The fintech gender gap

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Abstract

Can fintech close the gender gap in access to financial services? Using novel survey data for 28 countries, this paper finds a large and ubiquitous 'fintech gender gap': while 29% of men use fintech products, only 21% of women do. This difference exceeds the gender gap in bank account ownership at traditional financial institutions. Country characteristics and individual-level controls explain about a third of the fintech gender gap. Gender differences in attitudes towards fintech explain over 60% of the residual gap: it declines from 5.9 percentage points to 2.2 percentage points when accounting for gender differences in the willingness to use new financial technology, the suitability of fintech products, and the willingness to use fintech entrants if they offer cheaper products. The paper concludes by discussing drivers of differences in attitudes, and implications for policy to foster financial inclusion with new technology.

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1 Introduction

Better access to financial services can improve individuals' employment outcomes, wealth accumulation and propensity to start a business (Guiso et al., 2004; Brown et al., 2019; Célerier and Matray, 2019). And yet, women all over the world remain unbanked or underbanked relative to men: they have lower rates of bank account ownership (Demirgüç-Kunt et al., 2017), are less likely to manage household finances (Guiso and Zaccaria, 2021) and participate less in the stock market (Ke, 2021).

Hopes are high that new financial technology – or 'fintech' – can enhance financial inclusion and close the gender gap in the access to financial services (Demirgüç-Kunt et al., 2018; Breza et al., 2020). Indeed, an explicit policy goal of the G20 is to harness financial digitization to benefit women (G20, 2022). By leveraging new technology and non-traditional data, both traditional financial institutions ('incumbents') and new fintech firms ('fintech entrants') promise to offer novel products better tailored to consumers' needs at a lower cost (Buchak et al., 2018; Philippon, 2020; Thakor, 2020). These technological advances could benefit disadvantaged groups disproportionately (Suri and Jack, 2016; Bachas et al., 2021; Lee et al., 2021). However, evidence on whether fintech helps to close the gender gap in the access to and use of financial services is scarce.

This paper uses data from a large survey of over 27,000 adults from 28 major economies to investigate gender differences in the adoption of new financial technology. The survey sample is representative along the age and gender distributions and includes details on individuals' use of fintech products and attitudes towards fintech entrants and incumbents. It also contains detailed information on respondents' socio-economic characteristics.

Our key finding is the presence of a large and ubiquitous 'fintech gender gap': women are significantly less likely to use fintech products or services offered by fintech entrants than men. On average, 29% of men report having used fintech entrants over the previous

six months. The respective figure for women is 21%. The gap is present in almost all countries in our sample and not fully explained by a large set of traditional individual characteristics, such as age, income, education, marital or employment status, or a proxy for financial literacy. Nor is it fully explained by country-specific characteristics. Accounting for individual characteristics reduces the gap from 8.4 percentage points (pp) to 5.9 pp, or by 30% relative to its unconditional mean. Further including country fixed effects reduces the gender gap to 5.2 pp, but it remains highly statistically significant.

How does the fintech gender gap compare with the gap in bank account ownership? Demirgüç-Kunt et al. (2018) report that 72% of men and 65% of women have a bank account globally. The unconditional gap in bank account ownership (7 pp) is thus smaller than the fintech gender gap (8 pp). Scaled by mean adoption rates, which equal 69% for traditional bank accounts and 25% for fintechs, the difference is sizeable: (7/69 =) 10% vs (8/25 =) 32%. These numbers suggest that fintech entrants have so far not closed the gender gap in the access to financial services.

Fintech products differ greatly in scope. For example, some products facilitate cross-border payments, while others offer peer-to-peer loans. Potentially, the gap is more pronounced in some categories than others, which could explain the aggregate gap. To test this possibility, we estimate regressions at the respondent-product level for 19 narrowly defined product categories. We find that including product fixed effects and comparing the use of fintech services and products by men and women within the same product category does not affect our estimates of the gender gap in any statistical or economically meaningful way.

