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CAN INTERNET BANKING AFFECT HOUSEHOLDS' PARTICIPATION IN FINANCIAL MARKETS AND FINANCIAL AWARENESS?

by Valentina Michelangeli* and Eliana Viviano*

Abstract

We are in a digital era. More and more banks have begun to offer Internet banking services (through simple websites and user-friendly mobile apps), meeting growing demand by customers to manage their own finances without going to their branches in person. The availability of this new channel to interact with financial intermediaries can reduce households' cost of acquiring information and the time spent on financial transactions; therefore, it could also impact on households' decisions to start investing in financial markets. As the decisions to adopt Internet banking and to enter financial markets could be jointly determined, we derive a measure of bank supply of Internet-based services, which constitutes our instrumental variable, and then assign this to each household in our sample. We find that the adoption of Internet banking induces households to participate in financial markets and, in particular, to hold short term assets with a low risk/return profile. Over time, the adoption of Internet banking also drives a better understanding of basic financial concepts.

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Contents

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1 Introduction[1]

We are in a digital era. New Internet-based technologies allowed for a vast increase in the speed and breadth of transactions and communication. Traditional ways of conducting businesses, selling and buying products, and exchanging knowledge are complemented by innovative digital approaches. The digitalization process, in act by almost two decades, has dramatically accelerated during the Covid-19 crisis, when the only possibility for households to access many services was through online platforms. This modernization affected, sometimes abruptly, the vast majority of sectors in the economy; banks were somehow favoured because the development of online technologies was already started years earlier. Indeed, Internet banking has been increasingly offered by banks wishing to reduce their operating costs, downsizing their branch networks, and attracting new customers (Bonaccorsi di Patti et al., 2004; Claessens et al., 2002; and Clemons et al., 2000 for a more general discussion on the supply Internet banking). In recent years, banks have made great effort in developing simple and appealing websites and easy-to-use mobile apps, which provide clients with both a direct access to banking services and more information on the services themselves (Brun et al., 2017; Rahi et al., 2017).[2] Many banking websites as well as mobile apps are characterized by an intuitive interface that allow to visualize all the relevant information. For instance, the first screen typically shows a direct link to trading, which, at the same time, simplifies and incentives households to make financial investments (Figure 1). Customers have also increased their demand for Internet banking wishing to lower trading, search, and transportation costs associated with financial investments (see Goldfarb & Tucker, 2017, for a general review on the impact of digital services). The convenience of making the investment choice from home, the rapidity of the transactions, and the time saved are among the main reasons that make households willing to make their financial operations through Internet banking (Figure 2).

In this paper we empirically investigate whether the availability of Internet banking for

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[2]Through Internet banking, households can monitor their own accounts in real time, transfer funds, pay bills, make investments, and, in a few cases, obtain a loan.

trading and managing bank accounts affects households' financial behavior. Specifically, we aim at assessing the casual impact of the adoption of Internet banking on households' choice to participate into financial markets and on their awareness about financial concepts. These are relevant questions as the adoption of Internet banking will likely increase due to the Covid-19 crisis. Many scholars have documented the limited participation in financial markets (Campbell, 2006; Vissing-Jorgensen, 2002; Paiella, 2001; Attanasio & Paiella, 2011; Badarinza et al., 2016; Guiso & Sodini, 2013, among others), but it is not clear whether a more direct access to financial services can increase the riskiness of households' portfolios and the investors' ability to understand basic financial concepts. By providing a first comprehensive assessment of the casual impact of Internet banking on participation in different financial markets and on financial awareness, we contribute to the literature that analyses the link between new technologies and household investment behaviour (Tufano, 2003; Waite & Harrison, 2004; Dynan, 2009; Hannig & Jansen, 2010; Guiso & Viviano, 2014; Xue et al., 2011; Rahi et al., 2018).

We focus on Italy, which is a relevant case study. Indeed, in Italy the use of Internet banking has increased considerably over the past 15 years, from around 4 million Internet banking connections at the beginning of the 2000s to about 30 in 2017.[3] This trend has been favoured by the development of the broadband network, intensified after 2010.

In a simple theoretical model we show the possible channels through which the diffusion of Internet services could affect portfolio choices: an increase in current and future returns, a decrease in current and future fixed or/and variable costs. Since the current and future returns of a given investment are the same irrespective of whether the household buys it at a physical branch or through an online platform or app, we can claim that Internet banking mainly drives a reduction in the annuity value of future costs. Indeed, for an household with Internet banking it may be easier to access its bank account and change its investment composition over time: this flexibility is considered by households upon adopting the digital technology. A 2018 survey by the American Bankers Association showed that nearly three-quarters of Americans bank customers (73 per cent) prefer to do their banking online compared with any other methods.[4] Another survey conducted in 2018 on 2,000 English adults found that technology like self-service checkouts, internet shopping or banking and mobile traffic updates were saving the

[3] In the Supervisory Reports, each bank indicates the number of clients that have access to Internet banking. If a client uses more than one connection, the total number of connections is reported.

[4] $https : //www.aba.com/about - us/press - room/press - releases/survey - bank - customers - preference - for - digital - channels - continues - to - grow$

average person around six-and-a-half hours each week and, as people switch to mobile and online banking, the average time spent in the physical branch has decreased by 40 minutes each week in the last decade. It has also been calculated that Internet banking saves around 21 minutes each week for the average person and could be classified as the top best modern convenience, followed by email, microwaves, online clothes shopping, etc.[5] Aggregate evidence also shows that since the beginning of 2000s Italian banks reduced the fees associated with opening a security account or with trading and the reduction was larger for banks with a higher share of online clients.

Empirically, it is extremely difficult to obtain unbiased estimates of the effects of Internet banking on portfolio choices, as they are very likely to be determined endogenously. To address these identification issues, we exploit a unique household-bank dataset, obtained by merging the Bank of Italy Survey on Household Income and Wealth (SHIW) and bank data from Supervisory Reports (SR). Our dataset contains information on the number of Internet connections for all financial intermediaries (available in the SR), on households' portfolio choices and on households' use of Internet banking (available in the SHIW). In particular, the SHIW panel component allows us to relate the adoption of Internet banking to changes in financial investments. Following a methodological approach similar to Greenstone et al. (2020), we construct an instrument for the supply of Internet banking services, which is based on the assumption that each bank offers these services with the same intensity to all its customers over the national territory; the instrument corresponds to the bank-time fixed effects after removing local time-varying demand-side factors.

We find that the adoption of Internet banking drives participation in financial markets, i.e. households that start using Internet banking also begin to hold at least one financial asset different than deposits. The impact is sizeable: our IV estimates imply that households who adopt Internet banking have a 89 percentage points higher probability of beginning to participate in financial markets. The IV estimates are larger than the OLS, as they are local average treatment effects (LATE), i.e. they measure the average effect of treatment for the sub-population of adopters who respond to changes in the supply of Internet banking services (middle-age with income above the median). However, the IV estimates indicate a sizeable downward bias in the OLS estimates, which may reflect the selection bias as some households

[5] $https://www.thelondoneconomic.com/tech-auto/modern-technology-saves-brits-the-equivalent-of-two-weeks-every-year/05/12/$

were already participating in financial markets before adopting Internet banking and therefore are not accounted for in the OLS regressions. The impact on short term assets, typically characterised by a low risk/return profile, is also positive and sizeable: our IV estimates indicate that households who adopt Internet banking have a 65 percentage points higher probability of beginning to hold these financial instruments. The impact on other risky assets, like corporate bonds and stocks, is less precise across OLS and IV, but positive. With respect to long term government bonds, OLS and IV provide estimates with different sign, suggesting that the impact of the adoption of Internet banking is less robust.

We evaluate heterogeneity in the access to financial intermediaries by considering the number of banks used before the adoption of Internet banking and the dimension of the city where the household lives. We find that households with less than two banks and living in small cities are those that more likely benefit from using Internet banking and enter into financial markets after its adoption. This result suggests that the costs of accessing banking services and, more in general transaction costs, are more important for households that have limited access to bank branches (e.g. they are served only by one bank) and/or live in small cities, where the density of bank branches and the number of financial experts are presumably lower. For such households, transportation and search costs are very likely higher than for other ones, who can benefit from higher proximity and interaction with more financial intermediaries. Participation costs, such as the annual account fee, are less relevant for richer households because they erode a proportionally lower share of financial resources. Our results on the heterogeneity in household income, financial assets, and wealth indicate that the effects of the adoption of Internet banking are higher among households with less financial resources and suggest that a reduction in participation costs could contribute to households' choices over financial market participation.

We also show that the adoption of Internet banking drives over time a higher household knowledge about key financial concepts. This result is in line with the hypothesis that an easier access to information can increase awareness not only about financial opportunities, but also about some basic financial concepts that are potentially useful for both financial investments and other choices of the everyday life.

Our findings have some interesting policy implications. They indicate that the availability of a new technology to invest can affect the propensity to participate in financial markets.

Differently from other studies that highlight the importance of cost of opening a bank account (Vissing-Jorgensen, 2002, among others), our results suggest that the adoption of Internet banking could affect household portfolio choices also through a reduction in costs associated with the convenience in making financial transactions (higher information availability, transportation costs, and time, as in Alan, 2006). Thus, to increase participation in financial markets, policies aimed at decreasing the initial cost of participation (annual account fee) could be coupled with policies aimed at reducing the transaction costs, such as those related to information about financial opportunities and easiness of making and tracking investments and expenses.

The exposition to a wider range of contents and the possibility to place trades directly without any experts' advice can be valued as positive if and only if households fully understand the key characteristics of the financial products they buy. Our results on financial literacy indicate that customers that are exposed to Internet banking have a 85 percentage points higher probability of answering correctly questions typically used to measure financial literacy, a very large effect. The extent to which Internet banking affects both households savings and understanding of financial investments has, thus, important implications for both the regulation of consumer financial products and financial stability, particularly after the Covid-19 crisis when more individuals will likely adopt Internet banking.

This paper builds on several strands of literature. First, it relates to the field of household finance and, in particular, to household portfolio choices (Peress, 2003; Gomes & Michaelides, 2005; Campbell, 2006; Guiso & Sodini, 2013; Fagereng et al., 2017, among others). Several authors have identified portfolio under-diversification as one of the more costly households' financial mistakes. Among those authors, Badarinza et al. (2016) find that participants in the stock market tend to have under-diversified portfolios, a result that is robust across countries. Calvet et al. (2007) study households' risk exposure in Sweden looking at the idiosyncratic risk in household portfolio. They focus on two main types of inefficiency in portfolio investment decision: under-diversification and non-participation in risky asset market. Vissing-Jorgensen (2002) identifies fixed transaction costs as a possible explanation of the lack of participation in the stock markets. Other studies analysed the relationship between financial market participation and financial awareness (Guiso & Jappelli (2005); Guiso & Viviano (2014); Gaudecker (2015); Gerhardt & Hackethal (2009)). We contribute to this literature showing that the adop-

tion of Internet banking increases participation in financial markets. Considering four financial asset classes that differ with respect to their risk/return profile, we show that the more robust effect of the adoption of Internet banking concerns short term assets, but we cannot exclude that the availability of a new channel to interact with financial intermediaries may increase the riskiness of households' portfolios. We also provide evidence that the entry into Internet banking induces a higher households' knowledge about key financial concepts.

Second, the paper relates to the growing literature on financial technology services (FinTech; Kuchler, 2015; Goldstein et al., 2019; Thakor, 2020). Becker (2017), using data from a natural experiment, shows that households that begin to use a money management tool are more likely to significantly increase their saving balances. DAcunto et al. (2019) show that the portfolios of investors who hold initially less than five stocks perform better after using a robo-advising portfolio optimizer; indeed this tool increases portfolio diversification and decreases volatility. On the other hand, individuals who own more than ten stocks before the adoption of the tool are almost not affected by it. We add to this strand of literature showing the effects of the adoption of financial technology over the last years, during which the diffusion of broadband Internet connections was quite widespread in Italy. We focus on the entire population of Italian and not on the most sophisticated individuals that have access to robo-advising, our reference sample is therefore more adequate to make inference on the effects of the Covid-19 crisis. We show that, to fully identify the effect of the adoption of new financial technologies, it is important to have access to fast connections to Internet. This is crucial both for the supply and the demand of new technologies.

Third, the paper connects with the studies that focus on the impact of financial innovation on household choices and welfare (Björkegren & Grissen, 2018; Gao & Su, 2018; Zhang et al., 2019; Bharadwaj & Suri, 2020; Agarwal et al., 2020). Among the benefits of financial innovation, there is a reduction in transaction costs (Daniels & Murphy, 1994) and search costs (Tufano, 1989). Goldfarb & Tucker (2017) emphasize that the digital economy has lowered also replication costs, transportation costs, tracking costs, and verification costs. We contribute to the literature by providing a first comprehensive assessment of the impact of the adoption of Internet banking on participation in different financial markets and on households' financial awareness.

The paper is organized as follows. Section 2 reports some stylized facts about Internet

banking in Italy, Section 3 presents a simple theoretical framework, Section 4 describes our dataset. Sections 5 and 6 present our identification strategy and our main results on portfolio choices. Section 7 concludes.

2 Some facts on the diffusion of Internet banking in Italy

The possibility for households to switch to Internet banking for their financial transactions may depend on several factors. Some of them are essential pre-requisites: (i) the availability of a fast and reliable internet network, as the broadband network; (ii) the propensity to buy products and services online; (iii) banks' availability at supplying Internet banking services; (iv) lower transaction costs.

