
- Lastly, the regressions control for whether respondents have trust in domestic banks. It has been conjectured that the use of fintech or crypto assets is related to a lack of trust in banks. Likewise, the increase in cash demand that has been observed since the outbreak of the global economic and financial crisis in 2008 has been associated with these factors. Our results partly confirm this conjecture as a lack of trust in domestic banks is correlated with a higher likelihood of using fintech. For crypto assets or cash preferences, however, we find no effect. To check for the robustness of results, we repeat the regressions only for those respondents that own the devices/cards for making use of banking and payment innovations (e.g. persons who hold a contactless card). This modification has little qualitative implications for the discussed findings.

While these results are informative, we also stress that they should be treated with some caution. The literature has shown that perceptions of ease of use, costs and other factors are important drivers of adoption (Bagnall et al., 2016), and due to missing information we cannot control for all relevant drivers. Moreover, some of the explanatory variables, i.e. trust in the safety of an innovation, are likely to be endogenous. A more detailed study of adoption decisions should acknowledge these considerations but is beyond the scope of this paper. We conjecture that the results for age, risk attitudes and interest in technology are unaffected by controlling also for these missing variables.

While the regressions inform us about relative effects, table 10 presents descriptive statistics about key variables and thus informs us about the characteristics of

Table 10

Socioeconomic characteristics of users

	Total	Type: debit card PIN (monthly)	Type: online banking	Type: contactless card payment w/o PIN (monthly)	Type: use of at least one fintech service or product	Type: interest in crypto assets	Type: cash preference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>% of respondents</i>							
Age (median)	48	44	39	39	36	33	56
Share of persons born before 1980	67	63	52	50	42	36	77
Share of persons aged 66 or over	20	12	5	7	3	3	33
Share of persons willing to take high financial risks	13	16	21	19	36	37	10
Share of people with high interest in technology	45	51	64	62	71	84	32
Share of persons who own risky assets	19	21	24	19	31	27	18

Source: OeNB-Barometer Q2/2018.

Note: The table shows mean values of socioeconomic characteristics (in rows) for different user types (in columns). For age, the median is reported. Total refers to the sample of all individuals. Risky assets refer to mutual fund investments and stocks.

the adopters of new technologies. Specifically, table 10 presents descriptive statistics on their age, the share of persons willing to take high financial risks and the share with a strong interest in technological innovations for the overall population and for different types. The median age of users, e.g. of online banking, is considerably lower than the median age of the overall Austrian population. Across different types, the median adopters are in their 30s, and hence a considerable share of adopters cannot be considered to be “digital natives” (who are usually understood to be born in 1980 or later). At the same time, we observe rather low adoption rates for persons older than 65 years. Persons that prefer cash, in turn, are considerably older than the overall population. Table 10 also shows that risk preferences of adopters deviate substantially from the population average as does interest in technology. Finally, table 10 summarizes the share that possesses risky assets (i.e. stocks and mutual funds shares). In contrast to risk preferences, the actual ownership of risky assets also reflects financial resources. Among those who use at least one fintech product or service and those interested in crypto assets, ownership of risky assets is more prevalent than among the overall population.

The regressions reveal that adopters of fintech and persons who are interested in crypto assets share common characteristics. So are they the very same persons? Among all the persons who are either interested in crypto assets or who use fintech, about one-fifth belongs to both consumer types. The remaining 80% belong to one of the two types but not to both.

7 What role for cash?

Given that Austrians have access to a multitude of payment options and increasingly use these options, how do they see the role of cash? How does this assessment differ between users and nonusers of financial innovations? And what does this imply for the future of cash?