Respondent-product level regressions also allow us to exploit variation across genders within the same product. We find that the gender gap is around 50% smaller among products that complement traditional banking services, relative to those that are substitutes. These findings indicate that women might be more likely to adopt fintech products

that complement familiar services.

Does it matter who offers fintech products? We find that 49% of respondents use novel financial products and services that are offered by traditional financial institutions, compared with 25% for fintech entrants. Moreover, if individuals use fintech products provided by incumbents, they also report using fintech entrants significantly more than respondents who do not use incumbents (35% vs 15%). These findings are consistent with literature that finds that fintech entrants are a complement to rather than a substitute for traditional banks (Fuster et al., 2019; Tang, 2019a). Still, men are more likely to use fintech products irrespective of the provider. The gender gap equals 6.4 pp (25% of the mean adoption rate) among services provided by entrants and 7.1 pp (14% of the mean) among those provided by incumbents. The difference across providers is statistically insignificant, which implies that the gender gap is not specific to *who* provides fintech products or services, but rather to the products themselves. This also implies that the current gap in access to financial services provided by traditional financial institutions is unlikely to narrow as banks and their services increasingly move towards the digital realm.

To investigate potential determinants of the gender gap, we document differences between women and men in their reported attitudes towards privacy and technology. Women report more than men that they worry about their security when dealing with companies online. They also report being significantly less willing to adopt new financial technology in general, for example digital banks. Results further suggest that men are more willing to use a fintech entrant or share their personal data for cheaper offers. Finally, women report being less willing to use a fintech even if it offers better products or products that are better-suited to the respondent's lifestyle.

We then examine to what extent differences in attitudes can explain the gender gap. Controlling for whether an individual worries about her or his security does not materially

affect results, which suggests that differences in concerns about data abuse and associated concerns do not explain the fintech gender gap. However, controlling for attitudes towards technology, the suitability of products, and differences in price sensitivity reduces the gap from 5.2 pp to 2.2 pp. Thus, while individual and country characteristics reduce the unconditional gender gap by around one-third, further accounting for differences in attitudes reduces the remaining gap by over 60%.

We confirm these findings by using a mediation analysis following Gelbach (2016). Decomposing the overall decline in the fintech gap of 6.1 pp (the coefficient estimate declines from 8.4 pp to 2.3 pp) into potential mediators shows that individual-level controls account for around 11%, country fixed effects for 9%, and differences in attitudes for 80% of the decline. Further decomposing the overall impact of differences in attitudes shows that attitudes towards technology account for 45% of the overall effect, while differences in the suitability of products and price sensitivity account for around 27% and 28%, respectively.

We perform several additional exercises. For example, it could be that within households, men are more likely to make financial decisions. Yet we find that the gender gap is also present among respondents who live alone. This result suggests that arguments that try to tie the gap to traditional gender roles within households fall short. Similarly, we find a significant gap among respondents who are employed, have multiple accounts at financial institutions, or feel confident in their ability to conduct financial planning (a proxy for financial literacy). This suggests that differences in these factors by gender are not key drivers of the gap. One important caveat is that our survey does not contain direct measures of risk aversion. We do find, however, that including individual fixed effects to account for unobservable characteristics leaves our findings unaffected.

Our results suggest that the gap in the use of fintech is closely linked to differences in attitudes towards technology, the suitability of products and price sensitivity. What

could determine differences in these factors? They could be explained by differences across genders in risk aversion or confidence (Croson and Gneezy, 2009; Dohmen et al., 2011; Bucher-Koenen et al., 2021), or differences in the costs and benefits that consumers attach to the use of these new products. The fact that the suitability of products and services explains a significant part of the gap could suggest that fintech products do currently not cater sufficiently to the needs of female users. However, our finding that the gender gap is significantly lower among fintech products that complement existing offers could suggest that the gap narrows as fintech becomes more widely adopted.