Concerning the first factor it is very likely that fast broadband Internet connections foster households' decision to make financial investments from distance, i.e. without physically going to the bank branch. In particular, while the Internet traditional slow-speed net could be sufficient for households that are interested in just checking their bank accounts, high-speed Internet connections could benefit especially those who want to make more complex financial investments or trading online without going to a physical bank branch.

Since 2009 the diffusion of broadband connections has progressively increased, but only after 2012 more than 50 per cent of the Italian territory was covered by this technology (Figure 3). Its expansion reflects, at least in part, the actions taken by the European Commission since 2010 to achieve the Europe 2020 broadband objectives. As shown by Figure A1 the proportion of EU households with access to this type of connections increased, on average, from 48 per cent in 2011 to 80 per cent in June 2017 and Italy displayed the largest increase thanks to a combination of private and public investments.[6]

Together with the development of the net, according to Istat data in 2018 about 68 per cent

[6]Indeed, in 2010 the EU set three targets. First, by 2013 basic broadband (up to 30 Megabits per second, Mbps) should have been available to all Europeans, a target that was achieved by nearly all Member States by the end of June 2016. Second, by 2020 all Europeans should have access with fast broadband (over 30 Mbps). The third target is a take-up by 50 per cent or more of European households of the ultra-fast broadband (over 100 Mbps), a target that is far from being reached as only 15 per cent of households had subscribed to Internet connections at this speed by mid-2017. However, according to the European Court of Auditors (ECA), on the basis of past progress and current plans, it is unlikely that the 30 Mbps will be available to all Italian citizens by 2020. Far from stating that in Italy the EU targets are already reached or they will be reached soon, the evidence here presented just confirms the large diffusion of this technology in recent years.

of individuals have declared to access Internet from home (Table A1). Among Internet users in 2018, more than 50 per cent declared to have bought goods or services through Internet, around 45 per cent used banking services, around 40 per cent made payments, and about 10 per cent carried out financial transactions (Table 1). There are again differences by age groups, for instance the largest share of individuals that bought goods and services refers to the age group 20-24, while the largest share for online financial transactions refers to the age group 35-44 and 45-54.

Also banks' adoption of online technologies has gradually increased over time, in line with the diffusion of high-speed broadband connections. As shown in Table 2 the number of banks without online connections has decreased over time to 38 in 2016, 7 per cent of the total (more than 30 per cent at the beginning of the 2000s). Moreover, between 2012 and 2016 the share of online connections over total clients has increased by 20 percentage points to 75 per cent. According to the data from the 2019 Regional Bank Lending Survey, all surveyed Italian banks allow their clients to access online to payment services, also through the use of mobile apps. This increase in the supply was also due to the need to rationalize banks' presence through traditional branch or to reach new local markets without opening a new branch.

Households with Internet banking could access the bank account without going to the bank branch and change the investment composition at will. This implies lower time and transportation costs. Moreover, through online services clients can also reduce the costs of acquiring information for their financial decisions.

Last, since Internet banking can allow banks to rationalize their supply of consultancy and financial services it is also possible that these lower costs are passed-through to their clients. Indeed, aggregate evidence shows that since the beginning of 2000s Italian banks have reduced both the fixed fees for opening a security account[7] and the variable trading fees.[8] In both cases, the reduction was more intense for banks with a share of Internet banking connections higher than the median (Figures 4 and 5). It is thus very likely that clients of banks adopting Internet banking will experience a cut in their total cost of financial market participation.

[7] We compute the average yearly fixed fees associated with opening a security account ("conto titoli") dividing the total "commissioni di gestione e custodia" by the total number of bank clients. On average, in the period considered, these fees decrease by over 30 per cent, from 32 euros in 2002 to 21 euros in 2016.

[8] We compute the average bank fees dividing the total bank fees specifically associated with trading ("commissioni di gestione negoziazioni" and "commissioni di gestione ordini e consulenza") by the total flow amount related to sales and purchases of financial assets ordered by the clients. Data are available from 2009.

3 Theoretical framework

In this section we present a simple model to sketch how Internet banking, by reducing the costs associated to financial investments can favour financial market participation. In particular, we discuss the potential impact on participation of a reduction of both fixed and variable costs.

We build on the model described in Vissing-Jorgensen (2002) by jointly considering two types of costs associated with the investment in financial assets: the participation cost (i.e. the annual account fee equal for everybody) and the transaction cost (associated with the purchase or the sale of the security). We first present a simple theoretical framework to get an intuition of the mechanisms at play and we then extend it to multiple periods.

Consider a household i that, in an initial period, holds financial wealth W_i with stochastic return (net of taxes) equal to r. At the end of the period, financial wealth equals $W_i(1+r)$. The certainty equivalent end of period financial wealth W_i^C is given by:

$$EU(W_i(1+r)) = U(W_i^C) \tag{1}$$

Household financial wealth can be invested in safe assets (insured deposits) or in risky assets (any asset other than insured deposits). Let α_i be the fraction invested in risky assets and $(1-\alpha_i)$ the one invested in safe assets with returns r^R and r^S respectively. The household is indifferent between investing in the portfolio with stochastic return r and in a portfolio with certain return r_i^C:

$$EU(W_i(1+r^S+\alpha_i(r^R-r^S))) = U(W_i(1+r^S+\alpha_i(r_i^C-r^S))) \tag{2}$$

A household that decides to enter into financial markets has to pay some participation cost F, which is the annual account fee ("conto titoli") and is equal for all households, and a transaction cost λ_i, which depends on the amount and number of exchanges (purchases or sales). This latter cost is different across households and it captures monetary costs of acquiring new information, opportunity cost of the time spent in searching, transportation costs, trading costs, and other per-period costs related to the amount invested. We assume that transaction costs reduce households' returns in a different way across households, while participation costs reduce the

total wealth in the same way across them. Equation (2) can be modified as:

$$EU(W_i(1+r^S+\alpha_i(r^R(1-\lambda_i)-r^S))-F)=U(W_i(1+r^S+\alpha_i(r_i^C(1-\lambda_i)-r^S))-F) \quad (3)$$

A household decides to enter into financial markets by detaining risky assets ($\alpha_i > 0$) if and only if:

$$U(W_i(1+r^S+\alpha_i(r_i^C(1-\lambda_i)-r^S))-F) > U(W_i(1+r^S)) \quad (4)$$

or, in other words, if the benefit from the investment exceeds the total costs (participation plus transaction):

$$W_i\alpha_i(r_i^C-r^S) > F+W_i\alpha_i\lambda_i r_i^C \quad (5)$$

In a multiperiod model, a household i decides to enter into financial markets if the annuity value of the benefits exceeds the annuity value of participation costs and of transaction costs:

$$\sum_{t=0...T}\beta^t W_{i,t}\alpha_{i,t}(r_{i,t+1}^C-r_{t+1}^S) > \sum_{t=0...T}\beta^t F_t+\sum_{t=0...T}\beta^t W_{i,t}\alpha_{i,t}\lambda_{i,t+1}r_{i,t+1}^C \quad (6)$$

As we are studying the effect of the adoption of Internet banking on the entry into risky financial markets, we concentrate on those households for which condition (6) is not satisfied at time $(t-1)$. Thus, for household i that, upon adopting Internet banking at time t, decides to enter into risky financial markets, condition (6) implies that at least one of the following is true: (a) $r_{i,t}^C$ has increased or r_t^S has decreased; (2) the participation cost F has decreased; (3) the transaction cost λ_i has decreased. The adoption of Internet banking has no impact on financial assets' returns, indeed a household faces the same returns by going to a bank branch to buy a asset or buying financial assets online. Instead, the diffusion of online technologies could reduce banks' costs and translate into lower annual account fees. Furthermore, the possibility of operating in the financial markets without going to the branch reduces the information costs, transportation, and trading costs asymmetrically for different households. In section 6, we will evaluate the effect of the adoption of Internet banking on the participation in financial markets and we present heterogeneity by number of financial intermediaries, city size, income, financial assets and wealth. We also try to identify the categories of financial assets that have been affected the most by the diffusion of the online technology, i.e. those for which condition (6) is satisfied.

4 The data

The aim of our paper is to evaluate the impact of the adoption of Internet banking on households' portfolio choices. To this end, we exploit the SHIW, a survey of the Italian population carried out by the Bank of Italy every two years since 1960. In each wave about 8,000 households are interviewed. Half of them are interviewed for at least two consecutive waves. The survey collects information on the households' demographics, employment status, income (by source), and real and financial wealth. Since 2000 households are also asked: "In the year xx have you or a member of your family used some remote connection (telephone or through PC) with banks or financial intermediaries (home banking, online account, etc.)?". In this paper those who answer "yes" are referred to as the ones that use Internet banking, those who did not use Internet banking in the previous wave (conducted at time $t-2$) and report to use it in the current wave (at time t) are those who start adopting Internet banking.

The dataset also contains detailed information on the portfolio shares and the amount invested in financial assets at the end of the reference year by a quite detailed asset classification. In our analysis we group financial assets into four main categories based on their horizon and risk/return profile: short term assets, long term government bonds, corporate bonds, and stocks.

Short term assets include deposit certificates (CDs), repos, short-term Italian treasury bonds (the so-called BOTs), zero coupons, and monetary mutual funds. This latter asset refers to funds that typically invest in high-quality and very liquid short term debt instruments, with low returns but also low credit risk. Long term government bonds include *Certificati di Credito del tesoro* (CCTs), *Buoni del tesoro Poliennali* (BTPs), and other government bonds. Corporate bonds include bonds issued by Italian firms and banks, funds or Exchange-Traded Funds (ETFs) in bonds (in euros). Stocks include shares in listed companies and foreign securities, balanced (or mixed) funds or ETFs in euros, funds or ETFs in equities in euros, funds or ETFs in foreign currencies, and managed accounts.

Since we look at entry in each of this market segment in connection with the adoption of Internet banking we define as entrants in a given asset class those who did not hold assets at time $t-2$ and report to hold some at time t. Those who start holding (between $t-2$ and t) at least one type of asset are those who start participating in financial markets. In our

analysis, we do not consider the impact of Internet banking on bank current accounts, because any household that adopts Internet banking must also have at least one of them and, given our focus on the participation, the result would be obvious. Thus, we focus on households which start using Internet banking during the period that we analyse and we look at contemporaneous portfolio choices.

Figure 6 reports, for each year of the survey, both the share of households that declare to use Internet banking and the share of households that start to use it. The share of households that use Internet banking was lower than 5 per cent at the beginning of 2000s and reached about 30 per cent in 2016, a trend similar to the one observed in aggregate administrative data. Moreover, following the trend observed in administrative data, we can claim that in 2019 the share of households using Internet-based services has further expanded.

For our main estimates we focus only on the years from 2012 to 2016, i.e. a period in which more than 50 per cent of the territory was covered by Internet broadband (as mentioned in Section 2). This choice is motivated by the fact that the heterogeneous development of Internet across the country could be due to local factors, related to the demand for Internet services (and ultimately to the use of Internet banking). Thus, we prefer to limit our time span to a period when this potential source of bias is likely to be small, as a large share of the territory is served by the broadband.

If a household adopts Internet banking at time t it is excluded from the sample from time $t + 2$ onward, i.e. it remains in the sample until it adopts Internet banking (it is always in the sample if it never adopts Internet banking). The final dataset consists of around 4,000 households observed at least twice from 2012 to 2016.

To assess the survey data quality, in Table B1 in the Appendix we compare the SHIW with the Bank of Italy Financial Accounts, which presents statistics on the financial assets and liabilities of the Italian household sector. The amount of shares reported in the Financial Accounts is typically higher than the one collected by the SHIW; this reflects also the fact that the financial holdings of the extremely rich households, which are very likely to hold stocks in large amounts, are not captured well by the SHIW due to under-reporting bias, a problem very common in survey data (see, for instance, Vermeulen, 2018). We then exclude shares and compare the relative weight of deposits, government bonds, corporate bonds, and mutual funds

in household portfolios. All in all, the picture provided by the two sources is quite consistent, also over time and the correlation between the two sources is quite high. This remains true when we restrict the sample to households that are interviewed for at least two years (Panel C), i.e. the only ones for which we can define entry. For these households the correlations with Financial Accounts exceed 50 per cent for each group of financial instruments.

In Table 3 we report some descriptive statistics. Households that begin to use Internet banking are, on average, younger, better educated, have higher income and are wealthier than non-users. They are also more likely to hold financial assets.[9] Their financial market participation is also higher, particularly for short term assets and stocks. These facts highlight the potential endogeneity of the use of Internet banking with respect to household income and wealth, as well as the potential endogeneity of the decision to adopt Internet banking with respect to portfolio choices. Thus, it is important to find an adequate instrument that allows us to disentangle the diffusion of Internet banking from demand factors.

To this end, we employ bank data drawn from the SR of the Bank of Italy. Banks operating in Italy are required to report annually the number of Internet banking connections in each province in which the bank operates. Banks have to signal both the number of individuals using Internet banking for information purposes and individuals using these services also for their financial operations. Less than 20 per cent of the bank clients use online services to get information only, thus we do not distinguish by type of use. We employ these data to construct a bank-level index of supply of Internet banking, which is presented in Section 5.

Since the SHIW contains information on the main bank used by households, it is possible to merge it with the SR and get information on the evolution of Internet banking services provided by each bank used by the household.[10] We will refer to this merged dataset as SHIW-SR.

5 Identification strategy: the supply of Internet banking

The Italian territory is divided into 108 administrative province, i.e. rather small and homogeneous geographical areas. Because of the very high degree of fragmentation of the banking

[9] Differences between Internet banking adopters and non-users are confirmed when considering the entire sample from 2002, as shown in Table B2.

