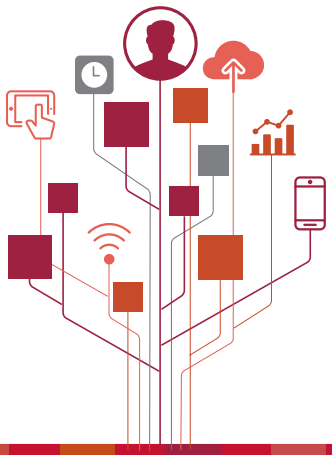


The Digital Investor

Financial attention through multiple digital channels

Vanguard Research | May 2019

As mobile devices and apps grow more popular, more investors are becoming accustomed to interacting with financial institutions through mobile phones or tablets. This installment of the Digital Investor series examines how investors interact with their accounts at Vanguard through various digital channels.

By contrasting investors' account access via a desktop or laptop with their access via mobile devices, we highlight the growth of mobile device use among Vanguard investors. Our study also reveals attention patterns that can be used to inform mobile platform design. In particular, we find, the design should accommodate the more frequent but shorter-duration use of mobile devices, while striving for broad consistency with the desktop channel.

Digital financial attention across channels among Vanguard clients

Mobile access grew at double-digit rates.

More than half of Vanguard investors used the desktop channel exclusively, while the remainder used mobile devices as a complement. However, attention through mobile channels was growing by more than 10% per year, while that through desktop channels dropped potentially because of the convenience of mobile devices.

Attention patterns of desktop and mobile users differed.

Most noticeable across all channels was the skewed nature of attention: A few investors spent considerable time online while most spent little or no time. Compared with a desktop, mobile app usage was both more frequent and of shorter duration. Retail desktop users were actively logged on, on average, 17 days a year and spent about 13 minutes on those days. In contrast, retail app users were active for 24 days a year and spent about 5 minutes on those days. Among investors with a defined contribution (DC) account only, the contrast was even sharper.

Channel choice and attention varied by investor characteristics.

Male investors were more likely to have accessed their account via a mobile device than female investors. Men spent 40% more time accessing accounts on mobile devices than women. Especially among retail investors, larger Vanguard assets were associated with significantly higher mobile device use. Investors with assets of $1 million or more were 60% more likely to use a mobile device and spent 85% more time accessing accounts than investors with $50,000 to $99,999.

Introduction

One of the important questions concerning digital experiences is how the type of device—desktop, laptop, tablet, mobile phone—influences user behaviors. For example, websites accessed through desktops and laptops contain web pages that are more complex in structure and information content than the highly condensed information on mobile apps. Using a desktop or laptop requires users to be more stationary than they are when they use a mobile phone. These differences between "stationary" and "on the go" access might influence a user's ability to process information as well as affect the level of attention. Reflecting these differences, evidence from Melumad et al. (2019) suggested that social media postings on smartphones were more emotionally laden than those made through desktops.

This question about the role of the device is part of a broader body of research on the nature of "digital financial attention"—how individuals interact digitally with their financial accounts. Choi et al. (2002) showed that web access to 401(k) plans affected participants' trading behavior. Sicherman et al. (2015) highlighted the importance of financial attention as a distinct economic phenomenon, separate from, and more prevalent than, portfolio trading. Xu et al. (2019) described the highly skewed nature of attention across retail investment and retirement accounts among Vanguard investors. Separately, Gargano and Rossi (2018) considered the relationship between attention and portfolio performance.[1]

Most digital platforms for U.S. investors began as website experiences, designed for desktop or laptop access. (Throughout this paper we use "desktop" to refer to both desktop and laptop.) The website experiences were then tailored to fit mobile devices, with a mobile app experience added later.

Yet we expect that the mobile channels will continue to gain in popularity for several reasons. First, smartphone access is ever-growing. Nearly 80% of Americans have smartphone access (Pew Research Center, 2018). Hence, we anticipate that in the long term, investors will be drawn increasingly to the convenience of mobile devices, as consumers generally have in shopping, news consumption, music, and social media. Second, the preference for mobile access, which is typically associated with younger users, will become more pervasive among all investors with the simple passage of time.[2]

In this paper, we develop initial insights on the impact of the type of device on financial attention, relying on a sample of Vanguard retail and defined contribution (DC) investors. The main goal is to understand the unique patterns of digital access by device type—and in particular how the demand is shifting between stationary access and mobile access. The distinctive patterns can reveal how investors use these various device types today—and can help inform the design of future digital platforms serving investors.

1 Digital channels also provide policymakers and plan sponsors a way to influence investor behavior. A survey by the Federal Reserve Board (Dodini et al., 2016) demonstrated how digital "nudges" can influence both mobile banking and spending behavior, while Xu and Pagliaro (2018) analyzed how the layout of a 401(k) home page affected savings behavior.

2 As millennials become a larger part of the workforce in the U.S., the demand for mobility will increase since more than nine in ten millennials own a mobile device (Jiang, 2018).

Data and approach

As with the previous paper in the series (Xu et al., 2019), this work is based on a representative sample of the total population of investors who joined Vanguard before 2015. Our sample consisted of those 18,360 tenured investors.[3] They had a median age of 53 years, had median Vanguard assets of approximately $84,000, and had a median tenure as Vanguard investors of 14 years, as of December 31, 2017 (**Figure 1**). Of this sample, 43% were female. A total of 69% were retail investors and 31% were DC-only.[4]

We studied their digital behavior over a three-year period, from January 2015 to December 2017, in order to understand how they paid attention to Vanguard accounts through three distinct digital channels:

Desktop browser
Access through a desktop browser

Mobile browser
Access through a tablet or smartphone browser

Mobile app
Access through a tablet or smartphone app

For all the channels, we aggregated digital browsing behavior on a daily basis and computed the following attention metrics:

- **Attentive days**—the number of days on which an investor logged on to his or her Vanguard account, regardless of how many times the investor logged on during that day.
- **Attentive duration in minutes**—the number of minutes an investor spent on a daily basis after logging on.