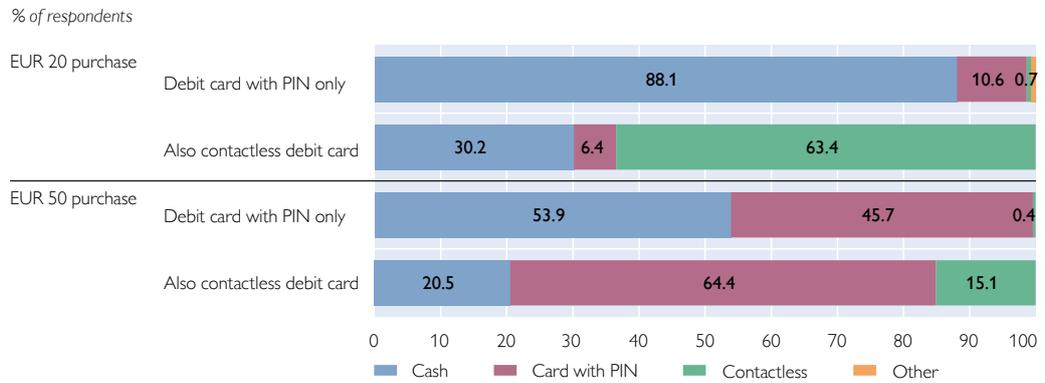
Over the past decades, many have expected that the importance of cash will sharply decline or that cash will disappear altogether. However, cash has proven to be remarkably resilient. In fact, cash demand has even increased over the past decade in the euro area, the U.S.A., Switzerland and Japan as well as in many other economies (Jobst and Stix, 2017; Bagnall et al. 2016). The proliferation of electronic payments and the parallel increase in cash demand indicate the difficulties in predicting the future of cash. Part of this seeming paradox arises because the largest part of cash demand is unrelated to its use for domestic payments (e.g. cash as a store of value or cash circulating outside the euro area): the use of cash for payments is estimated to account for only 10% to 15% of overall cash in circulation (Politronacci et al. 2018; Stix 2004).

To grasp how the use of cash for transactions is likely to evolve, chart 13 compares the payment preferences of two types of consumers: those who use the contactless function of their debit card and those who pay with their debit card only in a traditional way, that is by entering their PIN. The chart shows the share of respondents stating a preference for card and cash payments for a purchase worth EUR 20 and EUR 50, respectively. To grasp the relevance of this example, we note that the group paying only with PIN comprises 33% of the population and the group who already uses contactless payments accounts for a share of 50%.

The preference for cash is considerably lower among contactless payers than among “traditional” card payers. For a EUR 20 purchase, almost 90% of traditional

Chart 13

Preferred payment instrument: persons making PIN card payments only compared with persons using both PIN and contactless card payments



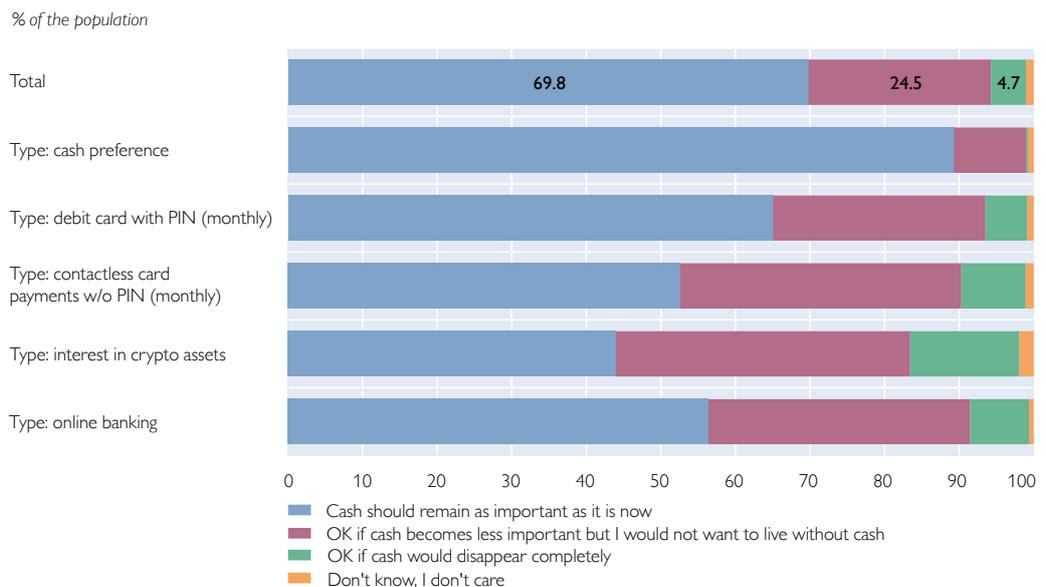
Source: OeNB-Barometer Q2/2018.