[10] Indeed the survey asks to report also what is the second and third most important bank. Only around 5 per cent of Italian households use three different banks.

system, in each province there are on average around 200 branches of different banks. The province-level Herfindahl concentration index is also remarkably low and equals to 0.15, on average during the period 2012-16.[11]

The presence of branches of different banks in the same province and the unconcentrated structure of the local banking sector provide us an opportunity to purge from local demand factors. They could be relevant in Italy because, particularly in the less developed regions located in the Southern part of the country, lower income levels could impact on the demand for online services.

We focus on the period 2012-16 when the broadband network covered almost the entire Italian territory. By excluding earlier observations we try to ensure that the estimated province-level fixed effects are capturing demand factors independently on the development of the network.

As mentioned in Section 4 the SR database contains information on the number of Internet banking connections by each bank in each province over time. Then, let $n_{b,p,t}$ the number of Internet banking connections of bank b, in province p, in year t. Similarly to Greenstone et al. (2020), Barone et al. (2018) and others, we run the following regression:

$$\Delta n_{b,p,t} = \gamma_{b,t} + \gamma_{p,t} + u_{b,p,t}. \tag{7}$$

where $\Delta n_{b,p,t}$ is the change in the number of connections, calculated as $\frac{(n_{b,p,t}-n_{b,p,t-2})}{(.5*n_{b,p,2}+.5*n_{b,p,t-2})}$ (to include also provinces with zero values at time $t-2$) and the terms $\gamma_{b,t}$ and $\gamma_{p,t}$ are bank and province fixed effects respectively. Regressions are run by couple of years. The term $\gamma_{b,t}$ captures bank time-varying supply of online services. We implicitly assume that banks offer Internet banking services with the same intensity across provinces, a condition that is satisfied if a fast and reliable broadband network is diffused uniformly over the national territory (i.e. from 2012, as shown in Section 2). Thus, if a bank increases its number of online clients because of some bank-specific policy, we would capture it through the bank time-varying fixed effect. Figure 7 reports the distribution of $\gamma_{b,t}$ (normalized) and allows to appreciate its variability. The term $\gamma_{p,t}$ captures local time-varying characteristics common to all banks operating in province p. In line with Amiti & Weinstein (2018), if the expansion in the number of Internet

[11]The market share of each bank is computed considering the total number of its clients over the total bank clients in a province.

banking connections is due to local shocks, we will account for them through this province-year fixed effects.[12]

As shown in Section 2, Internet banking is used more frequently by some socio-demographic groups, i.e. those aged between 35 and 54, probably with higher income. This implies that our identification strategy is valid only if banks with above- or below-average supply-shifters are not systematically sorted into socio-demographic groups with better/worse-than-average outcomes. To test for this assumption we carry out two exercises, using the entire time span and all the observations of our merged dataset SHIW-SR. In the first one we calculate the share of bank b clients aged 35-54 in total clients. We then regress the term $\gamma_{b,t}$ on this share, and on its lags. The presence of correlation between $\gamma_{b,t}$ and the share of clients with higher propensity to use Internet banking could signal banks' sorting. The results are reported in Panel A of Table 4 and support our identification strategy. Panel B replicates the same exercise, but the share of clients is now referred to those with income above the median, among those aged 35-54. Also in this case the hypothesis of sorting is not supported by the data. One could argue that other household characteristics are correlated with our instrument, invalidating our identification strategy. We regress our instrument against the main household variables, using a linear regression model controlling for time invariant bank characteristics. Graphical results for the 95th confidence interval around the mean are presented in Figure 8 and indicate that none of these characteristics is statistically different than zero. This further supports our identification strategy.

Last, one could dispute the validity of the instrument by arguing that the variation in the number of online connections is driven by banks' policies aimed at increasing the revenues from fees obtained from selling investment products. This can potentially invalidate our identification strategy because the instrument directly affects the outcome (i.e. financial market participation). To test for reverse causality we then analyse the correlation between $\gamma_{b,t}$ and lags and leads of the bank revenues from fees associated to investment products. These fees include fees from negotiating financial assets, fees from depository services, fees from executing transactions on behalf of clients, fees from financial advisory services, placement and distribution fees. We use the entire time span of the dataset (from 2002), to maximize the sample size in the presence of numerous leads and lags. The results of Table 5 lead us to exclude reverse

[12]This approach allows to remain agnostic about the specific model underlying the shocks.

causality, as future values of the instrument are uncorrelated with present and future values of the fees (in logs) and, if any, are correlated only with past values of our Internet banking supply index.

6 Main results

6.1 IV: First stage

Since financial market participation and Internet banking adoption could be jointly determined we use an IV approach. We model the decision to adopt Internet banking as a function of $\gamma_{b,t}$, which measures the Internet banking supply of the main bank used by each household. This variable, calculated on the SR dataset for each bank b in year t, is assigned to household i in the SHIW dataset; in household-level regressions we label it as $\gamma_{i,b,t}$.[13] We estimate the following equation:

$$IB_{i,b,p,t} = \gamma_{i,b,t} + \phi_i + \phi_t + \phi_p + \epsilon_{i,b,p,t} \tag{8}$$

where $IB_{i,b,p,t}$ is the decision of household i that lives in province p and whose main financial intermediary is bank b to adopt Internet banking, which takes value 1 if the household had no Internet banking at time $t-2$ and uses it in t. The variable $\gamma_{i,b,t}$ is then our instrumental variable for the decision to adopt Internet banking, under the assumption that a nation-wide increase in the supply of bank b's Internet banking is correlated with the household decision to adopt it, but uncorrelated with its portfolio decision.

Results of the first-stage regression are reported in the first Column of the Table 6. The regression includes household fixed effects, to control for all the time invariant household attributes, year fixed effects, to account for time trends, and province fixed effects, to account for time invariant province characteristics. The variable that measure the Internet banking supply is highly significant and the F-test of the regression is around 46. Internet banking supply is positively correlated with the probability for a household to adopt Internet banking

[13]The merged banks comprise the largest banks operating in Italy in the year of the survey and cover on average more than 75 per cent of clients in the country. More precisely, the list included in the SHIW is made of the largest institutions in terms of total deposits from households. We have on average 55 banks covering on average during the various years 75.4 per cent of the market.

and, given the way we constructed them, it can be viewed as exogenous to the household investment decision.

Columns 2-4 carry out the same exercises for the following samples: (i) one composed only of households where the reference person is aged between 35 and 54; (ii) one composed of households with household income larger than the median; (iii) a sample of households where the reference person is aged between 35 and 54 and income is above the median. These further regressions are aimed at shed some light on what group of households respond more to the instrument and may help interpreting the second stage results, which are presented in the next section.

Consistently with Istat aggregate data, we find that the size of the coefficient of the supply of Internet banking $\gamma_{i,b,t}$ almost doubles in the subgroup of 35-54 households. It is also higher than the average when the household income is above the median and it is almost 4 times larger when the sample is composed by middle-age and high-income households. For instance, when the supply of Internet banking ($\gamma_{i,b,t}$) increases by one standard deviation (0.244), the probability to adopt Internet banking increases by around 2 p.p. in the full sample and by 8 p.p. in the sample of middle-age and richer households. These households account for around 15 per cent of the total sample. However, as shown in Figure 9, the difference in the estimated coefficient between the first and the other models are within the 95th confidence interval.

6.2 Entry into financial markets

Does Internet banking increase the probability to invest in financial markets? If the adoption of Internet banking is associated with lower information costs and lower search costs it is possible that the adoption of this new technology affects financial market participation. This effect could be further reinforced if the diffusion of Internet banking leads to a reduction of the costs of holding a security account, as suggested by Figures 4 and 5, and if this reduction is large enough relative to current and future returns (see Section 3 for a formal analysis).

We then test empirically these implications by the use of the following model:

$$E_{x,i,b,p,t} = IB_{i,b,p,t} + \phi_i + \phi_t + \phi_p \epsilon_{i,b,p,t} \tag{9}$$

where $E_{x,i,b,p,t}$ is a dummy variable that captures entry into the market of asset x for household i that lives in province p and whose main financial intermediary is bank b. The variable $IB_{i,p,b,t}$ is defined as in Section 5 and is instrumented by $\gamma_{i,b,t}$ in a two-stage least square regression. Households without Internet banking at time t are followed also after time $t+2$ to include household fixed effects ϕ_i in the regressions and capture unobserved heterogeneity. ϕ_t is a dummy for the year of analysis, ϕ_p is a dummy for the province of the household, $\epsilon_{i,b,p,t}$ is an idiosyncratic error term.

More in detail, $E_{x,i,b,p,t}$ takes value 1 if household i holds asset x in year t, but not in the previous wave, i.e. in year $t-2$, and value 0 if the household reports a zero amount of asset x in both year $t-2$ and t. Of course, this is a rather imperfect measure of entry, as we do not observe household decisions between time $t-2$ and time t. Nevertheless, as households are typically characterized by a quite high level of inertia (Bilias et al., 2010, for instance), we are confident that $E_{x,i,b,p,t}$ is a good proxy for entry. Assets x can represent either the holding of a generic financial assets (when we consider the entry into financial markets, for which it is sufficient to detain at least one asset other than deposits), or a given asset class (short term, long term government bonds, corporate bonds, or stocks).

Figure 10 displays the average entry into financial markets by Internet banking status, distinguishing also for the different asset classes, and shows that the share of households that enter into financial markets is higher among those that adopt Internet banking than among those that do not use this technology.

In Table 7 we present the OLS and IV results of equation 9 for the entry into financial markets. All models include province, year and household fixed effects.

The OLS coefficient is positive and almost statistically significant, while the IV coefficient is highly statistically significant indicating that the adoption of Internet banking causes households to entry into financial markets. Households, upon adopting Internet banking, choose to participate also in financial markets by holding at least one instrument different from bank account. The regressions show that the IV coefficient is very large (around 0.89) and much larger than those for the OLS as it is a local average treatment effect (LATE), i.e. it measures the average effect of treatment for the sub-population of adopters who respond to changes in the supply of online services (middle-age with income above the median, as shown in Section

5). It also suggests that there is a strong downward bias associated with the OLS estimates, which may reflect the fact that some households decide to participate in financial markets independently on the adoption of the technology. Indeed, about 15 per cent of households that do not use Internet banking participate in financial investment.

We also evaluate whether the impact of Internet banking differs across financial assets. In principle, information and search costs can vary by type of financial product. It is then possible that Internet banking favours some asset classes more than others. To check for this hypothesis, we group assets into four broad categories, on the basis of their investment horizon and risk/return profile (short term, long term government bonds, corporate bonds, and stocks).

Results from the econometric regressions are reported in Table 8. As in Table 7, for each asset class we present the OLS and IV estimates with year, household, and province with fixed effect. Our IV regressions (Column 2) indicates that the adoption of Internet banking drives an increase in the likelihood of holding short term assets, but, while positive, the coefficients for long term government bonds, corporate bonds, and stocks are not statistically significant. These regressions confirm selection and downward bias in the OLS estimates. With respect to stocks, the magnitude of the IV coefficient is larger than that of the OLS coefficient, but it is not statistically significant.

6.3 Heterogeneity of the effects

As mentioned in Section 4 we do not have information that allows us to test that Internet banking affects household portfolios because of lower transaction or/and participation costs, as our microdata do not include them. Nevertheless, we can look at heterogeneity of the estimated effects to shed some light on the plausible channels at work.[14]

We claim that the cost for each transaction is lower if a household, before adopting Internet banking, has more than one bank from which to obtain information or if it lives in a big city. In these cases, the household has probably more opportunities to acquire information thanks to the relationship with different financial intermediaries, can benefit from a larger network of people to communicate with, and probably faces lower transportation costs, under

[14]The coefficients of the first stage regressions are generally significant also for the subsamples considered in this section.

the assumption that, everything-else equal, a higher density of bank branches reduces these costs. Table 9 shows that the adoption of Internet banking has, in general, a significant effect for households with less than two banks at time t-2 or not living in a big city (Columns 2 and 4).

We then evaluate the heterogeneity by the previous-period households' financial conditions. As shown in Table 10, the effect of the adoption of Internet banking is larger for households with income (Column 1), or financial assets (Column 3), or with wealth (Column 5) below the fourth quartile of the distribution of the variable in the population; for these groups of households participation costs matter more than for the remaining ones.

In Table 11 we evaluate heterogeneity by age and education. With respect to age,[15] the effects are larger for older households; this may reflect the fact that younger households invest primarily in housing and easier access to financial market does not drive any major changes in their investment behavior. Regarding education, the effects are larger for less educated households; this may indicate that this group, that typically includes households that are more financially constrained, is the one that was sustaining the largest cost of acquiring information.

These results suggest that the reduction in transaction costs, specifically associated to search and transportation, is complementing the decline in participation costs in driving the entry into financial markets.

6.4 Financial awareness in making investments

We then test whether Internet banking increases households' ability to understand some key financial concepts. To this end we exploit two questions that are available in 2010 and 2016. The first question aims at assessing households' understanding of the difference between nominal and real rates;[16] the second one tests households' awareness about the relationship between risk and return and, thus, the importance of portfolio diversification.[17] To assess whether the

[15] We consider two age classes: below and above 45 years. The 45- years threshold divides in two equal parts the age group 35-54, which is the groups that reacts the most to an increase in the supply of Internet banking. Regressions on more detailed age classes cannot be carried out because of the small sample size.