The general differences could also result from gender-based discrimination (Bartlett et al., 2022), for example from bad previous experiences by women with financial institutions (Brock and De Haas, 2022). Finally, the gap could arise from social norms or laws that affect the cost-benefit trade-off differently across genders (Falk and Hermle, 2018; Hyland et al., 2020). For instance, if women have reason to worry more about a leak of personal data, then it may be rational to avoid services that require collection and processing of personal data.[1] However, while recent results indeed suggest that women are more concerned about implications of data-sharing for their personal safety (Armantier et al., 2021), our findings suggest that concerns about data sharing explain only a small part of the overall gap.

As factors related to attitudes towards new financial technology, price sensitivity and the suitability of products explain a sizeable part of the overall gap, future research focusing on the determinants of these factors could be particularly promising in further explaining the fintech gender gap.

Overall, our findings suggest that improvements in technology alone may fall short of the objective of closing the gender gap in access to financial services. Instead, the

[1] Okat et al. (2020) argue that trust in traditional financial institutions is not a significant driver of fintech adoption, while Yang (2020) shows that a scandal in the US banking sector has led to an increase in fintech adoption.

fintech revolution may need to be complemented by targeted policy initiatives that take account of differences in attitudes across demographic groups. This will also influence the specific policy response. If differences in adoption rates are based primarily on differences in preferences, then the scope for interventions through policy is limited. Should, however, the observed outcome be the result of discrimination or social norms and laws that disadvantage women, then policy that addresses and remedies these factors could help to promote financial inclusion through financial innovation. For example, policy could nudge fintechs towards developing products that are more tailored towards the needs of female users, or foster female-founded start-ups.

Our paper contributes to the current literature on the effects of financial technology on financial inclusion and the gender gap in access to financial services (see Demirgüç-Kunt et al. (2017) for a survey). Fuster et al. (2019) and Tang (2019a) show that fintech often serves as a complement, rather than a substitute, to traditional banking services. Jagtiani and Lemieux (2018), Hau et al. (2018), Agarwal et al. (2019) and Frost et al. (2019) instead argue that fintech and big tech lenders serve borrowers that are traditionally underserved by banks. Other papers highlight how fintechs could spur financial inclusion, for example by reducing the costs of financial intermediation (Arner et al., 2020; Boot et al., 2021; Philippon, 2020; Sahay et al., 2020) or changing consumer behaviour (Carlin et al., 2019; Breza et al., 2020). Our results are, to the best of our knowledge, among the first that use individual-level information to investigate the adoption of fintech products from the consumer side by gender for a large sample of countries.

Our results further show that the willingness to share data and concerns about privacy differ by gender. If users value privacy differentially, then effective privacy regulation needs to take these differences into account, for example when assigning control rights (Acquisti et al., 2016; Tang, 2019b; Jones and Tonetti, 2020). In light of the debate on algorithmic fairness and bias in data (Kleinberg et al., 2015; Corbett-Davies and Goel,

2018; Kleinberg et al., 2018), algorithms trained on non-representative data that are then used to derive conclusions about the general population could lead to an inefficient outcome (Bergemann et al., 2022). Our findings hence highlight the need to better understand the causes of differences in the willingness to share data across demographic groups.

The rest of this paper is organised as follows. Section 2 describes our survey data. Section 3 contains our empirical analysis of the fintech gender gap. It also investigates general differences in attitudes and whether the gap differs depending on who provides the fintech product or service. Section 4 discusses the implications of our findings for public policy.

2 Data

In this section, we explain the data and construction of main variables. We provide further details in the Online Appendix.

Our main source of data is the EY Global Fintech Adoption Index (2019). The purpose of the survey is to get an understanding of global fintech adoption trends across markets and demographic groups. The consumer survey is based on 27,103 interviews with adults between February and March 2019 in 28 countries around the world.[2] The countries in the sample represent around 82% of global GDP and 58% of the world population. The sample is drawn from a standing panel provided by the survey company Ipsos Group, where the sample is constructed to mirror the age and gender distribution within each country. Specifically, Ipsos Group sends an invitation to all individuals that are part of their standing panel to take part in the online survey. Interview slots are

[2]Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, France, Germany, Hong Kong SAR, India, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Peru, Russia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, the United Kingdom and the United States.

then allocated on a first come, first serve basis, taking into account the sample selection criteria.[3] Respondents are remunerated for participation.