Note: The chart summarizes answers to hypothetical questions about the use of payment instruments for EUR 20 and EUR 50 purchases for two groups: 1) for respondents who pay with their debit cards but do not use contactless payments and 2) for respondents who also use contactless debit card payments.

card payers prefer to use cash, while this share is only 30% for those paying contactless (the difference is statistically significant). The share of those preferring cash for a EUR 50 payment is only 54% among card payers and 21% among contactless payers (the difference is statistically significant). As the number of contactless payments will increase in the coming years, these results suggest that cash use for transactions will decline overall and decrease relatively more strongly for smaller payment amounts.

Chart 14

Preferences regarding the future of cash



Source: OeNB-Barometer Q2/2018.

Note: The chart summarizes the responses to the following question: "In some countries, e.g. Sweden, cash has almost disappeared from daily life. Almost all people pay by card or by mobile phone. There has been a debate about the future of cash also in Austria. Which of the following statements reflects your preference?".

Over the past years, there have been discussions about the future of cash and whether cash is still needed in a digital world. The survey looked into the preferences of respondents in this regard. Overall, about 70% of Austrians state that cash should remain as important as it is now, 25% state that it would be ok for them if cash became less important but that they would not want to live without cash, and only 5% state that it would be ok for them if cash disappeared completely. Chart 14 also depicts the responses for the different types of consumers. Evidently, the support for cash is strongest among respondents with a preference for cash (who still account for 45% of the population) and weakest among those using payment innovations. However, even within the group who uses contactless card payments, there are still 53% that would like cash to remain as important as it is now and a further 38% would not want to live without cash (even though they would not mind if it declined in importance). Overall, the results show that only a small minority of Austrians is in favor of a complete abolition of cash.

The reasons why people use cash are manifold – speed of transaction, ease of use, convenience, costs, keeping track of expenses, anonymity (Rusu and Stix, 2017). In a previous OeNB survey (fall 2017), respondents were asked to which extent various payment instruments come close to their notion of an optimal payment instrument. Cash ranked first by a considerable margin, with 96% of Austrians saying that cash comes close to an optimal payment instrument (74% of the population completely agreeing and 22% rather agreeing).

The Deutsche Bundesbank asked a similar question in their payment survey of 2017 (Deutsche Bundesbank, 2017), although the phrasing of the question and answer categories differed somewhat. In Germany, about 12% are in favor of either an abolition of cash (2%) or of cash being replaced with electronic means of payments to the largest extent possible (10%). 88% would like to keep the option of paying in cash. Despite the limited comparability of the questions, both the results for Austria and for Germany show that a vast majority does not want cash to disappear.

As Germany and Austria are rather similar in terms of the use of cash (Esselink and Hernandez, 2017), it is interesting to look at a country that has a much lower cash use, e.g. Denmark, where only 23% of transactions are carried out in cash compared to about 80% in the euro area or in Austria. A survey of Denmark's Nationalbank (Smestad, 2017) asked whether it would “be problematic for [respondents] if there was no cash in society as we know it today.” 50% answered yes and 40% answered no (the remaining 10% answered “don't know”). This shows that support for cash is much lower in general, but at the same time this support can be observed also among respondents that are not heavy cash users.

Clearly, answers to questions on respondents' preferences regarding the future of cash only reflect a snapshot and will vary over time, i.e. as people increasingly pay cashless. Nevertheless, the results from both the OeNB-Barometer and from the Danish study suggest that people's answers do not only reflect personal views but also societal considerations. For example, 92% of Austrians hold the view that some social groups would have difficulties in a world without cash.