[16] The question is: "Imagine leaving 1,000 euros in a current account that pays 1% interest and has no charges. Imagine that inflation is running at 2 per cent. Do you think that if you withdraw the money in a year's time you will be able to buy the same amount of goods as if you spent the 1,000 euros today? (1) yes; (2) no, I will be able to buy less; (3) no, I will be able to buy more; (4) don't know; (5) no answer."

[17] The question is: "Which of the following investment strategies do you think entails the greatest risk of losing your capital? (1) investing in the shares of a single company; (2) investing in the shares of more than one

adoption of Internet banking has driven a higher financial awareness, we construct a dummy variable $D_{awareness,x,t}$ equals to 0 if the household did not answer correctly to any questions and equal to 1 if it answered correctly to at least one of them. We aim at assessing whether households that adopted IB between 2010 and 2016 are more likely to have higher financial awareness in 2016, controlling for the main household characteristics and their level of financial awareness in 2010. Results are reported in Table 12. Both the OLS and the IV estimates are positive and significant. As before, the IV estimate is larger than the OLS one: the adoption of Internet banking over six years drives a higher (by 85 percentage points) awareness of financial concepts.[18]

6.5 Robustness checks

To further confirm the validity of our identification strategy we run additional experiments and robustness checks. First, one could argue that the province*year fixed effect does not fully account for local demand, as there may be time-varying components of the demand that are associated with the bank*year fixed effect, i.e. with out instrument. Thus would imply that our instrument does not fully isolate from the demand effect since the bank's decision to expand the supply of online services would depend on the local demand. We thus compute our instrument excluding the first fifteen provinces in terms of population, where the demand is likely higher. Computing the instrument using the smaller areas would also imply that the bank specific demand in less populated areas is not correlated with the bank specific demand in more populated areas. The provinces excluded are Roma, Milano, Napoli, Torino, Brescia, Palermo, Brescia, Bari, Catania, Bergamo, Salerno, Firenze, Bologna, Padova, Caserta, which account for about 40 per cent of the Italian population. We use this instrument to study the entry into financial markets. Results presented in Table 13 confirm the validity of our analysis.

Second, in our baseline specification, we restrict the sample to the period 2012 on-wards, a period characterized by a good national coverage of Internet broadband. Figure 11 shows, that before the financial crisis, about one quarter of the population had broadband Internet access and Ciapanna & Sabbatini (2008) found that, in the early years of 2000s, the broadband network was more developed in urban than in rural areas. We restrict our sample to households

company; (3) don't know; (4) no answer."

[18]The instrument is the usual one. A first stage regression with the adoption of IB between 2010 and 2016 as dependent variable confirms its validity.

living in urban areas (with more than 200,000 individuals) before 2008; this group of households is the one that is likely to have access to fast connection. The IV result presented in Table 14 confirms that the adoption of Internet banking has driven an increase in financial market participation.

Last, we evaluate whether the results on the entry into financial markets change sign or become statistically insignificant when we account for other regressors that capture household financial conditions. Results are reported in Table 15. Specifically, we include the age and education of the reference person, the previous wave financial assets, the previous wave wealth, the previous wave income. As in the main specification, the coefficient associated with Internet banking remains positive, statistically significant, and similar in size across the different specifications, confirming the robustness of our results.

7 Conclusions

In this paper we study whether the adoption of Internet banking affects households' participation in financial markets. While the related literature is mainly concentrated on household stock holding (Bogan, 2008, among others), we focus on participation in financial markets tout court and in specific segments that differ with respect to their risk/return profile (short term assets, long term government bonds, corporate bonds, and stocks). To limit the endogeneity issues, we rely on an instrument that captures bank supply shocks after 2012, when the access to a fast broadband became quite widespread in the national territory. To support the validity of our instrument we carry out several tests. We show that households with higher propensity to invest in financial assets do not systematically sort into banks with higher propensity to develop Internet banking and we run a test to show that the variation in the number of online connections is not caused by banks' policies aimed at increasing the revenues from fees obtained from selling investment products. We use this instrument for the adoption of Internet banking.

Our results indicate that households, upon adopting Internet banking, enter into financial markets. The IV models indicate that there is a causal impact on short term assets. With respect to stocks and corporate bonds, the effect is positive, but it is not statistically significant. On long term government bonds, the effect of the adoption of Internet banking is less robust

across model specifications. We present aggregate data according to which, since the beginning of 2000s, fees declined more for banks with a higher share of online clients and we also provide indirect evidence that Internet banking affects households' portfolio choices through a reduction of transaction costs, such as those related to transportation, search and trading. Unfortunately, the data available does not allow us to evaluate whether it was more important the reduction in bank fees or the drop in transaction costs in driving the households' choice to entry in financial markets, but we can claim that both of them played a role, at least to some extent. Internet banking also leads to a better understanding of financial concepts, probably through an increase in available financial information.

Tables and figures

Table 1: Activities by Internet users (share of individuals, percentages)

Notes: People aged 15 and over who have used the Internet in the last 3 months and have bought goods and / or services for private use on the Internet (Column 1), sold goods or services via the Internet (es. eBay, Column 2), used Internet banking services (Column 3), used Internet payment services (es. paypal, Column 4), carried out financial transactions via the Internet (es. stocks, Column 4) in the last 3 months, by gender and age group. Year 2018. Source: Istat.

Age group	Buy goods and services (1)	Sell goods and services (2)	Use banking services (3)	Use payment services (4)	Make financial transactions (5)
15-17	42.7	5	3.8	17.6	0.8
18-19	62.9	9.8	18.3	37.1	1.3
20-24	72.6	13.8	41.4	53.1	6.1
25-34	68.2	14.3	52.3	49.8	10.4
35-44	62.6	14.5	53.1	46.2	13.6
45-54	55.6	10.6	48.2	39	12.9
55-59	45.0	6.6	43.9	30.5	9.7
60-64	37.9	5.9	42.4	29.3	8.1
65-74	33.5	5.3	40.1	21.5	9.3
75 +	26.4	2.4	31.7	14.6	5.1
Total	55.9	10.8	44.6	39.2	10.1

Table 2: Statistics based on Supervisory Reports

Notes: The Table shows several statistics based on the SR. Column 1 reports the year-to-year variation in the number of banks' online connections; Column 2 presents the share of online connections over total bank customers; Columns 3 and 4 show the total number of banks, the number of banks without online connections.

	Y-to-Y variation in the number of online connections (millions) (1)	Share of online connections over total customers (per cent) (2)	Total number of banks (3)	Number of banks without online connections (4)
2002	1.49	12.85	747	232
2003	0.87	15.94	726	170
2004	0.98	19.37	713	134
2005	1.45	23.98	712	119
2006	2.60	32.11	712	69
2007	2.06	38.08	722	61
2008	1.88	43.26	721	69
2009	2.38	48.61	722	58
2010	1.99	55.38	705	53
2011	0.55	56.07	695	59
2012	0.43	55.42	655	54
2013	1.61	58.49	636	50
2014	1.96	63.67	619	46
2015	2.64	69.34	590	40
2016	2.19	74.74	543	38
2017	1.63	78.91	479	28

Table 3: Summary statistics (euros and share of households)

Notes: The Table shows the summary statistics for the households that do not use Internet banking (Columns 1 and 2) and for those that begin to use Internet banking (Columns 3 and 4) over the period 2012-16. Short term assets include BOTs, CDs, repos, other short term government bonds, monetary mutual funds; long term government bonds include CCTs, BTPs, and other government bonds; corporate bonds include bonds issued by Italian firms and banks, funds or ETFs in bonds in euros; stocks include shares in listed companies and foreign securities, balanced (or mixed) funds or ETFs in euros, funds or ETFs in equities in euros, funds or ETFs in foreign currencies, and managed current accounts. Source: SHIW.

	No O.B.		Entry into O.B.	
	mean	std.dev.	mean	std.dev.
	(1)	(2)	(3)	(4)
Age	63.53	15.81	53.05	13.55
Low education (%)	35.00	47.70	7.17	25.86
Medium education (%)	59.66	49.06	77.64	41.76
High education (%)	5.33	22.48	15.19	35.97
Income (euros)	24,623	13,616	35,311	17,500
Wealth (euros)	156,202	202,040	217,414	260,793
Financial assets (euros)	11,623	38,078	20,490	71,343
Own short term assets (%)	2.44	15.43	5.49	22.82
Own long term govt. bonds (%)	0.53	7.25	0.01	0.01
Own corporate bonds (%)	0.91	9.48	3.38	18.10
Own stocks (%)	0.40	6.33	2.95	16.97
Observations	3974		237	

Table 4: IV and share of clients with higher propensity to use Internet banking

Notes: The dependent variable is our instrument that measures Internet banking supply ($\gamma_{b,t}$ estimated in equation 7), regressed on the share of clients aged 35-54 in total clients (Panel A) and on the share of clients aged 35-54 with income above the median (Panel B). Standard errors clusterized at bank*year level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

	IV Supply of Internet banking			
	(1)	(2)	(3)	(4)
	Panel A			
Share aged 35-54	-0.010			
	(0.085)			
Share 35-54 ($t-2$)		0.159		
		(0.145)		
Share 35-54 ($t-4$)			0.150	
			(0.142)	
Share 35-54 ($t-6$)				-0.109
				(0.183)
Bank FE	Y	Y	Y	Y
Observations	485	354	259	168
R-squared	0.212	0.234	0.340	0.290
	Panel B			
Share aged 35-54 &	0.116			
Income>= median	(0.087)			
Share 35-54 ($t-2$) &		0.205		
Income>= median		(0.164)		
Share 35-54 ($t-4$) &			-0.059	
Income>= median			(0.187)	
Share 35-54 ($t-6$) &				-0.016
Income>= median				(0.139)
Bank FE	Y	Y	Y	Y
Observations	485	354	259	168
R-squared	0.215	0.236	0.338	0.289

Table 5: IV and bank fees from selling investment products

Notes: The dependent variable is the total bank fees from selling investment products at a national level (in logs). Supply of Internet banking corresponds to the variable $\gamma_{b,t}$ estimated on equation 7. We include lags (L) and leads (F). Standard errors clustered at the bank*year in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Bank fees (logs)	
	Full sample 2002-16	Sample year>= 2012
	(1)	(2)
F2.Supply of Internet banking	-0.078	-0.050
	(0.075)	(0.086)
F.Supply of Internet banking	0.103	-0.064
	(0.090)	(0.074)
Supply of Internet banking	0.063	0.094
	(0.100)	(0.106)
L.Supply of Internet banking	0.103	0.222***
	(0.097)	(0.092)
L2.Supply of Internet banking	0.108	0.048
	(0.071)	(0.068)
Year FE	Y	Y
Observations	6,539	1,561
R-squared	0.971	0.991

Table 6: The adoption of Internet banking (First stage)

Notes: The Table reports the first stage regression for the household decision to adopt Internet banking as a function of our instrument, which measures the supply of Internet banking for the main financial intermediary of the household ($\gamma_{b,t}$ estimated on equation 7). Column (2) refers to the sample of households whose reference person aged between 34 and 54; Column (3) to households with income above the median; Column (4) to households where the reference person is aged between 35 and 54 and household income is above the median. The models include household, province and year fixed effects; standard errors are clustered at bank*year level. *** p<0.01, ** p<0.05, * p<0.1.

	Full sample (1)	Aged 35-54 (2)	Income >= median (3)	Aged 35-54& Inc. >= med. (4)
Supply of Internet banking	0.080***	0.186***	0.118***	0.336***
	(0.022)	(0.040)	(0.052)	(0.111)
Province FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
HH FE	Y	Y	Y	Y
Observations	4138	946	1352	336

Table 7: Entry into financial markets

Notes: The Table shows the effects of the adoption of Internet banking on the choice to begin to hold at least one financial asset different than bank accounts, OLS (Column 1) and IV (Column 2). The models include household, province and year fixed effects; standard errors are clustered at bank*year level. *** p<0.01, ** p<0.05, * p<0.1.

	Entry into financial markets	
	OLS (1)	IV (2)
Adoption Internet banking	0.040	0.889***
	(0.024)	(0.431)
Province FE	Y	Y
Year FE	Y	Y
HH FE	Y	Y
Observations	4138	4138
F-test		12.727
Average	0.0435	0.0435

Table 8: Entry into financial markets by asset class

Notes: The Table shows the effects of the adoption of Internet banking on the choice to begin to hold short term assets (Panel A), long term government bonds (Panel B), corporate bonds (Panel C), and stocks (Panel D). The models include household, province and year fixed effects; standard errors are clustered at bank*year level. *** p<0.01, ** p<0.05, * p<0.1.

	OLS	IV
	(1)	(2)
	Panel A: Short term	
Adoption Internet banking	0.014	0.656**
	(0.014)	(0.297)
Observations	4138	4138
Average	0.026	
	Panel B: L.t. gvt. bonds	
Adoption Internet banking	-0.006**	0.228
	(0.003)	(0.141)
Observations	4138	4138
Average	0.005	
	Panel C: Corp. bonds	
Adoption Internet banking	0.024	0.155
	(0.019)	(0.246)
Observations	4138	4138
Average	0.012	
	Panel D: Stocks	
Adoption Internet banking	0.022**	0.195
	(0.011)	(0.122)
Observations	4138	4138
Average	0.005	
Province FE	Y	Y
Year FE	Y	Y
HH FE	Y	Y

Table 9: Entry into financial markets: heterogeneity by access to banks (previous bank relationship and city's dimension). IV models

Notes: The Table shows the effects of the adoption of Internet banking on the choice to begin to hold at least one financial asset different than bank accounts by number of financial intermediaries (Columns 1 and 2) and by the dimension of the city (Columns 3 and 4). Big cities have more than 500,000 habitants. The models include year, household, and province fixed effects. Standard errors are clustered at bank*year level. *** p<0.01, ** p<0.05, * p<0.1.