The survey is translated and administered in local languages. Answers to demographic questions, such as on income, education or employment status, are adapted to reflect the characteristics of each economy, and then grouped to allow for global comparability. Questions about income levels were posed in each market's local currency.

The survey asks detailed questions about individuals' use of and attitude towards fintech products provided by fintech entrants and traditional financial institutions. Fintech entrants are defined as companies providing innovative, technology-enabled financial services. The survey groups fintech products within five broad categories: money transfer and payments, budgeting and financial planning, savings and investments, borrowing and insurance. Within these categories, there are a total of 19 individual products. Interviewers describe each product in non-technical terms and provide the names of market-specific providers of those services as examples.

The online survey only includes demographic sub-groups that are digitally active. Yet internet access and mobile phone ownership differ across countries. Moreover, women are less likely than men to be digitally active, especially in developing countries (Barboni et al., 2018). How large are these differences across and within countries among our sample of advanced and emerging market economies? Data from the Gallup World Poll and the World Bank for 2019 show that in the median country in our sample, 89% of the population uses mobile phones; for internet access, the respective number is 80%. The male-female gap in mobile phone usage among our countries averages only 2%, compared to 6% globally.

As discussed in more detail below, we control for cross-country differences, including

[3]The Ipsos panel is used for a variety of other surveys, for example on the outreach of government policies during Covid-19 or consumer product branding, and aims for representativeness.

digital access, through country fixed effects.[4] However, country fixed effects cannot fully absorb gender differences within countries. While we cannot directly account for the selection into being digitally active at the individual level, the potential selection effect would likely increase the estimated fintech gender gap: women without access to mobile phones or the internet are more likely to report that they have never used fintech products, as these rely on digital technology. As there are more women than men who are not digitally active, our estimates of the fintech gender gap likely represent a lower bound of the actual gap.[5]

A related concern about the external validity of our analysis is that respondents to the online survey could differ from the general population. For example, those willing to take part in the survey could be more price sensitive or less concerned about sharing their data. Moreover, it is possible that individual characteristics and attitudes towards fintech across genders differ between survey participants and the general population. The survey design does not allow us to examine to what extent participants and non-participants differ, nor how these differences vary across genders. The caveat of potential differences in attitudes between the (unobservable) offline sample and the online survey sample should be kept in mind when generalising our results.

Our main explanatory variable is the dummy *uses fintech entrant*, or *uses FT* for short. It takes on a value of one if a respondent has responded that he or she has used a fintech product in at least one of the five categories money transfer and payments, budgeting and financial planning, savings and investments, borrowing and insurance over the last six month. It takes on a value of zero if a respondent has not used any fintech product in either category.

[4]Specifically, including country fixed effects that absorb any differences in observable and unobservable country characteristics in our regression narrows the gap by less than 10%.

[5]Consistent with this argument, the estimated gender gap in the use of fintech increases slightly in magnitude when we restrict the sample to countries where the male-female gender gap in mobile usage exceeds 2% (unreported).

Generally, fintech products are proclaimed to differ along three dimensions: their use of new technology and big data; offering cheaper services than comparable offerings by traditional providers; and providing products that better cater to specific consumer needs or offer a better user experience. We define the following three variables that capture these aspects: *FT technology*, *FT pricing* and *FT products*. Each variable is based on the first principal component of a set of questions that proxy individuals' attitudes towards new financial technology, price advantages and better-tailored products. Higher values indicate that an individual is more willing to *i*) adopt new financial technology in general, *ii*) adopt fintech products to obtain cheaper offers, and *iii*) adopt fintech because it offers better-suited products. We report the detailed questions underlying the construction of these variables in the Online Appendix. One potential concern that we will revisit below is measurement error in the variables capturing attitudes.