8 Conclusions

The digitalization of banking and payment services has provided Austrian consumers with different access modes to banks (self-service counters, online and mobile

banking), “banking products” provided by nonbanks (e.g. crowdlending) and a multitude of payment options (e.g. traditional card payments, contactless payments, payments by mobile phone). The present study employs survey data for a stocktaking of how Austrians use digital innovations in the field of banking and payments. Overall, the results reveal considerable changes in the way Austrians bank and pay.

A substantial share of Austrians are already using digital services. Most prevalent are online banking and card payments, which are also the most mature technologies. Contactless card payments, an option which has been available only for a few years, are already used by 50% of the population. Other innovative payment solutions (e.g. via mobile phones) are at a much earlier stage of diffusion but can be expected to increase in importance in the coming years. The use of newer financial services and products (fintech), which have the potential of challenging banks and existent payment service providers, is very modest if looked at individually. However, overall, the proportion of the population that already uses a fintech service/product is not negligible. Abstracting from traditional debit card payments, overall, about two-thirds of the population have come in touch with digital payment or banking products: they either bank more frequently online than visit a bank branch, pay contactless by card (at least monthly) or use a fintech service (other than just mobile banking apps).

All these innovations provide different ways of accessing bank or nonbank assets denominated in legal tender. Crypto assets, which have been the subject of extensive media coverage, have a special position as their value is expressed in the respective “crypto currency” and transactions can be carried out without a trusted third party. The representative survey used in this paper shows that only about 2% of the population owns Bitcoin or other crypto assets. However, the share of those interested in these technologies is significantly larger, amounting to 11% of the population. Our results suggest that speculation is the major motive for an investment in crypto assets. The group who owns or considers buying crypto assets is much more willing to take financial risks than the overall population.

Besides this overall perspective, our data provide insights into user characteristics. Our results reveal a very similar pattern across various banking and payment innovations. Perceived safety, age, risk tolerance and interest in technology are key variables for the adoption of innovations. These results are useful for assessing the likely future evolution, e.g. as cash use among digital adopters is much lower than cash use across the overall population. For example, if today’s young people continue to use less cash as they grow older, the use of cash will drop automatically in the future.

While a significant number of Austrians have already entered the market of digital financial services, we also stress that a sizeable share of Austrians do not yet use newer technologies – and very likely will continue to do so in the coming years: For instance, 45% of the population prefers to pay for a EUR 50 purchase in cash, and 42% of the population does not conduct online banking. On average, the group of nonadopters and the group of persons with a strong affinity for cash overlaps considerably (but not perfectly). These persons are on average older, more averse to financial risks, have a lower level of education and lower income and want to keep track of their expenses (which, for this group, is easier with cash).

Several policy conclusions emerge from our analysis. First, in many areas of financial digitalization Austria ranks close to or above the EU-28 average – but not at the top. If increasing the use of financial digitalization is a policy goal, our results suggest that Austrians are already sufficiently equipped (given, e.g., their ownership of payment cards, their use of the Internet or their ownership of smartphones) for such a goal to be achieved. Obviously, some consumers have the necessary equipment and knowledge but do not use financial innovations. Second, we identify safety and trust as key factors for the adoption of financial innovations by consumers. While this finding does not come as a surprise, it underlines the importance of measures to enhance trust, e.g. regulation of providers and initiatives aimed at informing consumers about how they can assess the safety of financial innovations. Moreover, trust is even more important for saving products than for payments, and incumbent banks enjoy the trust of a large share of the population. New (non-)bank competitors who enter the market have yet to establish such a trust level among the wider population. Third, as many as one-third of respondents state that they visit a bank desk only once a year or less frequently. The trend toward visiting bank desks only very rarely will accelerate. There are two reasons for this: On the one hand, younger people visit bank desks very rarely already now (52% for persons aged 14 to 35 years, 43% for higher educated), and they will continue to do so as they grow older. On the other hand, online banking will grow further even among current nonusers as a consequence of the diffusion of new technologies. This development will further affect banks, which will be challenged to adapt their branch network, the way they communicate with customers (e.g. regarding financial advice or loans) and their investments in newer technologies. Fourth, the results also highlight the role of cash as a payment instrument that does not require skills or ownership of a technical device. It must be acknowledged that a considerable share of Austrians prefer to pay in cash and have good reasons to do so (as found in many previous studies, e.g. Bagnall et al., 2016). Fifth, the results of this paper enrich recent discussions of whether and how to regulate crypto assets. The majority (of people informed about crypto assets) sees problems with fraud, theft and illegal activities and hence is in favor of regulating crypto assets. Those interested in investing are, on average, aware of the associated risk of losses and are also more willing to accept such risks.