	Entry into financial markets			
	N. banks at time (t-2)		City's dimension	
	2+	0-1	big city	no big city
	(1)	(2)	(3)	(4)
Adoption Internet banking	0.198	0.860***	-0.162	0.924**
	(1.100)	(0.306)	(1.876)	(0.455)
Province FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
HH FE	Y	Y	Y	Y
Observations	370	3292	259	3794

Table 10: Entry into financial markets: heterogeneity by household's income, financial assets, and wealth. IV models

Notes: The Table shows the effects of the adoption of Internet banking ($IB_{i,b,p,t}$) on the choice to begin to hold at least one financial assets different than bank accounts by income (Columns 1 and 2), financial assets (Columns 3 and 4), and wealth (Columns 5 and 6) at time (t-2). Q4 refers to the fourth quartile of the variable distribution. IV models include year, household, and province fixed effects. Standard errors clusterized at bank*year in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Entry into financial markets					
	Income at time (t-2)		Fin. assets		Wealth	
	<Q4	=Q4	<Q4	=Q4	<Q4	=Q4
	(1)	(2)	(3)	(4)	(5)	(6)
Adoption Internet banking	0.734*	-1.564	0.551**	-0.774	0.959*	0.774
	(0.396)	(5.217)	(0.250)	(1.700)	(0.552)	(2.050)
Province FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
HH FE	Y	Y	Y	Y	Y	Y
Observations	3490	305	3580	143	3401	345

Table 11: Entry into financial markets: heterogeneity by household's age and education. IV models

Notes: The Table shows the effects of the adoption of Internet banking ($IB_{i,b,p,t}$) on the choice to begin to hold at least one financial assets different than bank accounts by time (t-2) age (Columns 1 and 2), and education (Columns 3 and 4). Low education means none, primary school certificate, lower secondary school certificate. High education means vocational secondary school diploma (3 years of study), upper secondary school diploma, 3-year university degree/higher education diploma,5-year university degree, postgraduate qualification. IV models include year, household, and province fixed effects. Standard errors clusterized at bank*year in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Age		Education	
	<45 years	>= 45 years	Low	High
	(1)	(2)	(3)	(4)
Adoption Internet banking	0.564	0.996*	0.867*	0.513
	(0.438)	(0.601)	(0.483)	(0.444)
Province FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
HH FE	Y	Y	Y	Y
Observations	547	3271	2864	1010

Table 12: Financial literacy as an outcome. Year 2016

Notes: The Table shows the effects of the adoption of Internet banking between 2010 and 2016 on the level of financial education in 2016. Age class refers to five possible age groups (16-30, 31-40, 41-50, 51-65, 66+), area to five geographical areas (North-West, North-East, Center, South, Islands). Standard errors clusterized at bank level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Financial literacy in 2016	
	OLS	IV
	(1)	(2)
Adoption IB between 2010 and 2016	0.123***	0.848*
	(0.025)	(0.483)
Financial lit. in 2010	Y	Y
Gender	Y	Y
Age class	Y	Y
Area	Y	Y
Observations	1691	1583

Table 13: Robustness check: IV computed in smaller markets

Notes: The Table shows the effects of the entry into Internet banking on the choice to detain at least one financial asset different than bank accounts. The instrument is computed excluding the first fifteen provinces in terms of population. All regressions include year, households, and province fixed effects. Standard errors clusterized at bank*year level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Entry into financial markets	
	OLS	IV
	(1)	(2)
Adoption Internet banking	0.043*	0.867**
	(0.025)	(0.430)
Province FE	Y	Y
Year FE	Y	Y
HH FE	Y	Y
Observations	4150	4150

Table 14: Robustness check: urban areas before 2008

Notes: The Table shows the effects of the entry into Internet banking on the choice to detain at least one financial asset different than bank accounts. We restrict the sample to households living in urban areas before 2008 (i.e. before the diffusion of broadband at a national level). The models include year, province and households fixed effects. Standard errors clusterized at bank*year level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

	Entry into financial markets	
	OLS	IV
	(1)	(2)
Adoption Internet banking	-0.047*	0.352*
	(0.024)	(0.193)
Province FE	Y	Y
Year FE	Y	Y
HH FE	Y	Y
Observations	136	136

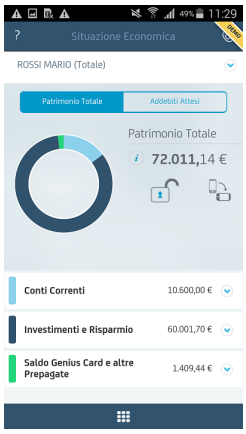
Table 15: Robustness check: additional controls in IV models

Notes: The Table shows the effects of the adoption of Internet banking ($IB_{i,b,p,t}$) on the choice to detain at least one financial asset different than bank accounts. The following controls are considered: age, education, financial assets at time (t-2), wealth at time (t-2), income at time (t-2). The models include household, province and year fixed effects; standard errors are clusterized at bank*year level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

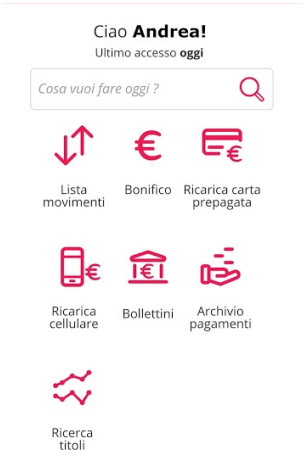
	Entry into financial markets				
	(1)	(2)	(3)	(4)	(5)
Adoption Internet banking	0.859*	0.786**	0.856**	0.857**	0.861**
	(0.437)	(0.394)	(0.434)	(0.435)	(0.432)
Lag fin. assets	N	N	Y	N	N
Lag wealth	N	N	N	Y	N
Lag income	N	N	N	N	Y
Province FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
HH FE	Y	Y	Y	Y	Y
Observations	4059	4059	4059	4059	4059

Figure 1: Internet banking

Notes: The figure shows mobile banking apps of some main Italian banks. The words "Investimenti e risparmio", "Ricerca titoli", "Trading", "Compravendita titoli" refer to links that allow households to directly make financial investments using the mobile app.



(a)



(b)

(c)

(d)

Figure 2: Households' engagement with Internet banking

Notes: This screenshot highlights some motivations behind households' preference for Internet banking.
Source: Facebook page

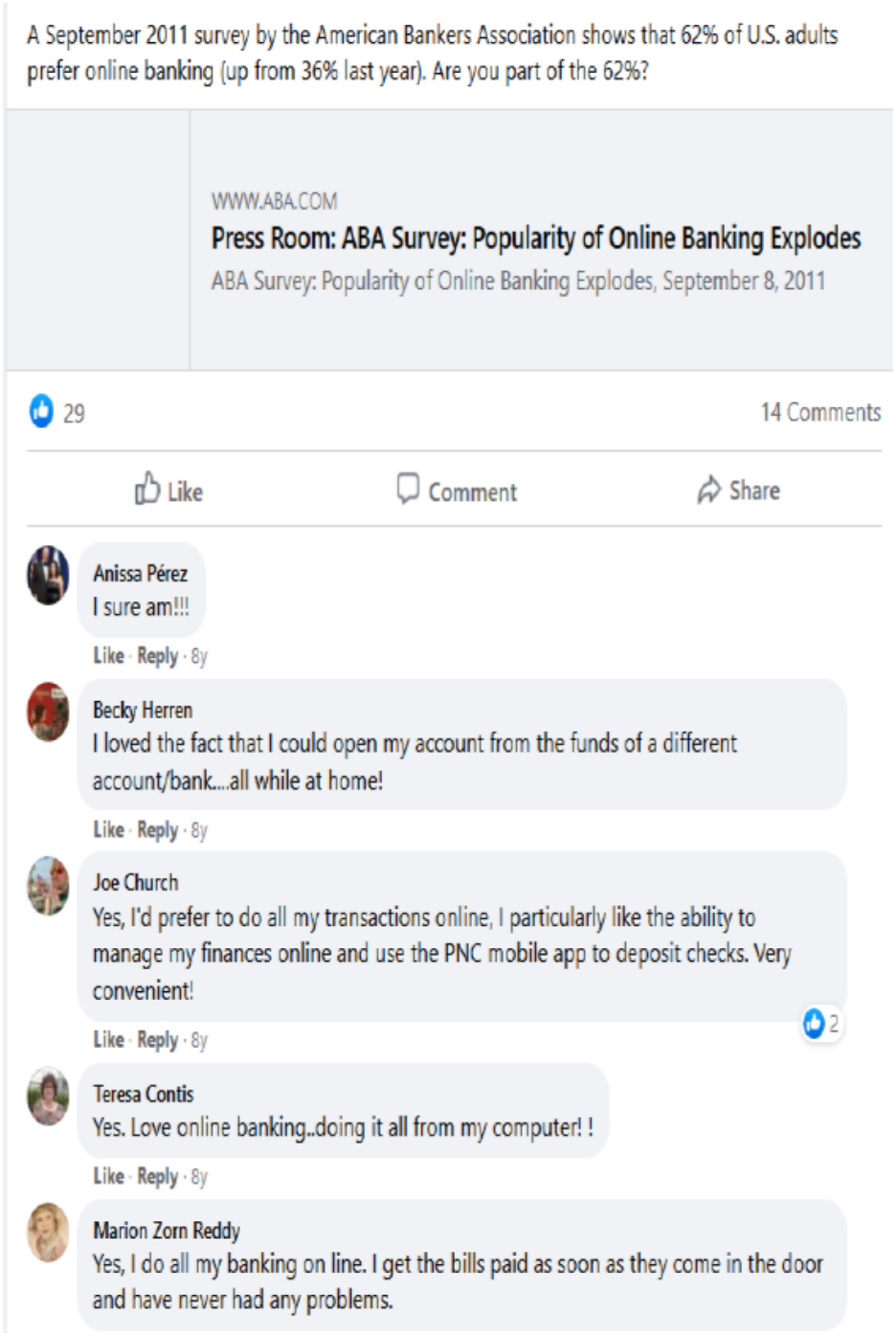


Figure 3: Incidence of the new broadband ADSL units

Notes: The figure shows the diffusion of the new broadband ADSL units in 2012.

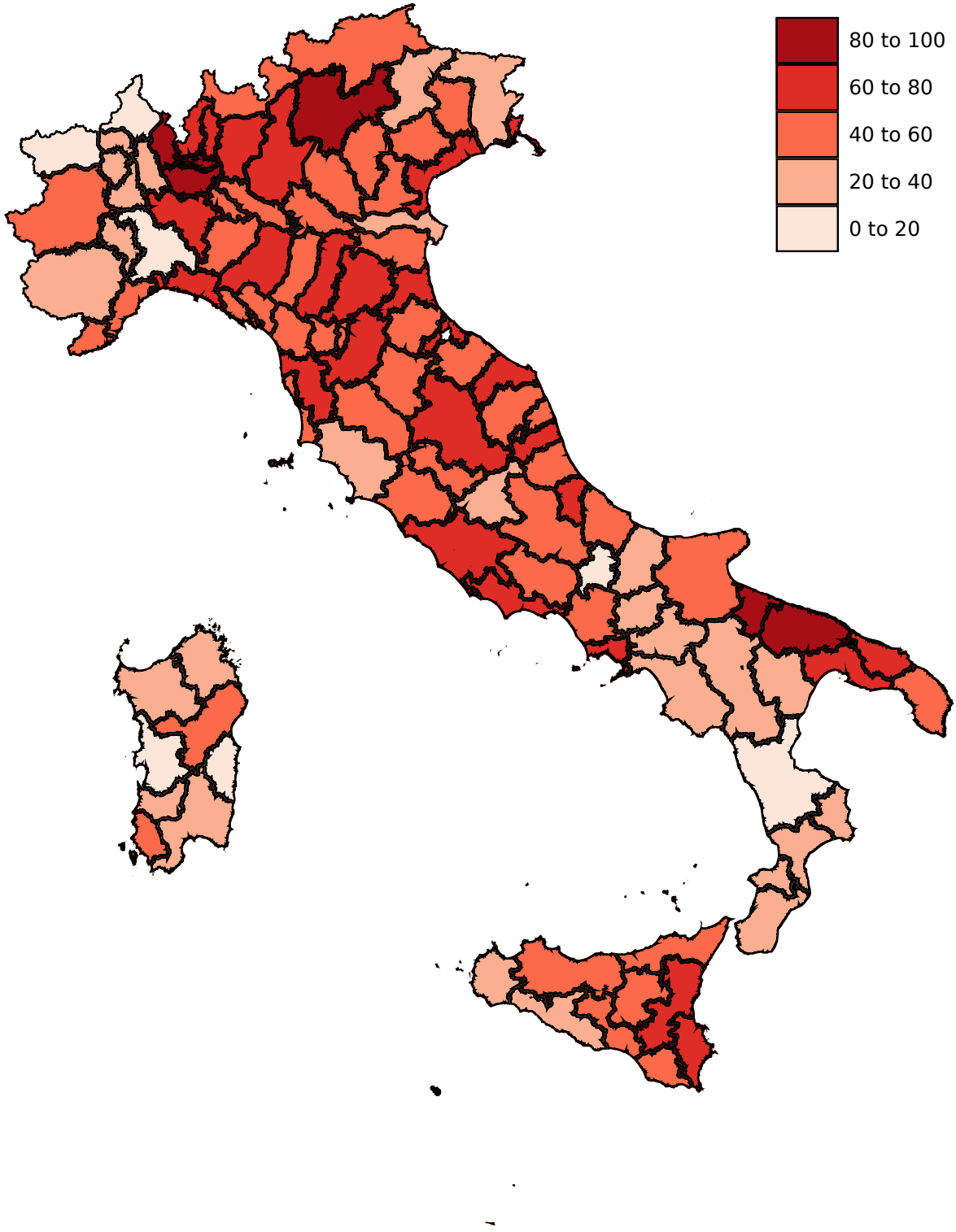


Figure 4: Fixed bank fees associated with owning a security account (mean, euros)

Notes: Average bank fees are obtained by dividing the total bank fees associated with owning a security account by the total number of bank clients. In computing the averages, we remove the observations belonging to top and the bottom 1 per cent. Banks are divided in two groups: those with a share of Internet banking connections above the median and those with a share of Internet banking connections below the median.
Source: Supervisory Reports.