We construct the following controls at the individual level: log of age, dummy *single* that takes a value of one for individuals not living with a partner, dummy *employed* that takes a value of one if an individual is employed, dummy *uses FI* that takes a value of one if an individual has used a traditional financial institution (FI) for novel financial products over the last six months, dummy *income group* that reflects an individual's position in seven distinct buckets within the country-specific income distribution and a *higher education* dummy for whether an individual has a higher education degree. We have no direct measure of financial literacy, which has been shown to matter for the adoption of financial services (Cole et al., 2011) and can differ across genders (Gomes et al., 2021). Instead, we proxy financial literacy by defining the dummy *financial planning* that takes a value of one if a respondent disagreed or strongly disagreed with the statement 'I am unsure how to plan best for my financial future'.

For country-level comparisons, we collect data on GDP per capita from the World Bank. We further construct a gender equality index similar to Falk and Hermle (2018)

that is based on the first principal component of the male-female labor force participation ratio, the World Economic Forum's Global Gender Gap and the United Nation's Gender Inequality Index.

Table 1 provides summary statistics for our key variables. It reports the share of overall respondents (column *all*) who answer with yes to a given question, and the respective shares of *female* and *male* respondents that answer yes. The final column *gap* reports the male minus female difference in means for each question.

On average, the overall gender gap in the use of fintechs equals 8 pp.[6] In terms of individual characteristics, 50% of respondents are female and the average (median) age is 43 (40) years (Figure 2, panel a). Two-thirds of respondents are working (full- or part-time or self-employed) and 15% live alone. Around 5% of respondents are unemployed and looking for work.[7] Around 48% of respondents have a higher education degree and 35% are unsure how to best plan for their future (panel b). Conditional on reporting their income, female respondents belong to slightly lower income groups. They are less likely to live alone, work or have a degree and more likely to agree that they are unsure how to best plan for their future.

[6]Note that the average overall gap mean of *uses FT* exceeds the mean of its sub-components, which arises from the fact there is overlap among the use of fintech products in different categories. To see why, suppose there are ten male and ten female respondents, as well as two product categories (A and B). Suppose three men and two women use product A, and two men and one woman use product B. This would result in a gap of 10% for product A as well as B. If the same men and same women use both products, this would result in an aggregate gap of 10%. However, if the women (men) that use product A do not use product B and vice versa, the aggregate gap would be 20%. The data show that the gender gap in the use of fintech products and services in more than one category is smaller than the overall fintech gap as measured with *uses FT*, suggesting more overlap among female respondents.

[7]Among those who are not working or unemployed, 15% report being a full-time parent or homemaker, 44% report being retired and 21% report being a student.

3 Empirical analysis

This section presents our main finding on the fintech gender gap and investigates potential explanations for the gap.

3.1 The fintech gender gap

Figure 1, panel (a) shows a sizeable gender gap in the use of fintech entrants. The panel plots the average share of female (black dots) and male respondents (red diamonds) who have used fintech products or services within the last six months by country. Vertical lines denote the sample averages for women (black line) and men (red line). Across countries, 29% of men use fintech products, but just 21% of women. In 26 out of the 28 countries men report using fintech entrants more than women.[8]

To investigate the gap in greater detail, we estimate the following regression:

$$y_i = \beta \; female_i + controls_i + \theta_c + \varepsilon_i. \tag{1}$$

In the baseline specification, the dependent variable y_i is a dummy with a value of one if individual i has used fintech entrants over the last six months, and zero otherwise. The dummy *female* takes on a value of one for female respondents and zero for males. A coefficient of $\beta < 0$ indicates that women have used fintech entrants less than men on average. To account for differences across individuals, we include the following individual-level controls: *log(age)*; dummies *single*, *employed*, *uses FI* and *financial planning*; as well as an individual's relative *income group* and *education group*. θ_c denote country fixed effects, which absorb any observable and unobservable differences across countries, for example in GDP per capita, internet access or gender equality. All regressions use

[8]The sole exceptions are India and Peru. In these two countries, the reported use of fintech products and services by men and women is broadly similar.

robust standard errors.