The ongoing changes in the way Austrians bank and pay, the possibility that the diffusion of new technologies could occur faster than in the past and the finding that the group of nonadopters is still large calls for further analyses. First, the survey should be repeated to observe developments over time and to shape the understanding about how Austrians deal with financial innovations and with cash. Second, further analyses should be conducted to delve deeper into the drivers of adoption and use – which was beyond the scope of this paper. Third, we have only considered the viewpoint of consumers, neglecting the viewpoint of banks, payment service providers and merchants as well as their strategic considerations (this concerns also the costs associated with payments, e.g. Kosse et al. 2017). A view beyond consumers will help to better assess the likely consequences of digitalization for the financial industry, for consumers and for society at large.

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Annex

Table A.1

Definition of explanatory variables

Household income	Household income is equalized by dividing household income by the square root of the number of persons living in the household. Then terciles are computed. Household income T1 = 1 if the equalized household income is among the 33% that represent the lowest household incomes in the sample, 0 otherwise. Household income T3 = 1 if the equalized household income is among the 33% that represent the highest household incomes in the sample, 0 otherwise. Nonresponse rates can be high for household income.
Level of education	Edu low = 1 if the highest level of education of the respondent is the completion of mandatory schooling ("Pflichtschule mit/ohne Abschluss"), 0 otherwise. Edu medium = 1 if the respondent has completed some form of medium secondary education, e.g. an apprenticeship ("Pflichtschule mit Lehre") or a three-year technical school ("Fachschule, Handelschule"), 0 otherwise. Edu high = 1 if the respondent has completed higher secondary or tertiary education ("Matura", university degree), 0 otherwise.
Risk attitude	Based on the question: "If there are financial decisions in your household: which of the following statement best describes your attitude toward risk: a) if I can expect a substantial profit, I am willing to take substantial financial risks; b) if I can expect an above-average profit, I am willing to take above-average risks; c) if I can expect average profits, I am willing to take average financial risks; d) I do not want to take any risk. High financial risk = 1 if respondents choose a) or b), 0 otherwise. Medium financial risk = 1 if respondents choose c), 0 otherwise. Low financial risk = 1 if respondents choose d), 0 otherwise.
Interest in technology	Based on the following question: "How would you assess yourself in relation to technological developments, e.g. new devices or applications? Which of the following statement best applies to you?" Answers comprise "A) Highly interested, I would like to try new devices or applications immediately", "B) I am interested, but would not want to buy or try new devices or applications immediately", "C) I buy new devices or applications only if I see a benefit", "D) I am not interested in technological developments and only buy new devices when I need them". Tech interest high = 1 if respondents choose A) or B), 0 otherwise. Tech interest low = 1 if respondents choose C), 0 otherwise. Tech interest very low = 1 if respondents choose D), 0 otherwise.
Financially literate	Based on the following statement: "In general, I am well informed about financial matters." Financially literate = 1 if respondents answer "very much agree," 0 if respondents answer "rather agree," "rather disagree," "very much disagree."
Think before buying	Based on the following statement: "Before I buy something, I consider very carefully whether I can afford it." Think before buying = 1 if respondents answer "very much agree," 0 if respondents answer "rather agree," "rather disagree," "very much disagree."
Quality news	= 1 if respondents regularly read an Austrian quality newspaper ("Der Standard," "Die Presse," "Salzburger Nachrichten") or magazine (e.g. "Profil," "Format," "Trend"), 0 otherwise (if answer was provided).
No trust in domestic banks	Based on the following question: "How high is your trust in domestic banks?" = 1 if respondents answer "rather low" or "low," 0 otherwise (if answer was provided).
Trust in safety of payment instrument	Based on the following question: "If you think about various digital payment methods – how safe do you consider the following methods? Think about the possibility of a financial loss or the unwanted disclosure of personal information". Trust in safety of online banking = 1 if respondents answer "very safe" or "rather safe," 0 if "rather unsafe," "very unsafe" or "don't know." Likewise for Trust in safety of cards with PIN, Trust in safety of contactless cards, Trust in safety of contactless mobile phone payments and Trust in safety of cash.
Relative trust in safety of payment instrument	Used in the regressions. Answers on trust in the safety of payment instruments (very safe, safe, unsafe, very unsafe) are normalized by respondents' average perception on the safety of these six payment instruments. As regards missing observations on the "Trust in safety of payment instruments" question, we only consider respondents who provide an answer for at least four payment instruments.