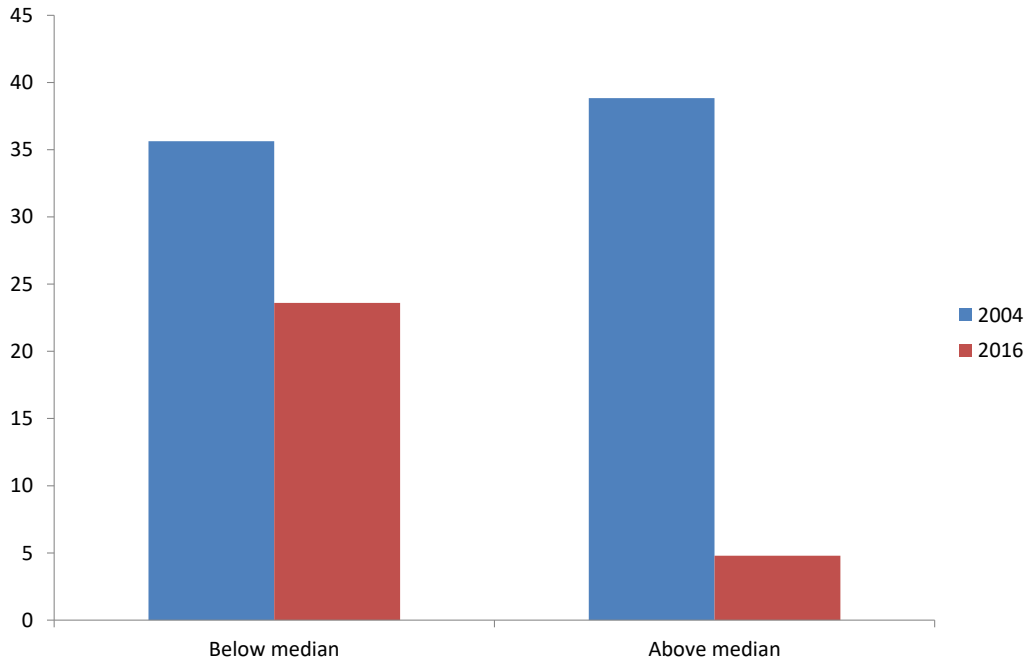


Figure 5: Variable bank fees associated with trading (mean, euros)

Notes: Average bank fees are obtained by dividing the total bank fees associated with trading by the total flow amount related to sales and purchases of financial assets. In computing the averages, we remove the observations belonging to top and the bottom 1 per cent. Banks are divided in two groups: those with a share of Internet banking connections above the median and those with a share of Internet banking connections below the median.
Source: Supervisory Reports.

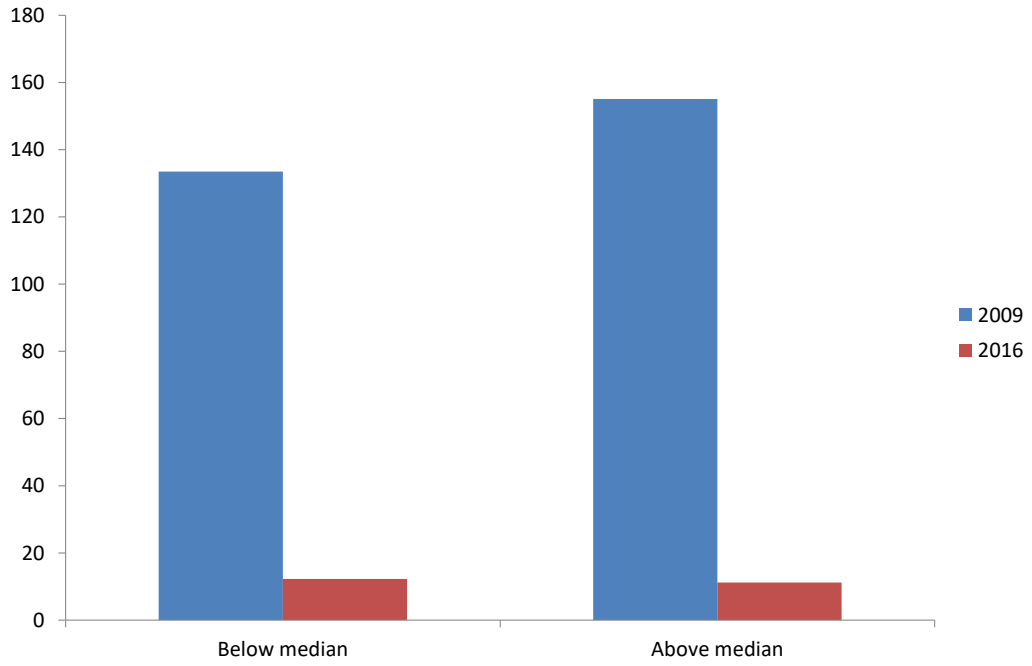


Figure 6: Share of households with Internet banking by year (percentages)

Notes: The figure shows the share of households that declare to use Internet banking and the share of households that declare to begin to use Internet banking (adopt Internet banking) by year.
Source: SHIW

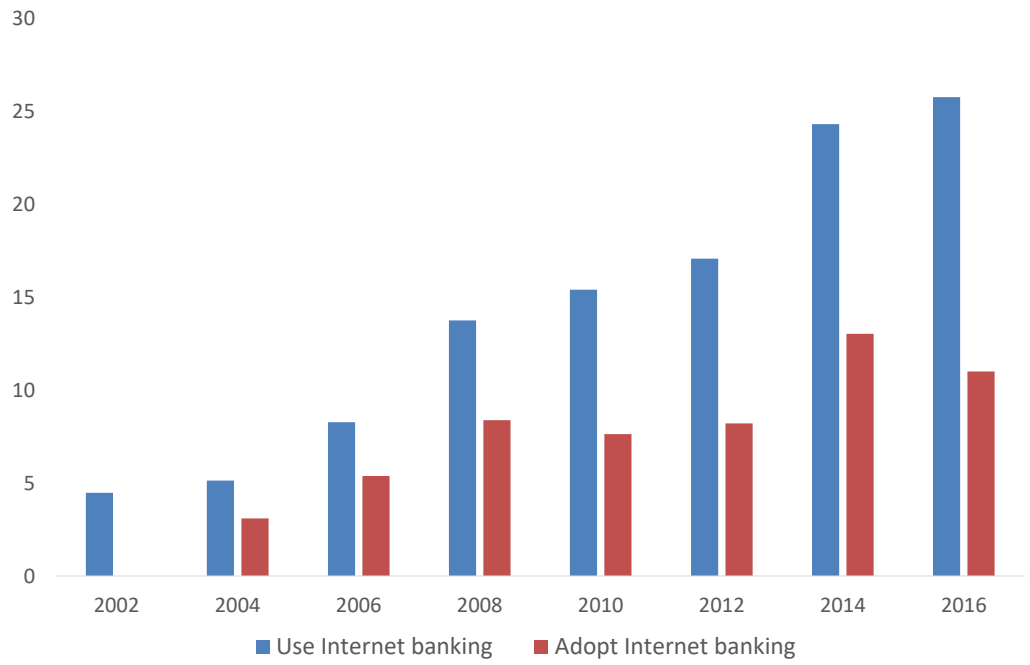


Figure 7: Distribution of our instrument: the Internet bank supply index

Notes: The figure shows the variability of the Internet banking supply index $\gamma_{b,t}$. Period 2012-2016.

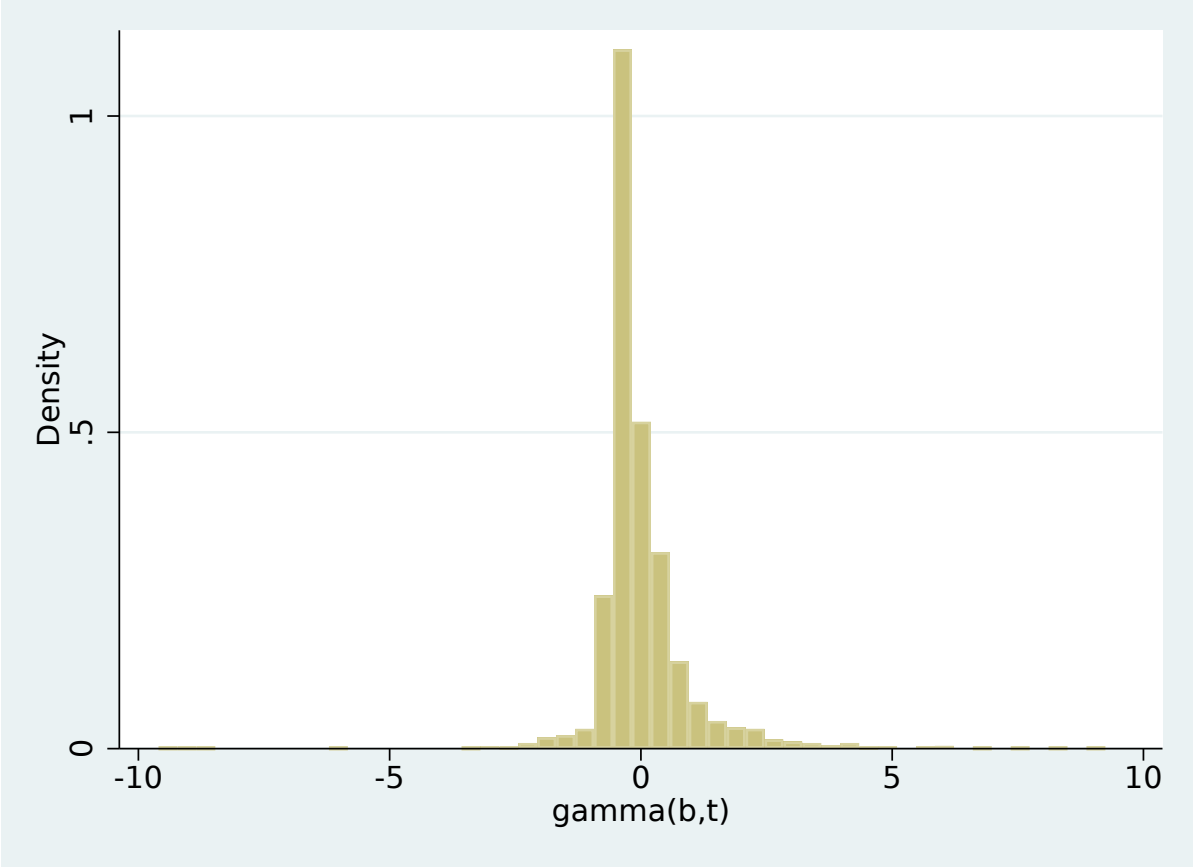


Figure 8: IV and sorting by household characteristics

Notes: The figure shows the 95th confidence interval for the variable at the bottom of each figure. The dependent variable is our instrument, i.e. the Internet banking supply. We restrict the sample to the period 2012-16. Bank fixed effects are included. Robust standard errors are accounted for.