Figure 1. Sample characteristics, December 2017

Digitally registered tenured investors

Number of observations	18,360
Demographic characteristics	
Median age	53
Female	43%
Median household size	1
High school/vocational education only	29%
College or postgraduate education	45%
Education level not supplied	26%
Account characteristics	
Median Vanguard assets	$84,191
Median account tenure (in years)	14
With DC-only account	31%
Attention characteristics	
Has used app	15%
Has used mobile browser	31%
Receives paperless statements	61%

Notes: Data are for a sample of 18,360 tenured investors drawn from a universe of more than 4.4 million retail investors and 2.3 million DC-only investors 18 or older as of January 1, 2015. The sample includes digitally registered tenured investors only and excludes advised investors. "Tenured investors" are defined as those who had at least one Vanguard account for the three calendar years ended December 31, 2017.

Source: Vanguard, 2019.

3 In addition, these tenured investors were at least 18 years of age and digitally registered as of January 2015, were current investors as of December 2017, and did not use any Vanguard advice services from 2015–2017.

4 Retail investors can have mutual fund and brokerage accounts and IRAs. DC-only investors can have a variety of defined contribution plans, including 401(k), 403(b), and profit-sharing plans but do not have a retail Vanguard account. A small fraction (less than 5%) of Vanguard retail investors also hold a Vanguard DC account; they are classified as retail investors.

Channel choice and usage

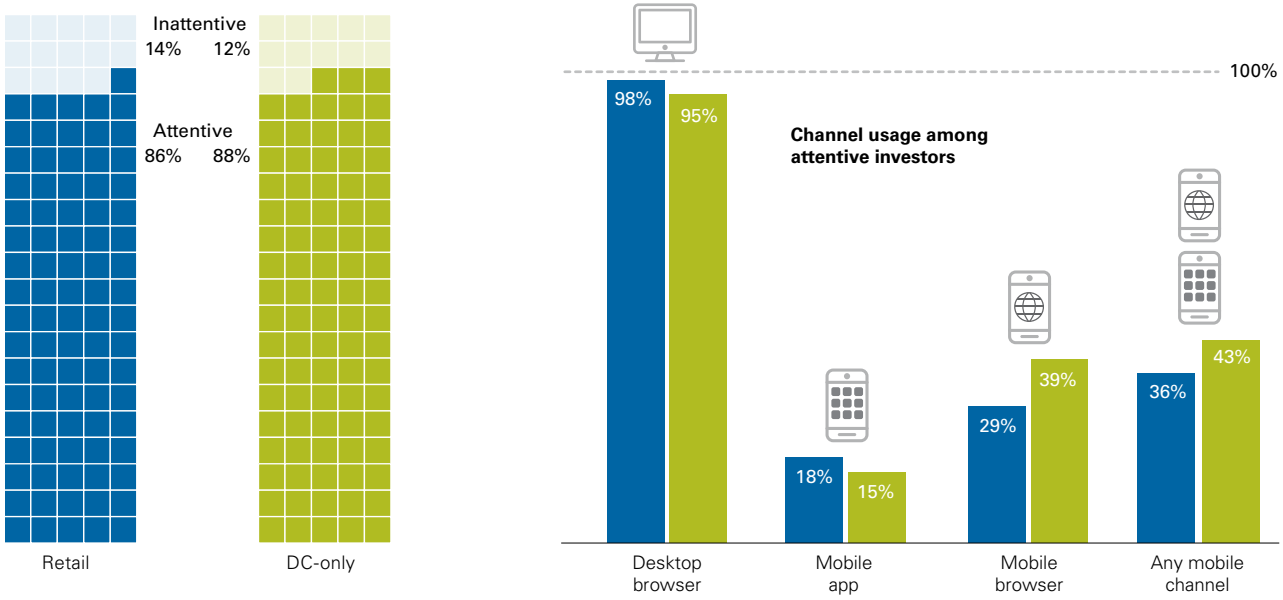
During the three-year sample period, the overwhelming majority of investors in the sample logged on at least once, through a desktop browser, the Vanguard mobile app, or a mobile browser (**Figure 2,** at left). These investors are referred to as "attentive investors." Only 14% of retail investors and 12% of DC-only investors did not log on during this period and are characterized as "inattentive investors." Our analysis focuses on attentive investors.

Desktop browser was the top choice

The desktop browser was the most popular digital channel. Over 95% of the attentive investors have logged on at least once via a desktop browser (**Figure 2,** at right). About four in ten investors in the sample have used a mobile device to log on. An app was less popular for access than a mobile browser. About two in ten investors logged on through the app. Usage patterns were in general similar for retail and DC-only subsamples, but DC-only investors were more likely to have accessed their account through a mobile browser.

Figure 2. Portion of sample investors who were attentive (logged on at least once) and used desktop browser

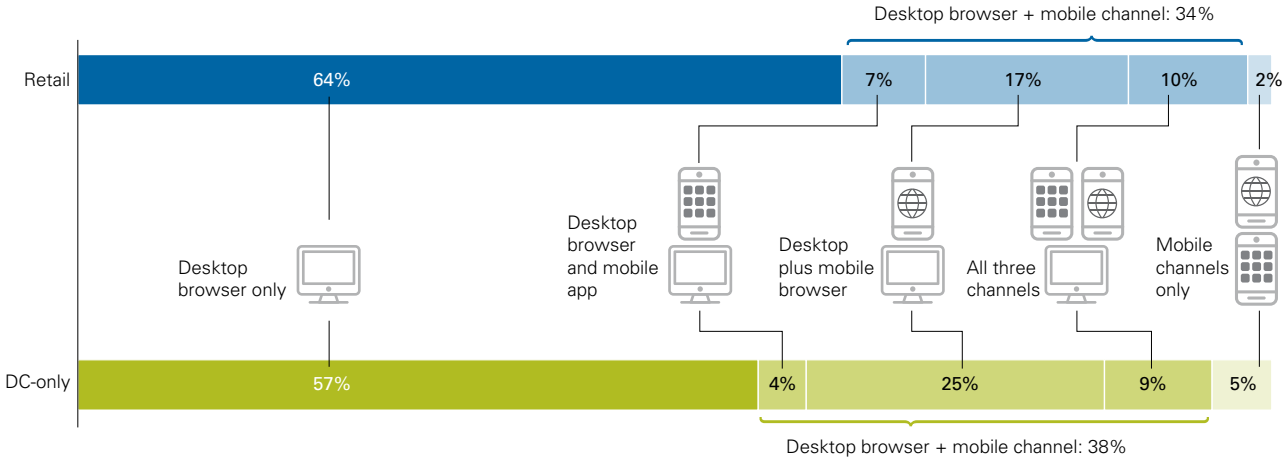
Among digitally registered, tenured investors



Source: Vanguard, 2019.