Source: OeNB-Barometer Q2/2018.

Table A2

Descriptive statistics

	Mean	Sd	Min	Max	Obs
Panel A. Sociodemographic variables					
Male	0.48	0.50	0.00	1.00	1,381
Age 14-35	0.28	0.45	0.00	1.00	1,381
Age 36-50	0.27	0.44	0.00	1.00	1,381
Age 51-65	0.25	0.43	0.00	1.00	1,381
Age 66+	0.20	0.40	0.00	1.00	1,381
Household income lowest	0.34	0.47	0.00	1.00	1,153
Household income middle	0.34	0.47	0.00	1.00	1,153
Household income highest	0.32	0.47	0.00	1.00	1,153
Level of education low	0.14	0.35	0.00	1.00	1,381
Level of education medium	0.57	0.49	0.00	1.00	1,381
Level of education high	0.28	0.45	0.00	1.00	1,381
<5,000 inh.	0.39	0.49	0.00	1.00	1,381
5,000 to 50,000 inh.	0.26	0.44	0.00	1.00	1,381
>50,000 inh.	0.35	0.48	0.00	1.00	1,381
Panel B. Risk preferences and interest in technology					
No financial risk	0.57	0.50	0.00	1.00	1,381
Medium financial risk	0.30	0.46	0.00	1.00	1,381
High financial risk	0.13	0.34	0.00	1.00	1,381
Interest in technology very low	0.27	0.44	0.00	1.00	1,381
Interest in technology low	0.28	0.45	0.00	1.00	1,381
Interest in technology high	0.45	0.50	0.00	1.00	1,381
Panel C. Financial literacy and trust					
Quality news	0.22	0.42	0.00	1.00	1,370
Financially literate	0.21	0.40	0.00	1.00	1,375
Think before buying	0.47	0.50	0.00	1.00	1,376
No trust domestic banks	0.26	0.44	0.00	1.00	1,372
Trust safety cards with PIN	0.85	0.36	0.00	1.00	1,381
Trust safety online banking	0.57	0.50	0.00	1.00	1,381
Trust safety cards contactless	0.46	0.50	0.00	1.00	1,381
Trust safety cash	0.96	0.20	0.00	1.00	1,381
Rel. trust safety cards with PIN	1.16	0.24	0.43	2.29	1,245
Rel. trust safety cards contactless	0.85	0.23	0.33	1.80	1,226
Rel. trust safety online banking	0.97	0.24	0.33	1.71	1,164
Rel. trust safety cash	1.41	0.43	0.38	2.67	1,247
Panel D. Ownership financial assets					
Savings deposits	0.66	0.47	0.00	1.00	1,354
Ownership risky assets	0.19	0.39	0.00	1.00	1,354

Source: OeNB-Barometer Q2/2018.