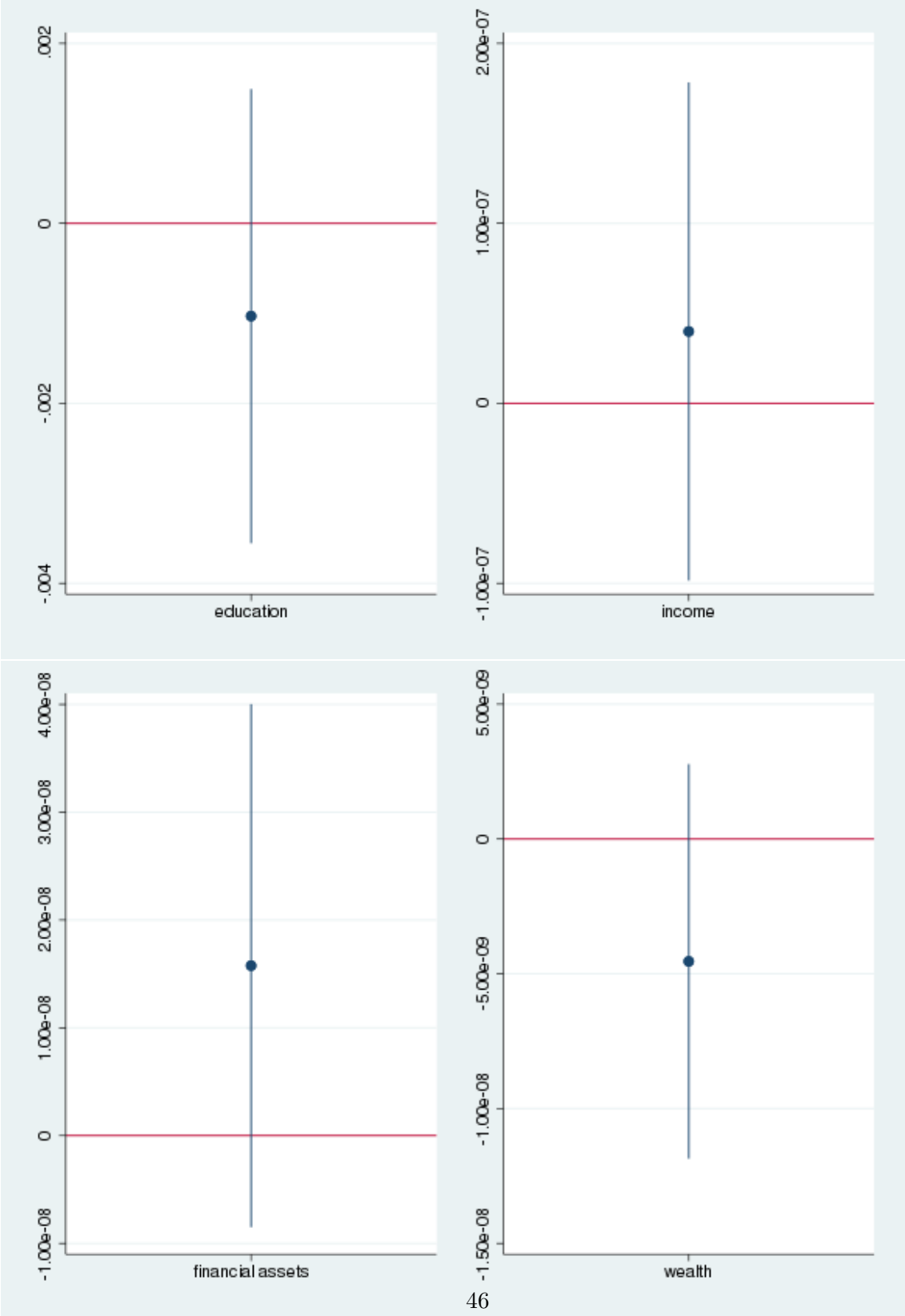


Figure 9: Testing for differences in the coefficients of the first stage models

Notes: The figure shows the 95th confidence interval for the supply of Internet banking in each of the four models presented in Table 6.

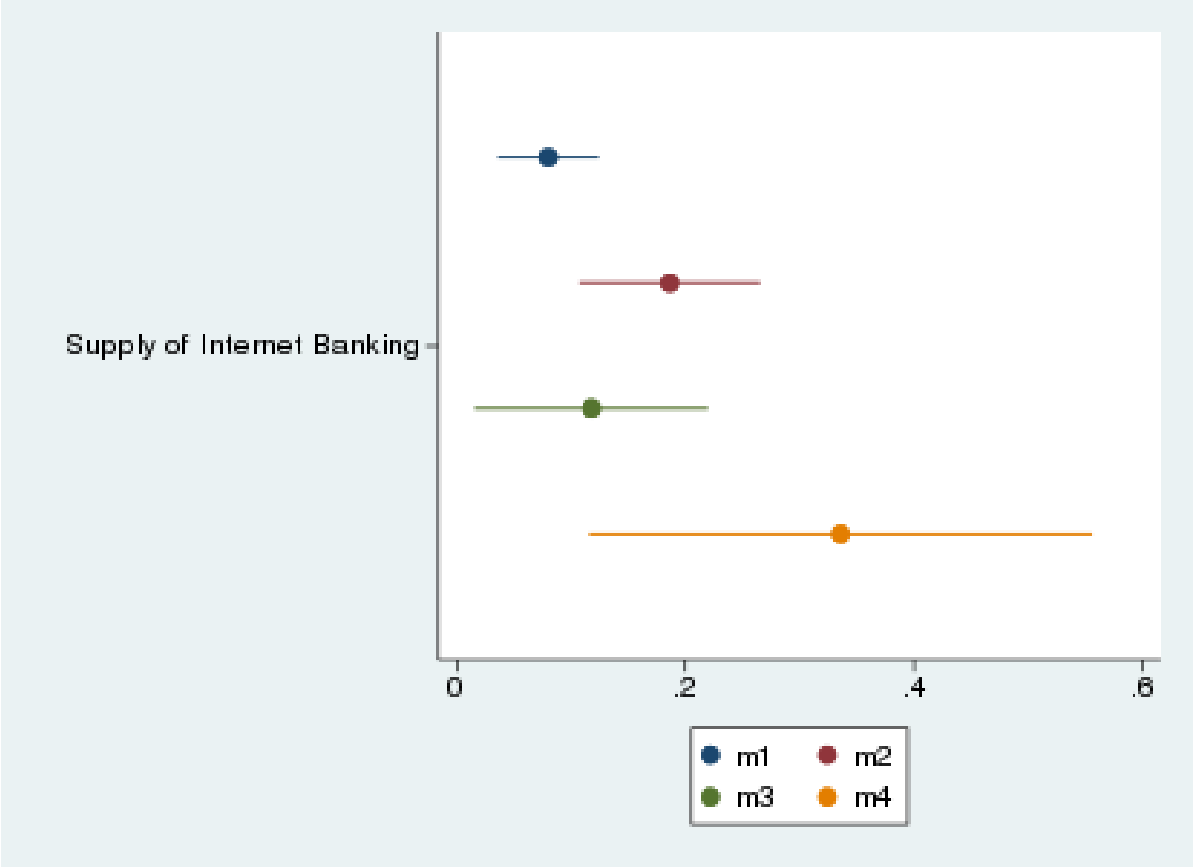


Figure 10: Entry into financial markets by O.B. status

Notes: The figure shows the share of households that begin to hold financial assets different than deposits (financial markets) and the different groups of financial assets (short term, long term government bonds, corporate bonds, and stocks). The estimates take into account of socio-demographic characteristics, province, year and bank of the household.

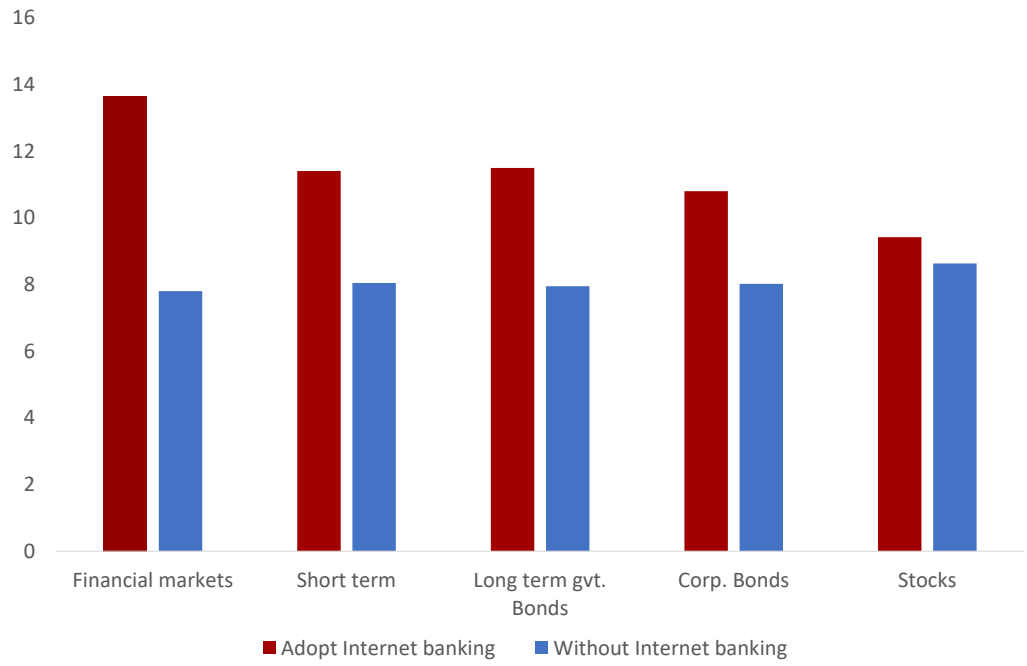
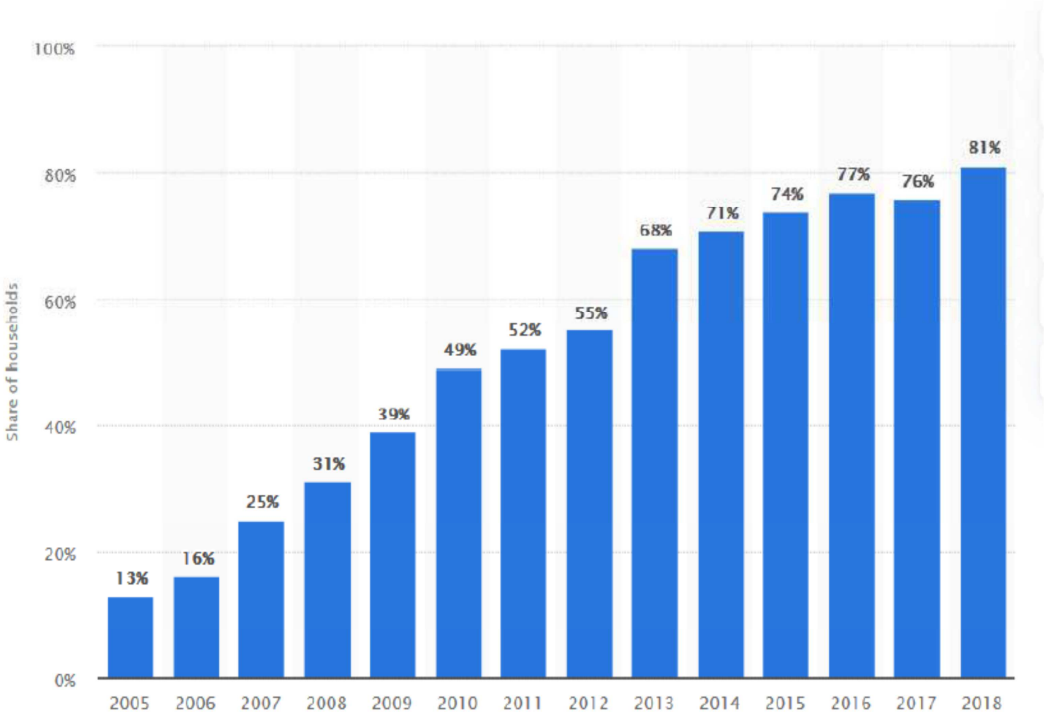


Figure 11: Share of households with broadband internet access

Notes: The figure shows the share of households with broadband internet access in Italy from 2005 to 2018.
Source: Statista 2020.



Appendix

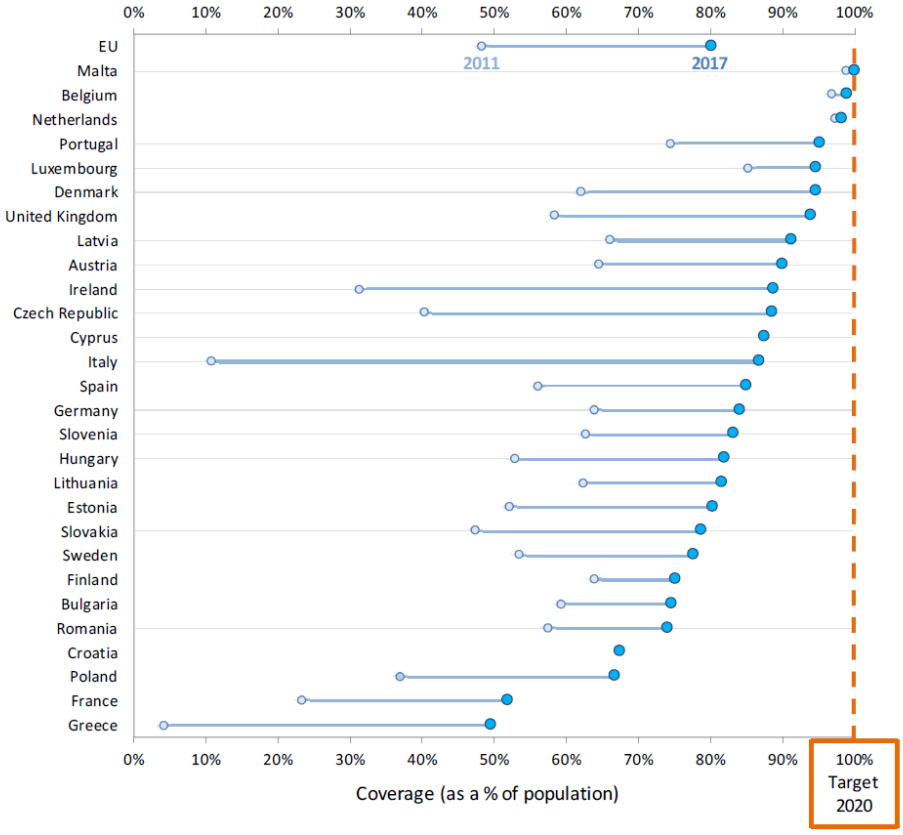
A Additional statistics on the diffusion of Internet in Italy

Table A1: Share of individuals that have used Internet in the past 12 months by sex, age and geographical area. *Source*: Istat.