Figure 3. How investors used mobile and desktop channels

Among digitally registered, tenured investors



Source: Vanguard, 2019.

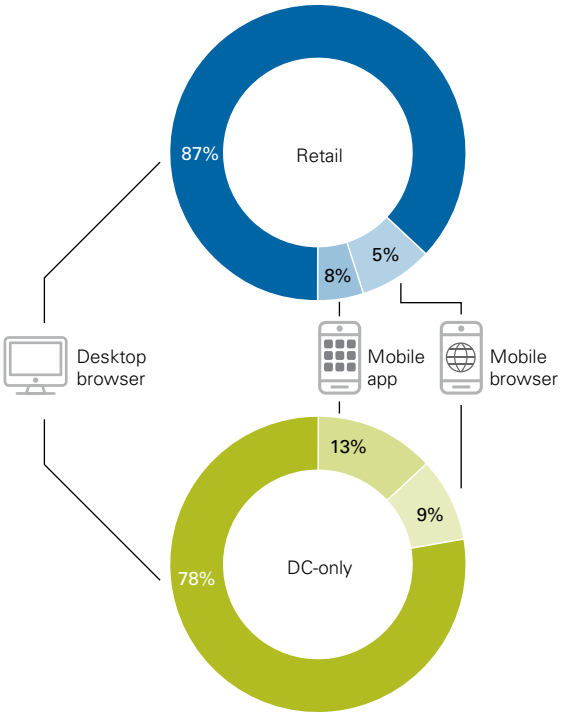
Mobile channels serve as a complement today

Among attentive clients, three distinct patterns of device usage stood out (**Figure 3**). First, the majority of retail and DC-only investors (about six in ten) used the desktop channel exclusively during the three-year period. Second, a third have combined desktop with mobile channels (that is, desktop browser plus a mobile browser and/or mobile app). In this latter group, no investors relied exclusively on the app, but instead used the app and a mobile browser together. Only one in ten investors accessed accounts through all three channels.[5] Finally, only a small fraction of investors (5% or less) relied on mobile access exclusively.

Most of the time that investors spent digitally interacting with Vanguard was through a desktop. Among retail investors, 87% of total time was spent on the desktop channel, versus 78% for DC-only investors (**Figure 4**). Mobile browser and mobile app usage was higher among DC-only than retail investors.

Figure 4. Amount of investors' digital interaction time spent on desktop

Among digitally registered, tenured investors



Source: Vanguard, 2019.

5 Investors rarely used multiple devices within the same day. Only 1% used more than one channel within a day.

There may be several reasons for the concentration of total time on the desktop channel. Investors may spend more time inherently on the desktop versus mobile access, especially the mobile app, given the relative difference in how much information is presented or how many actions can be taken on a mobile device. Investors may also choose the desktop channel for complex activities and the mobile channel for activities that take less time. The difference in time spent may also reflect the simpler, convenience-oriented design of a mobile device, which is intended to speed up interactions.

Mobile channels may be growing into a substitute for desktop access

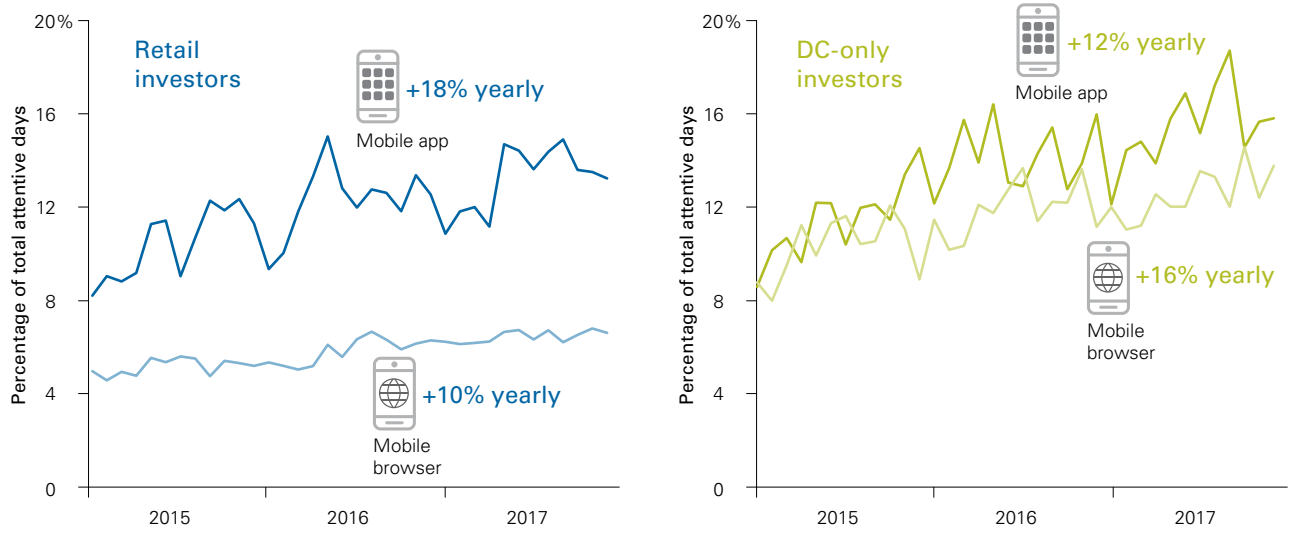
Although Vanguard investors primarily relied on digital access through a desktop, longitudinal analysis of the data has suggested that the demand for mobility has been growing rapidly. Two measures demonstrated this.