Table 2 shows that women are less likely to use fintech products than men. In column (1), the unconditional difference averages 8.4 pp. Once we add individual controls in column (2) the difference narrows, but women still are 5.9 pp less likely to use fintech products among respondents of similar characteristics. Our sample contains advanced and emerging market economies that differ along several dimensions, which could affect the availability and adoption of fintech products.[9] Column (3) thus accounts for any unobservable country characteristics by inclusion of country fixed effects. The gender gap narrows in magnitude to 5.2 pp, but remains highly significant. Results in columns (1)–(3) suggest that observable individual characteristics and country-specific differences account for 38% of the unconditional gap. Yet even after accounting for these factors, a sizeable difference remains. To put results into perspective, 25% of all respondents use fintech entrants, so the difference between men and women in column (3) represents over 20% of the average adoption rate.

Fintech products differ in scope: some products offer cross-border payments, while others facilitate investment decisions or offer peer-to-peer loans. If men and women use fintechs for different types of products, then the gender gap could be present *across* products, but not *within* similar products. Columns (4)–(7) hence estimate regressions at the respondent-product level for 19 distinct fintech products. On average, 4.6% of respondents use each fintech product. Column (4) shows that women are also less likely to use fintech entrants at the product level. Column (5) adds product fixed effects, exploiting only variation within the same category. The coefficient for dummy *female* remains identical to that in column (4), while the R-squared increases slightly. The gender gap within similar products equals 1.1 pp and 25% of the unconditional adoption

[9]For example, funding for fintechs is higher in countries with more innovation capacity and better regulatory quality (Cornelli et al., 2021).

rate.

A large literature shows that women are more risk averse than men (Croson and Gneezy, 2009). Women might thus be more willing to use products that complement familiar services. We thus estimate respondent (i) – product (p) – level regressions and introduce an interaction term with the dummy *complement* that takes on a value of one for fintech products that complement traditional financial products offered by financial institutions.[10] We thus estimate the following regression

$$y_{i,p} = \delta_1 \; female_i + \delta_2 \; complement_p + \delta_3 \; female_i \times complement_p + \theta_i + \varepsilon_{i,p}. \quad (2)$$

Similar to Equation (1), the dependent variable is a dummy with a value of one if individual i has used a fintech product of type p.

Column (6) in Table 2 shows that the gender gap is around 50% smaller among complements (0.8 pp), relative to substitutes (1.7 pp), as indicated by the positive and significant coefficient on the interaction term. In column (7), we exploit the rich within-product variation and include individual fixed effects (θ_i in Equation (2)). The coefficient on the interaction term does not change in any statistically or economically meaningful way.

Note that while the *absolute gap* is twice as large for substitutes relative to complements, the difference in the *relative gap* is less pronounced: with an average adoption rate for substitute products of 6.1% vs 3.4% for complements, the relative gaps equal (1.7/6.1=) 27.9% for substitutes and (0.8/3.4=) 23.5% for complements.

[10]The Online Appendix provides a detailed list. Fintech products are classified as complements if adoption rates are similar when offered by fintech entrants and traditional FIs.

3.2 Fintech entrants and incumbent FIs

The fintech gender gap could arise because women are less willing to adopt new technology, or because women are less willing to use new providers, even if they would be willing to use the underlying technology. To disentangle these channels, we compare the use of fintech products offered by fintech entrants to those offered by traditional incumbent FIs, which have been ardent adopters of information technology (Ahnert et al., 2022).

Figure 1, panel (b) plots the average share of female (black bars) and male (red bars) respondents that use fintech products offered by traditional FIs and fintech entrants. Three patterns stand out: first, 49% of respondents use novel financial products if they are offered by traditional FIs (average across left-hand bars). Second, the centre and right-hand bars show that respondents using incumbents also use fintech entrants significantly more (35% vs 15% on average). And third, among all groups there is a sizeable gender gap of 9 pp (17% of the mean adoption rate within that group), 8 pp (20% of the mean), and 4 pp (29% of the mean).