	Use of Internet in the past 12 months							
	2011	2012	2013	2014	2015	2016	2017	2018
Sex								
Male	56.7	58.3	60.3	62.4	65	67.6	69.5	72.5
Female	46.7	47.1	49.8	52.8	55.8	59	61.3	64.6
Total	51.5	52.5	54.9	57.5	60.2	63.2	65.3	68.5
Age group								
6-10	38.3	40.8	45.1	44.6	43.8	48.2	53.7	59.2
11-14	78.1	76.5	80.8	80.9	80.4	82.9	86.1	85.9
15-17	89.1	88.5	89.7	91.2	92	91.6	93.9	95.5
18-19	88.8	88.8	90	93.9	92	93	92.7	93.3
20-24	85.8	86	85.7	89.3	90.7	91.3	92.4	93.6
25-34	77.5	79.2	80.3	83.9	85.1	87.1	89.8	91.4
35-44	69.7	69.1	73.5	76.1	80.1	84.3	85.7	87.3
45-54	56.2	58.7	61.7	66.1	70	75.1	77.6	81.7
55-59	42.2	45.3	48.5	52	60.4	62.7	68.2	71.2
60-64	28.6	31	36	41.1	45.9	52.2	56	60.7
65-74	13.8	16.4	19	21.2	25.6	28.8	30.8	39.3
75+	2.7	3.3	3.5	4.4	6.7	7.7	8.8	10.9
Total	51.5	52.5	54.9	57.5	60.2	63.2	65.3	68.5
Geographical area								
North-West	56.4	57.3	58.3	61.5	64.6	67.6	69.1	72.3
North-East	55.9	57.7	60.1	61.5	65.2	66.9	68	72.2
Center	54.5	55.1	57.8	60.4	61.6	66.4	67.8	70.6
South	43.6	43.3	46.6	49.2	53.1	55.9	59.1	61.9
Islands	43.9	47.3	49.8	53	53.8	55.7	59.6	62.7
Italy	51.5	52.5	54.9	57.5	60.2	63.2	65.3	68.5

Figure A1: 30 Mbps coverage in all Member States in 2011 and in 2017

Notes: No data was available for Cyprus and Croatia in 2011. *Source*: ECA analysis based on Commission data.



B Additional statistics on SHIW and other administrative data sources

Table B1: Share of total financial assets in Financial accounts and in SHIW (percentages)

Notes: The Table shows the share of deposits, government bonds, corporate bonds, and mutual funds on their sum. In the financial accounts, other deposits include deposits different than sight deposits (such as deposit certificates). In the SHIW, other deposits include deposit certificates and repos; short term government debt include BOTs and zero coupons. Stocks are reported in the last Column. Total financial wealth does not include foreign assets, bills, insurance products, and trade credits. In Panel B, the statistics are computed considering all the SHIW respondents; in Panel C, the statistics refer to the sample used in the analysis.

	Deposits (sight and other) (1)	Gvt. bonds (short and long term) (2)	Corporate bonds (3)	Mutual funds (4)	Total (5)	*Stocks/ (Total+ Stocks)*
			A. Financial accounts			
2002	43.3	19.3	14.1	23.3	100	*31.7*
2004	44.0	17.8	17.2	21.0	100	*31.4*
2006	48.8	15.0	18.0	18.2	100	*42.6*
2008	53.1	15.6	21.0	10.3	100	*33.6*
2010	57.5	9.9	22.2	10.4	100	*29.0*
2012	58.4	11.9	21.3	8.4	100	*28.5*
2014	63.0	9.4	15.0	12.6	100	*33.6*
2016	69.1	7.8	8.7	14.4	100	*34.9*
			B. SHIW - All households			
2002	52.8	14.3	8.4	24.5 100		*8.3*
2004	58.3	14.6	7.3	19.8	100	*8.0*
2006	64.0	13.4	9.6	13.0	100	*11.3*
2008	54.7	15.7	14.3	15.3	100	*6.2*
2010	56.9	12.0	14.8	16.2	100	*6.0*
2012	50.5	12.9	12.7	23.9	100	*5.1*
2014	58.9	12.4	10.5	18.2	100	*5.3*
2016	61.3	10.1	11.5	17.1	100	*6.5*
			C. SHIW - Households in the survey for at least two waves			
2004	55.9	14.7	8.1	21.3	100	*9.2*
2006	62.6	12.6	11.0	13.8	100	*7.6*
2008	58.7	16.6	12.1	12.6	100	*4.9*
2010	61.6	11.3	13.9	13.2	100	*4.2*
2012	60.7	13.7	15.1	10.4	100	*4.7*
2014	58.3	12.4	11.0	18.4	100	*3.0*
2016	67.5	14.1	9.4	9.0	100	*1.8*

Table B2: Full sample. Summary statistics from 2002 (euros and share of households)

Notes: The Table shows the summary statistics for the households that do not use Internet banking (No O.B., Columns 1 and 2) and for those that begin to use Internet banking (Entry into O.B., Columns 3 and 4) over the period 2002-16. Short term assets include BOTs, CDs, repos, other short term government bonds, monetary mutual funds; long term government bonds include CCTs, BTPs, and other government bonds; corporate bonds include bonds issued by Italian firms and banks, funds or ETFs in bonds in euros; stocks include shares in listed companies and foreign securities, balanced (or mixed) funds or ETFs in euros, funds or ETFs in equities in euros, funds or ETFs in foreign currencies, and managed current accounts.

	No O.B.		Entry into O.B.	
	mean	std.dev.	mean	std.dev.
	(1)	(2)	(3)	(4)
Age	61.41	16.10	52.29	12.68
Low education (%)	34.37	47.50	4.05	19.71
Medium education (%)	58.45	49.28	72.11	44.86
High education (%)	7.17	25.81	23.84	42.62
Income (euros)	28,042	18,761	47,505	36,862
Wealth (euros)	214,596	384,952	387,505	497,914
Financial assets (euros)	21,910	81,535	53,830	13,2466
Own short term assets (%)	9.23	28.94	17.41	37.93
Own long term govt. bonds (%)	3.11	17.37	7.51	26.36
Own corporate bonds (%)	6.16	24.04	15.02	35.73
Own stocks (%)	6.91	25.37	21.75	41.26
Observations	23,404		2,051	

References

Agarwal, S., Qian, W., & Tan, R. (2020). Financial inclusion and financial technology. In *Household Finance* (pp. 307–346). Springer.

Alan, S. (2006). Entry costs and stock market participation over the life cycle. *Review of Economic Dynamics*, 9(4), 588–611.

Amiti, M. & Weinstein, D. E. (2018). How much do idiosyncratic bank shocks affect investment? evidence from matched bank-firm loan data. *Journal of Political Economy*, 126(2), 525–587.

Attanasio, O. P. & Paiella, M. (2011). Intertemporal consumption choices, transaction costs and limited participation in financial markets: reconciling data and theory. *Journal of Applied Econometrics*, 26(2), 322–343.

Badarinza, C., Campbell, J. Y., & Ramadorai, T. (2016). International comparative household finance. *Annual Review of Economics*, 8, 111–144.

Barone, G., De Blasio, G., & Mocetti, S. (2018). The real effects of credit crunch in the great recession: evidence from italian provinces. *Regional Science and Urban Economics*, 70, 352–359.

Becker, G. (2017). Does fintech affect household saving behavior? findings from a natural field experiment. *mimeo*.

Bharadwaj, P. & Suri, T. (2020). Improving financial inclusion through digital savings and credit. In *AEA Papers and Proceedings*, volume 110 (pp. 584–88).

Bilias, Y., Georgarakos, D., & Haliassos, M. (2010). Portfolio inertia and stock market fluctuations. *Journal of Money, Credit and Banking*, 42(4), 715–742.

Björkegren, D. & Grissen, D. (2018). The potential of digital credit to bank the poor. In *AEA Papers and Proceedings*, volume 108 (pp. 68–71).

Bogan, V. (2008). Stock market participation and the internet. *Journal of Financial and Quantitative Analysis*, 43(1), 191–211.

Bonaccorsi di Patti, E., Gobbi, G., & Mistrulli, P. E. (2004). *The interaction between face-to-face and electronic delivery: the case of the Italian banking industry.* Technical report, Bank of Italy, Economic Research and International Relations Area.

Brun, I., Rajaobelina, L., Ricard, L., & Fortin, A. (2017). Impact of website characteristics on relationship quality: a comparison of banks financial cooperatives. *Journal of Financial Services Marketing*, 22(4), 141–149.

Calvet, L. E., Campbell, J. Y., & Sodini, P. (2007). Down or out: Assessing the welfare costs of household investment mistakes. *Journal of Political Economy*, 115(5), 707–747.

Campbell, J. Y. (2006). Household finance. *The Journal of Finance*, 61(4), 1553–1604.

Ciapanna, E. & Sabbatini, D. (2008). La banda larga in italia. *Bank of Italy, Occasional papers*, 34.

Claessens, S., Glaessner, T., & Klingebiel, D. (2002). Electronic finance: reshaping the financial landscape around the world. *Journal of Financial Services Research*, 22(1-2), 29–61.

Clemons, E. K., Hitt, L. M., et al. (2000). *The Internet and the future of financial services: Transparency, differential pricing and disintermediation.* Technical report, Wharton School Center for Financial Institutions, University of Pennsylvania.

Daniels, K. N. & Murphy, N. B. (1994). The impact of technological change on the currency behavior of households: an empirical cross-section study. *Journal of Money, Credit and Banking*, 26(4), 867–874.

Dynan, K. E. (2009). Changing household financial opportunities and economic security. *Journal of Economic Perspectives*, 23(4), 49–68.

D' Acunto, F., Prabhala, N., & Rossi, A. G. (2019). The promises and pitfalls of robo-advising. *The Review of Financial Studies*, 32(5), 1983–2020.

Fagereng, A., Gottlieb, C., & Guiso, L. (2017). Asset market participation and portfolio choice over the life-cycle. *The Journal of Finance*, 72(2), 705–750.

Gao, F. & Su, X. (2018). Omnichannel service operations with online and offline self-order technologies. *Management Science*, 64(8), 3595–3608.

Gaudecker, H.-M. V. (2015). How does household portfolio diversification vary with financial literacy and financial advice? *The Journal of Finance*, 70(2), 489–507.

Gerhardt, R. & Hackethal, A. (2009). The influence of financial advisors on household portfolios: A study on private investors switching to financial advice.

Goldfarb, A. & Tucker, C. (2017). *Digital economics*. Technical report, National Bureau of Economic Research.

Goldstein, I., Jiang, W., & Karolyi, G. A. (2019). To fintech and beyond. *The Review of Financial Studies*, 32(5), 1647–1661.

Gomes, F. & Michaelides, A. (2005). Optimal life-cycle asset allocation: Understanding the empirical evidence. *The Journal of Finance*, 60(2), 869–904.

Greenstone, M., Mas, A., & Nguyen, H.-L. (2020). Do credit market shocks affect the real economy? quasi-experimental evidence from the great recession and" normal" economic times. *American Economic Journal: Economic Policy*, 12(1), 200–225.

Guiso, L. & Jappelli, T. (2005). Awareness and stock market participation. *Review of Finance*, 9(4), 537–567.

Guiso, L. & Sodini, P. (2013). Household finance: An emerging field. In *Handbook of the Economics of Finance*, volume 2 (pp. 1397–1532). Elsevier.

Guiso, L. & Viviano, E. (2014). How much can financial literacy help? *Review of Finance*, 19(4), 1347–1382.

Hannig, A. & Jansen, S. (2010). *Financial inclusion and financial stability: Current policy issues*. Technical report, ADBI working paper.

Kuchler, T. (2015). Sticking to your plan: Empirical evidence on the role of present bias for credit card paydown. *Available at SSRN 2629158*.

Paiella, M. (2001). *Limited financial market participation: A transaction cost-based explantation*. Technical report, IFS Working Papers, Institute for Fiscal Studies (IFS).

Peress, J. (2003). Wealth, information acquisition, and portfolio choice. *The Review of Financial Studies*, 17(3), 879–914.

Rahi, S., Ghani, M., Alnaser, F., & Ngah, A. (2018). Investigating the role of unified theory of acceptance and use of technology (utaut) in internet banking adoption context. *Management Science Letters*, 8(3), 173–186.

Rahi, S., Yasin, N. M., & Alnaser, F. M. (2017). Measuring the role of website design, assurance, customer service and brand image towards customer loyalty and intention to adopt internet banking. *The Journal of Internet Banking and Commerce*, (pp. 1–18).

Thakor, A. V. (2020). Fintech and banking: What do we know? *Journal of Financial Intermediation*, 41, 100833.

Tufano, P. (1989). Financial innovation and first-mover advantages. *Journal of financial economics*, 25(2), 213–240.

Tufano, P. (2003). Financial innovation. In *Handbook of the Economics of Finance*, volume 1 (pp. 307–335). Elsevier.

Vermeulen, P. (2018). How fat is the top tail of the wealth distribution? *Review of Income and Wealth*, 64(2), 357–387.

Vissing-Jorgensen, A. (2002). *Towards an explanation of household portfolio choice heterogeneity: Nonfinancial income and participation cost structures*. Technical report, National Bureau of Economic Research.

Waite, K. & Harrison, T. (2004). Online banking information: what we want and what we get. *Qualitative market research: an international journal*, 7(1), 67–79.

Xue, M., Hitt, L. M., & Chen, P.-y. (2011). Determinants and outcomes of internet banking adoption. *Management science*, 57(2), 291–307.

Zhang, D. J., Dai, H., Dong, L., Wu, Q., Guo, L., & Liu, X. (2019). The value of pop-up stores on retailing platforms: Evidence from a field experiment with alibaba. *Management Science*, 65(11), 5142–5151.

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2019

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2021

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