First, there was a marked increase in the proportion of total logons through mobile versus nonmobile devices. At the beginning of 2015, on average, a retail investor used mobile devices for 13 of 100 attentive days—eight days through the app and five days through a mobile browser (**Figure 5,** at left). By the end of 2017, this number grew to about 20 (13 days through the app and seven days through a mobile browser). Over this period, app use grew nearly twice as fast as mobile browser use (18% versus 10%) while desktop use declined by 2% yearly.

The growth rates of mobile were even more striking among the DC-only investors (**Figure 5,** at right)—the fraction of attentive days with mobile access increased from 18 (nine through the app and nine through a mobile browser) to 30 (16 through the app and 14 through a mobile browser). The growth rates of both app and mobile browser were more than 12% yearly. During the same period, desktop usage declined by 5% yearly among DC-only investors.

Figure 5. Relative frequency of logons using mobile devices

Among digitally registered, tenured investors



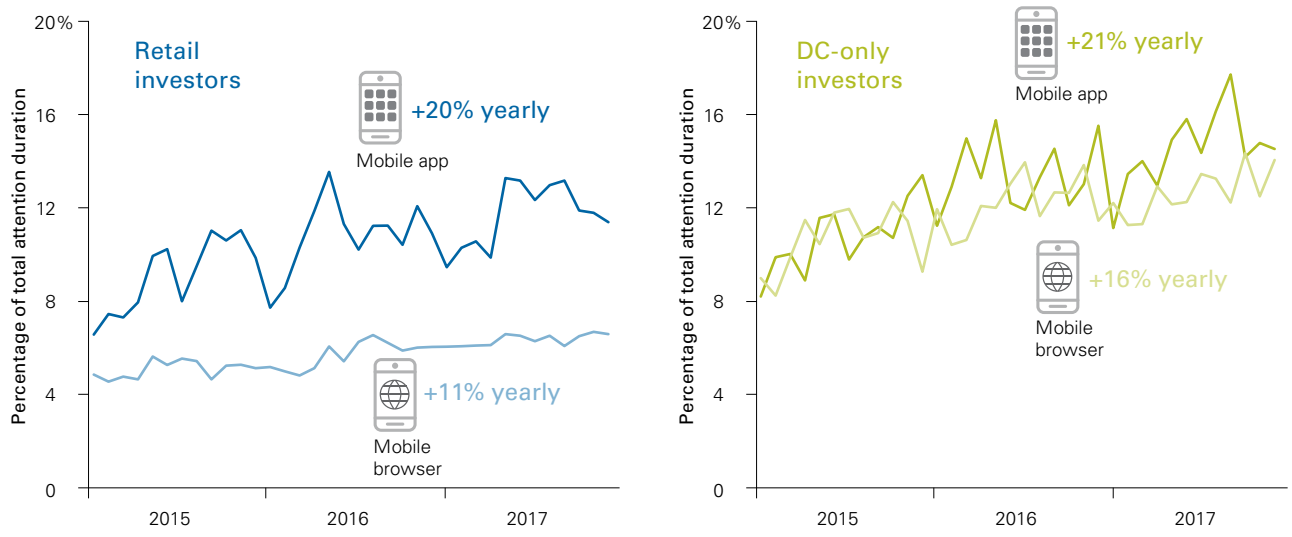
Note: Desktop usage has decreased by about 2% year over year for retail investors, and 5% for DC-only investors.
Source: Vanguard, 2019.

Second, there was a similarly large increase in the proportion of total time spent on mobile channels. Among retail investors, the proportion of total time spent on app access grew from 7% to 11%, an annual growth rate of 20% (**Figure 6,** at left). The annual growth rate for mobile browser access was 11%, while the rate for desktop access decreased annually by 3%. Among DC-only investors, the trends were similar (**Figure 6,** at right). For both retail and DC-only investors, time spent on the app grew at a higher rate than for the mobile browser.

Broadly speaking, the growth rate of mobile access, whether measured by relative frequency or time spent, whether retail or DC-only investors, was more than 10% annually. This double-digit growth rate—occurring, it should be noted, among a fixed group of investors—suggested a growing relative demand for mobile interactions. And it suggested that mobile access could increasingly become a substitute for desktop access, as opposed to the complement it appears to be today.

Figure 6. Relative time spent on mobile channels

Among digitally registered, tenured investors



Note: Desktop usage has decreased by about 3% year over year for retail investors, and 5% for DC-only investors.
Source: Vanguard, 2019.

Attention patterns by channel

The remainder of the paper explores the characteristics of different types of investors by digital channel. The focus remains on attentive clients. We also separate specific types of attentive clients by channel. For example, "desktop investors" are attentive investors who had ever used the desktop channel during the three-year period.