To examine these patterns in more detail, columns (1) and (2) in Table 3 split the sample into respondents that have and have not used fintech products offered by traditional financial institutions. Among those that have used incumbents in column (1), the gap averages 7.5 pp; among those that have not, the gap averages 3.4 pp in column (2). While the absolute gap is smaller among those who do not use incumbents, relative to average adoption rates it equals 20% of the mean among those who use incumbents and 28% of the mean among those who do not. Further, column (3) shows that men are more likely to use fintech products, irrespective of whether they are offered by fintech entrants or traditional FIs. The dependent variable is dummy *uses FI*, which takes on a value of one if respondents use fintech products offered by incumbents. The gender gap equals 7.1 pp among products provided by traditional FIs, which is larger than the absolute gap

for fintech entrants of 5.2 pp.

Yet columns (4)-(6) show that the difference is statistically insignificant. We estimate regressions at the respondent-provider (entrants vs FIs) level. Column (4) shows that the gender gap averages 6.8 pp when we pool across fintech entrants and FIs. Column (5) interacts *female* with the dummy *fintech* that takes on a value of one if the provider is a fintech entrant, and zero if it is a traditional FI. The negative and significant coefficient for *fintech* indicates that the average respondent is less likely to use fintech products if they are offered by entrants. The coefficient on the interaction term $female \times fintech$ is small in magnitude and insignificant, suggesting that the gender gap is statistically and economically similar across providers. Adding individual fixed effects in column (6) to account for differences in unobserved respondent characteristics does not affect our estimates. The fact that the gender gap does not differ statistically across providers implies that the gender gap is not specific to *who* provides fintech products, but rather the products themselves (i.e. products relying on novel financial technology).

3.3 Attitudes towards fintech

To investigate potential determinants of the gender gap, this section documents differences between women and men in their reported attitudes towards privacy and technology.

Column (1) in Table 4 shows that women worry more about their security when dealing with companies online than men. Relative to the mean of the dependent variable (69%), the difference of 2.6 pp is small. Columns (2)–(4) use the three variables that capture individuals' general attitudes towards fintech products, as defined in Section 2: *FT technology* measures how comfortable respondents are with the use of new financial technology; *FT pricing* measures whether respondents are willing to use fintech entrants if they provide cheaper offers for comparable products than traditional FIs; and *FT products*

captures the willingness of individuals to use fintech entrants because they better cater to specific consumer needs or offer a better user experience. Column (2) shows that women report being significantly less willing to adopt new financial technology, such as digital banks, than men. Column (3) suggests that men are more price-sensitive: they are more willing to use a fintech entrant or share their personal data with an entrant for cheaper offers.[11] Column (4) indicates that women report being less willing to use a fintech entrant even if it offers tailored products that are better-suited to the respondent's lifestyle.

Investigating differences in these attitudes and their role in narrowing the fintech gender gap can offer insights into the potential factors underlying the observed gap. In columns (5)–(8) we thus examine how directly accounting for differences in attitudes affects our estimates of the gender gap. Across columns, we add each outcome variable from columns (1)–(4) as a additional mediator. Controlling for whether an individual worries about his or her security in column (5) does not materially affect the coefficient on *female*. Once we control for attitudes towards technology in column (6), the gap narrows to 3.1 pp. Further accounting for individuals' price sensitivity in column (7) reduces the gap to 2.3 pp. Further taking into account the suitability of products in column (8) reduces the coefficient of *female* to 2.2 pp. The overall drop in coefficient size is large: Table 2 showed that individual characteristics and country fixed effects reduce the gap from 8.4 pp to 5.2 pp. Accounting for attitudes towards technology, price sensitivity, and the suitability of products, the remaining gap declines from 5.2 pp to 2.2 pp. Thus, the mediators included in column (8) explain a combined total of 75% of the gap.

Attitudes could be subject to measurement error. As discussed in le Cessie et al.

[11] This finding is consistent with evidence from outside financial services. For instance, Farrelly et al. (2001) find that men are more responsive to changes in the price of cigarettes than women.