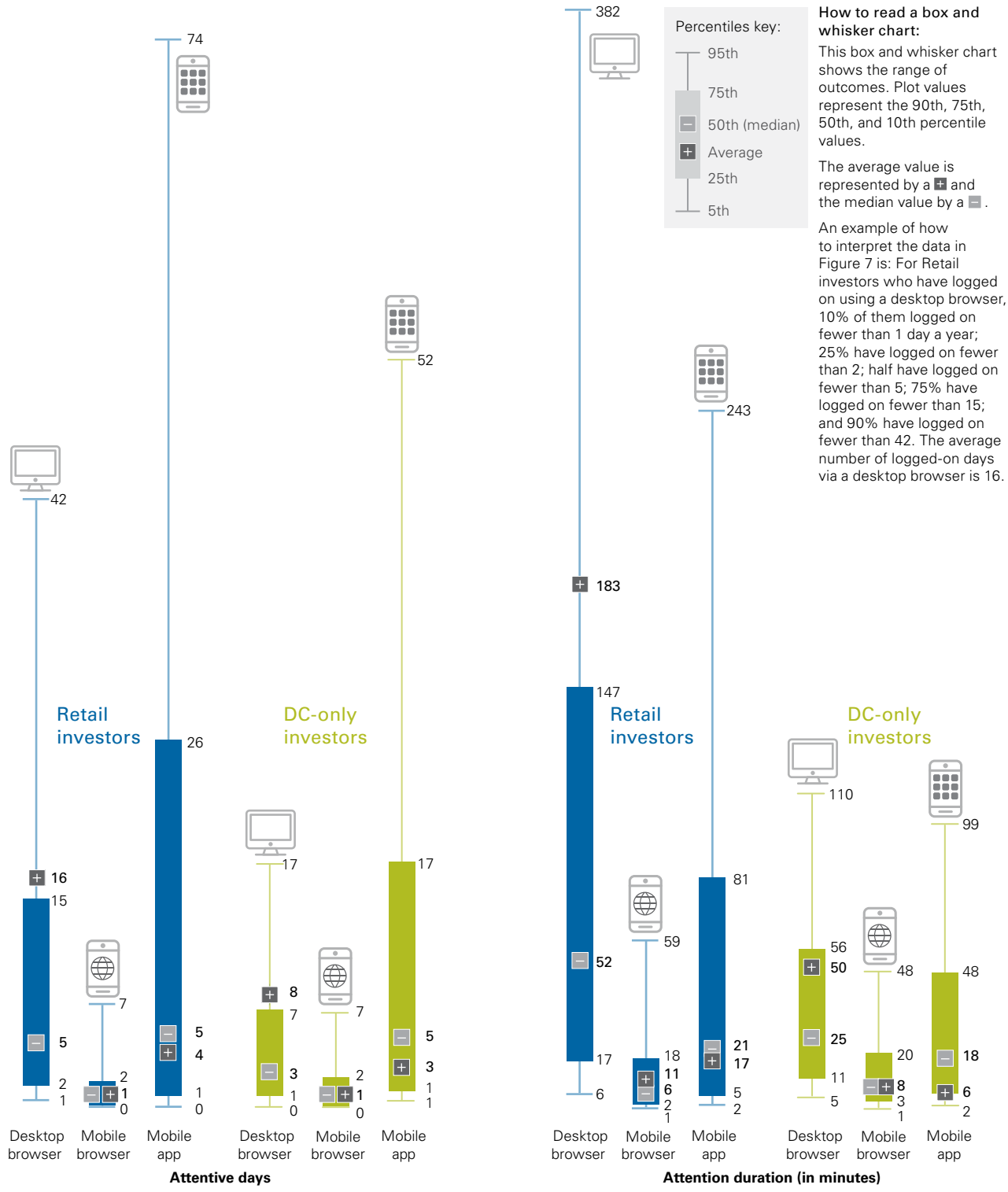
Several similarities across channels

First, attention (involving economic variables such as income or wealth) has a canonical skewed distribution—namely, a distribution with a very long tail. Across all channels, and within individual channels, most investors spent only a little time online—whereas a very small group spent a great deal of time online (**Figure 7**). For example, among desktop retail investors, the median investor logged on five days a year, whereas the top 10% of investors logged on 42 or more days a year. Similarly, in terms of total duration, the median retail desktop investor spent 52 minutes a year online versus the top 10%, who spent six hours and 22 minutes or more online. Retail attentive investors generally spent more time than DC-only investors, but the skewed patterns were observed for both subsamples.[6]

6 This might be due to the somewhat illiquid nature of DC accounts and the limited investment options and service menu available to participants.

Figure 7. Distribution of attention online

Among digitally registered, tenured investors



Note: When plot values match, only one label is shown.

Source: Vanguard, 2019.

Second, digital usage fluctuated in a predictable way in the course of a week. Usage was typically higher on weekdays than on weekends, with peak rates occurring Tuesday through Friday (**Figure 8**). What's more, the volume of attention across devices either increased or decreased in tandem, which is consistent with our prior observation that mobile devices complemented desktop use. If the channels were substitutes for one another, then one would expect changes in usage to move in opposite directions.

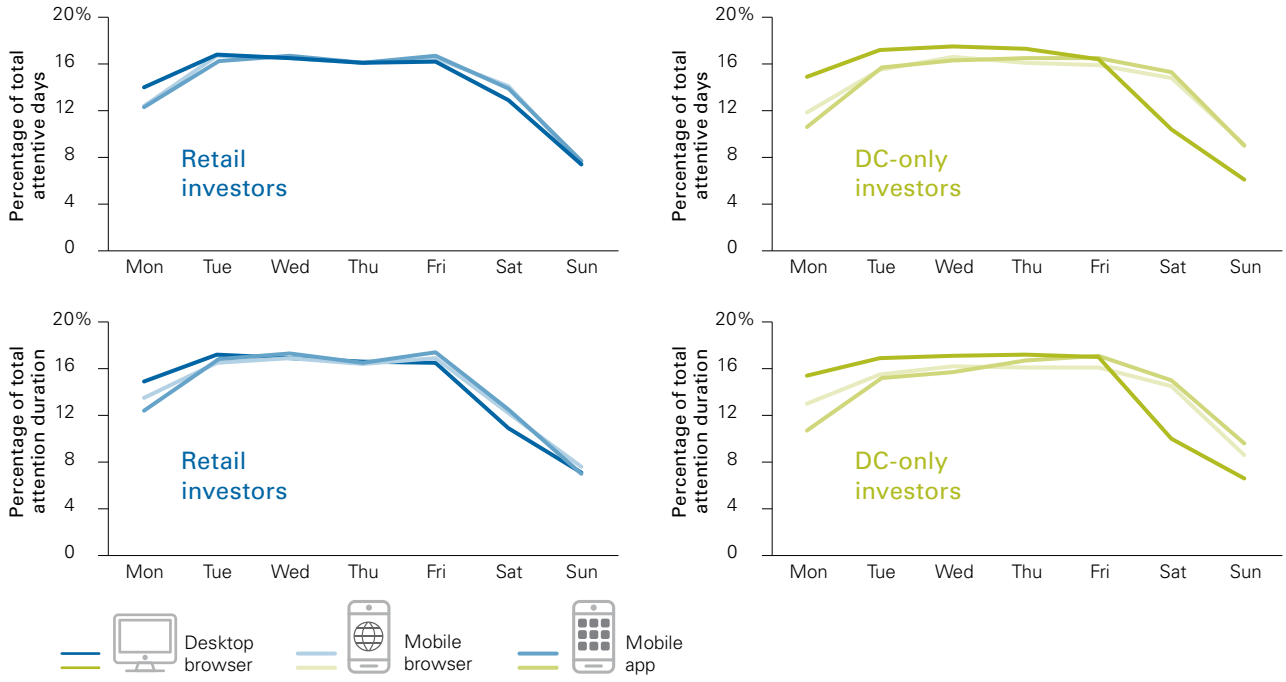
Third, clickstream data for DC-only accounts suggest that most of those logging on had similar intentions regardless of channel choice (**Figure 9**).[7] A ranking of the five most popular activities by channel among DC-only clients shows great consistency across the three channels, although rankings differed slightly. For DC participants using a mobile browser, viewing loan details and outstanding balance was uniquely popular.

Differences across channels

Attention patterns by channel also differed to some extent. Compared with desktop users, app users were attentive on more days (**Figure 10,** at left) but spent less time on each attentive day (**Figure 10,** at right). For example, retail desktop users were actively logged on, on average, 17 days of a year and spent about 13 minutes per day on those active days. In contrast, retail app users were active for 24 days of a year and spent about 5 minutes on average on those active days. Among DC-only app users, the contrast was even sharper. The average number of attentive days for those using the app (19 days per year) was more than twice that of those using a desktop (eight days per year). However, DC-only investors using the app spent only 4 minutes on average compared with 11 minutes among desktop users.

Figure 8. Patterns of device usage within a week

Among digitally registered, tenured investors



Note: Desktop usage has decreased by about 3% year over year for retail investors, and 5% for DC-only investors.
Source: Vanguard, 2019.

7 We chose to focus on DC-only investors whose app experience was designed to match closely with desktop experience. Using the app, DC-only investors were not able to undertake such complex tasks as adding a new bank to their Vanguard account while they were taking out a loan from the account. Retail investors using an app were not able to: update personal information, buy certain investments (such as options, individual bonds, non-Vanguard funds, and so on), transfer assets from or to an outside institution, transfer assets from one person to another, and initiate rollovers. We were unable to conduct a similar comparison for retail investors because the design of the retail platform varies more.

Figure 9. Most popular activities for DC-only investors by channel

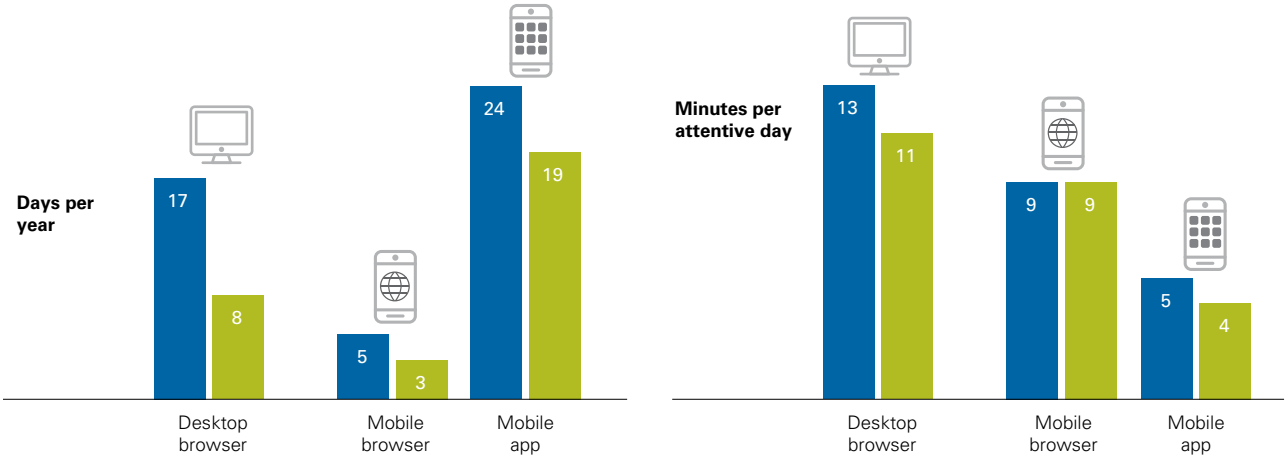
Among digitally registered, tenured investors

	Rank	Desktop browser	Mobile browser	Mobile app
Investors seem to have similar intentions regardless of channel choice	1	Evaluate my progress	View messages or see where to contact Vanguard	Evaluate the performance of my investments
	2	Get the details of a specific transaction	Figure out how much I should save	View messages or see where to contact Vanguard
	3	Evaluate the performance of my investments	Evaluate the performance of my investments	Figure out how much I should save
	4	View messages or see where to contact Vanguard	Get the details of a specific transaction	Evaluate my progress
	5	Figure out how much I should save	View loan details and outstanding balance	Get the details of a specific transaction

Source: Vanguard, 2019.

Figure 10. Distinct app and desktop usage patterns

Among digitally registered, tenured investors



Source: Vanguard, 2019.

Determinants of financial attention by channel

Our findings reveal that behavioral patterns of mobile device users differ from those of desktop users. This may be driven by differences in underlying investor characteristics. We used regressions to understand the relationship between mobile device usage and investor characteristics. The regressions associate the likelihood of mobile use and the time spent on a mobile device with factors such as age, gender, and level of Vanguard assets.[8]

Our results highlight several distinct relationships between mobile attention and investor characteristics:

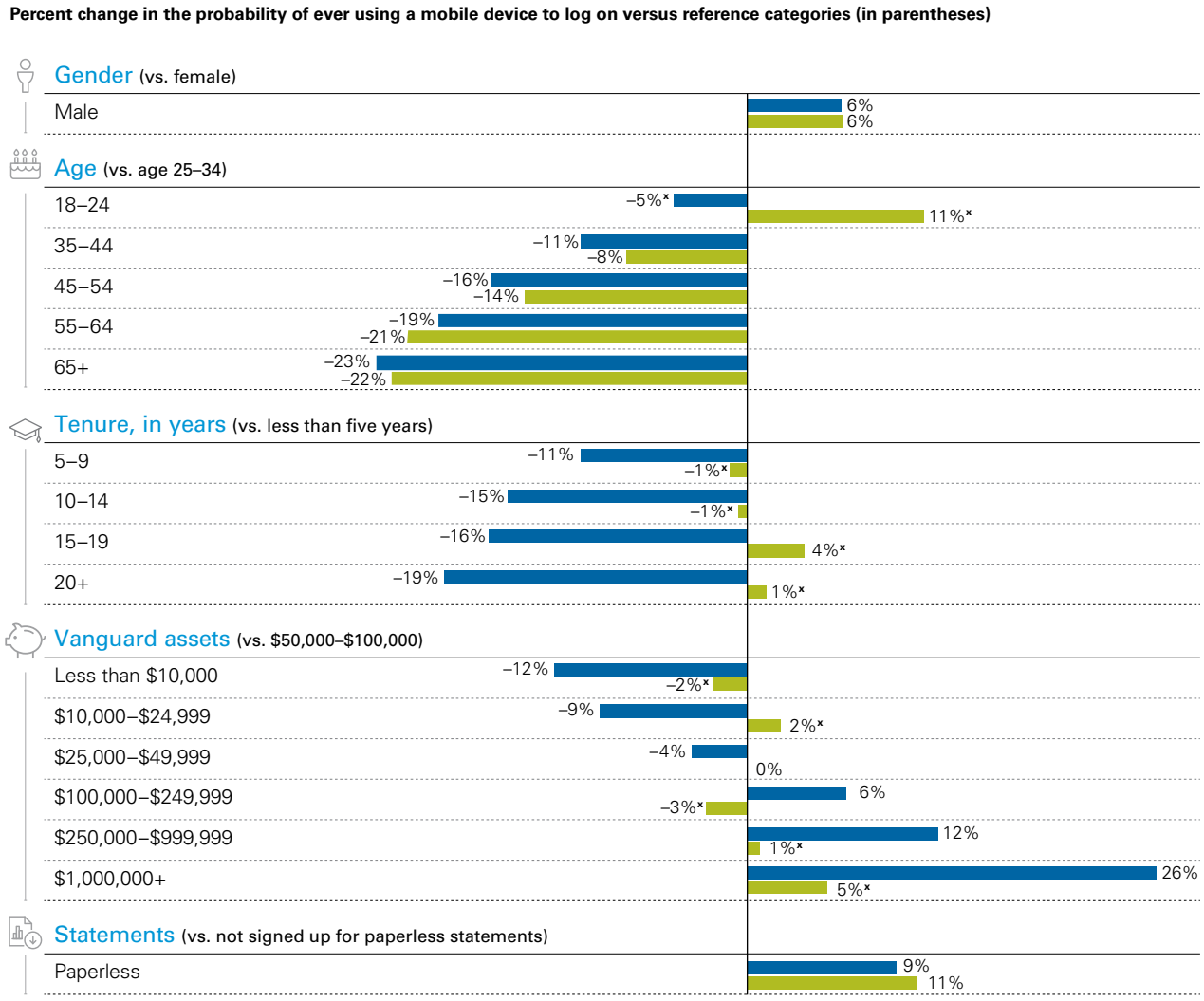
- **Age.** The usage regression showed that mobile device users tend to be younger (**Figure 11**). For example, among retail investors, all other factors being equal, investors older than 65 were 23% less likely to have used a mobile browser than the reference group (ages 25–34). This pronounced difference is noted in other studies about the tendency of younger people to adopt new technology more quickly. Yet, among those accustomed to using a mobile device, the investor's age was no longer related to how much time was spent on mobile channels (**Figure 12**). Younger and older mobile investors used mobile channels at a similar intensity.
- **Gender.** Gender differences were pronounced, particularly in terms of the likelihood of mobile use. Among both retail and DC-only investors, men were 6% more likely to have logged on via a mobile device than women. And men spent nearly 40% more time on mobile devices than women each year. This dramatic difference calls for further research on how this time is spent. Are male mobile users simply spending more time on the same tasks as female mobile users? Or are they more likely to use a wider range of capabilities of the mobile experience?
- **Tenure.** For retail investors, longer account tenure was related to a sharp drop in mobile usage, both in likelihood to access a mobile channel or time spent on the channel. For example, retail customers with 20 years or more of tenure were almost 20% less likely ever to have used a mobile channel, and spent 60% less time on it, than investors with tenure under five years (the reference category). Our sample includes only investors who were Vanguard clients for three continuous years, 2015–2017. So this greater reliance on mobility among newer clients is likely unrelated to the process of opening a new account, during which an investor logs on more often and for a longer time to complete initial required steps. This account-tenure effect was not observed for DC-only investors.[9]
- **Vanguard assets.** Retail investors with assets of over $1 million were about 26% more likely to have ever used a mobile browser than the reference group (those with assets between $50,000 and $99,999). Retail investors with higher assets also exhibited longer duration of attention. Among the DC-only sample, the effects were much more muted.
- **Paperless statements.** Investors who signed up to receive paperless statements were 10% more likely to have ever logged on via mobile devices than their counterparts. The status did not predict the duration of attention.

8 We also have separately examined the likelihood of a client's ever having used a mobile browser and app. The estimates were in the same direction as the regression results shown in the paper. Regression results are not shown but are available from the authors upon request.

9 In particular, when we separately examined duration of use on the app and on a mobile browser for retail investors, tenure was more predictive of attention duration on the app. Regression results are not shown but are available from the authors upon request.

Figure 11. Predictors for ever logging in using a mobile device

Among digitally registered, tenured investors

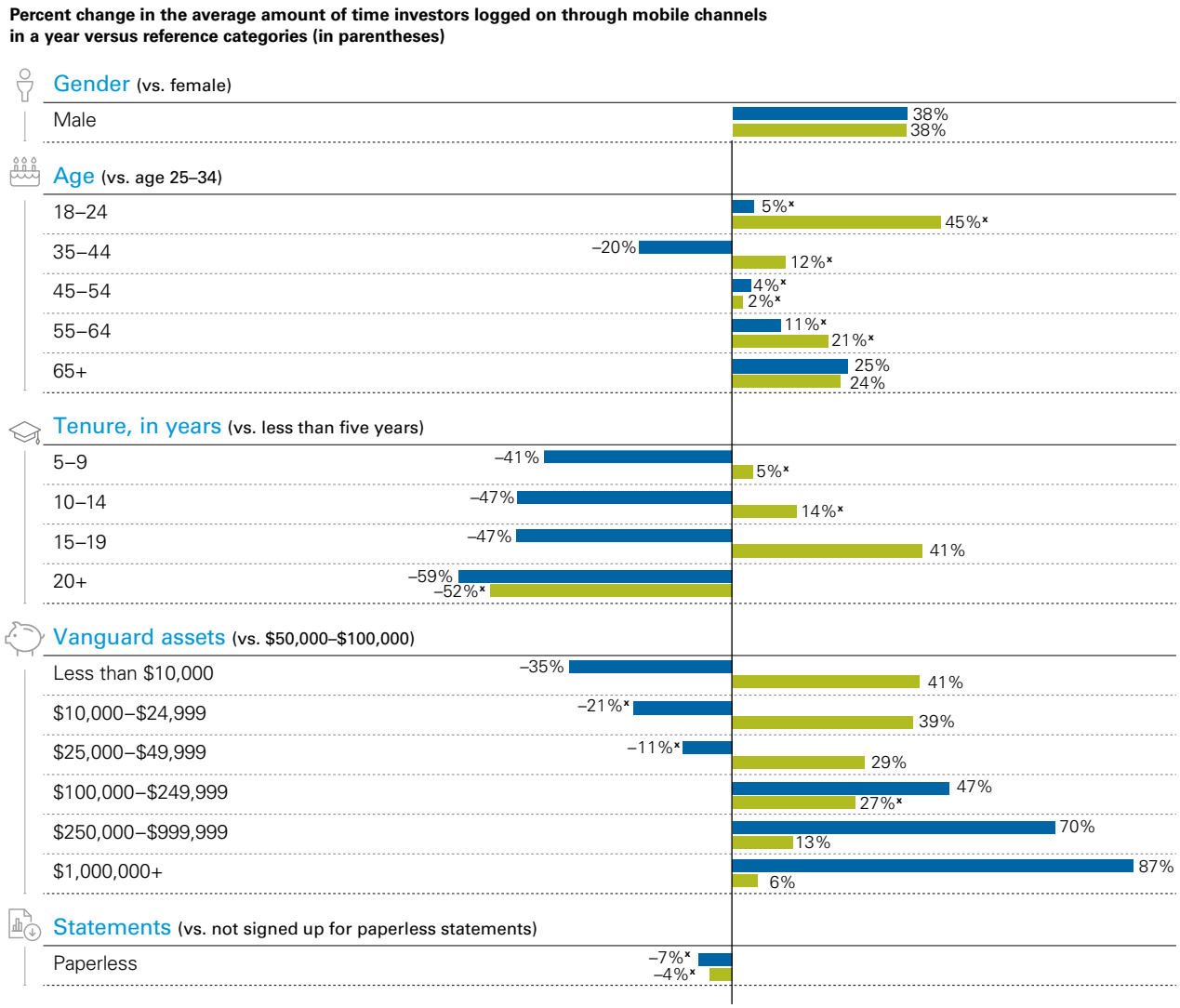


Notes: Figures are statistically significant at the 5% level, except for those marked with x, which are not. Marginal effects represent percent change in the probability of ever using a mobile device to log on. Marginal effects are measured against the following reference categories: female, age 25–34, household size of 1, high school/vocational education, tenure less than five years, assets $50,000–$99,999, and not signed up to receive paperless statements. Estimated and insignificant regressors (not reported): education and household size. Full results are available from the authors upon request.

Source: Vanguard, 2019.

Figure 12. Predictors for attention duration (in minutes) on all mobile channels

Among digitally registered, tenured investors



Notes: Figures are statistically significant at the 5% level, except for those marked with x, which are not. Marginal effects represent percent change in the average amount of time one logged on during a year. Marginal effects are measured against the following reference categories: female, age 25–34, household size of 1, high school/vocational education, tenure less than five years, assets $50,000–$99,999, and not signed up to receive paperless statements. Estimated and insignificant regressors (not reported): education and household size. Full results are available from the authors upon request.

Source: Vanguard, 2019.

Conclusion and implications

In this paper, we explored the patterns of online financial attention through three distinct channels: a desktop browser, a mobile browser, and the Vanguard mobile app. We found, first, that while the desktop channel is the most popular today, mobile usage is growing rapidly. Today, mobile usage appears to be a complement to desktop usage, but it could emerge in the future as a substitute for the desktop channel.

Second, channel patterns share both similarities and differences. Financial attention is significantly skewed—levels of attention vary greatly—for all channels. Most investors spend little time or only modest amounts of time on digital access, while a small fraction spend quite a bit of time. Also, while investors access mobile channels more frequently, the periods spent on mobile channels are much briefer. As a result, most of the aggregate time spent in digital interactions was still associated with desktop use.

Further, financial attention for different channels varied based on important investor characteristics. The reputed reliance of young people on the mobile channel was true with respect to any use of mobile, but not true with respect to duration. And men, notably, spent considerably more time on mobile channels than women, all other things being equal.

The findings highlight some of the critical strategic questions facing designers of digital experiences at financial institutions. With the growing popularity of mobile experiences in all aspects of digital life, how quickly should financial institutions seek to rely on exclusively mobile access as the dominant channel of interaction? Will the inherent differences between the desktop channel and the mobile channel lead to differences in investor decision-making?

With respect to investment platforms in particular, to what extent will the mobile channel promote convenient and easy access to information on one's account? Does it risk catering to short attention spans or encouraging impulsiveness as investors make consequential long-term choices? And to what extent can mobile experiences be shaped to encourage patience and a long-term perspective in decision-making, despite the short-term nature of the mobile interaction itself? These questions will become only more important as mobile experiences become more pervasive in all aspects of household financial decision-making.

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