(2012) and VanderWeele (2016), classical measurement error in the mediating variable has the consequence that the indirect effect (ie the effect 'explained' by the mediator) will be biased towards null. At the same time, the direct effect (ie the coefficient on the dummy *female* conditional on including the mediator) will be biased away from null. In other words, in the presence of measurement error the coefficient on the gender dummy would understate the extent to which the mediators explain the fintech gender gap.[12]

One drawback of sequentially adding controls to explain the gap is that the sequencing might affect the results. We thus perform a mediation analysis and decomposition exercise following Gelbach (2016) to assess the impact of each factor. The decomposition provides an accounting that is invariant to the order in which the individual controls are included. Decomposing the overall decline in the coefficient of 6.1 pp (from 8.4 pp to 2.2 pp) into potential mediators shows that individual-level controls account for around 11%, country fixed effects for 9%, and differences in attitudes for 80% of the decline (see Table 5). Further decomposing the overall impact of differences in attitudes shows that attitudes towards technology account for 45% of the overall effect. Differences in price sensitivity and in the suitability of products account for around 27% and 28%, respectively.

In conclusion, these results suggest that the gap in the use of fintech is closely linked to differences in attitudes towards technology, as well as price sensitivity and the suitability of products. We will discuss potential explanations for differences in these attitudes in section 4.

3.4 Robustness and extensions

Table 6 investigates the fintech gender gap among sub-groups of respondents. The gap is present when we restrict the sample to individuals who worry about the security of their

[12]The Online Appendix provides further details and derives a formula for the bias in the presence of measurement error.

data when dealing with companies online (column 1), or those who would be willing to share their data for better offers (column 2). Column (3) shows that even among those who would be willing to use a digital bank, the gap persists and is close in magnitude to the overall sample. Columns (4) and (5) yield a similar gap among those who are confident about planning for their financial future (a proxy for financial literacy) or have more than three accounts with financial companies. These findings suggest that differences in individual characteristics cannot fully explain the gap.

Could the gender gap reflect the presence of social norms and traditional gender roles that prescribe a division of labor within households (Alesina et al., 2013)? For example, among married couples, it could be that men are expected to manage the couple's finances (Ke, 2021). Column (6) shows that the gender gap is also present among individuals who live alone (5.2 pp). Relative to the average adoption rate, it equals 27% and is similar to the gap in the full sample.

4 Conclusions

This paper has identified a gender gap in the reported use of fintech services. The gap is present in almost every country in our global sample and is not fully explained by country and individual characteristics. Accounting for attitudes towards new financial technology, the suitability of products, and the willingness to use fintech entrants if they offer cheaper services narrows the fintech gender gap significantly.

Differences in attitudes hence seem to lie at the heart of the fintech gender gap. But what could determine differences in attitudes towards new financial technology? Generally, they could be explained by differences in preferences across genders. For example, Croson and Gneezy (2009) provide evidence that women are more risk averse than men, which could explain why women are less willing to adopt new financial technology. Differ-

ences could also arise due to gender-based discrimination, for example from bad previous experiences by women with financial institutions (Bartlett et al., 2022). Finally, differences in attitudes could reflect social norms that affect the cost-benefit trade-off differentially across genders within a society (Falk and Hermle, 2018). For instance, if women have reason to worry more about the consequences of a leak of personal data, then it may be rational to avoid services that require collection and processing of personal data, even if they offer cheaper or better products. Indeed, survey evidence for the US suggests that female respondents are more concerned about implications of data-sharing for their personal safety (Armantier et al., 2021).

Our data do not allow us to fully distinguish between these explanations, but provide suggestive evidence that privacy concerns do not lie at the heart of the observed fintech gender gap. As we show, controlling for whether an individual worries about the security of his/her personal data when dealing with companies online does not narrow the gap. Similarly, we find that the gender gap is present among individuals who live alone, which suggests that explanations that tie the gap to traditional gender roles within households may fall short.

With respect to gender equality, regressions revealed that including county-level controls does not affect our estimates, which suggests that country-level differences in eg gender equality cannot explain the gap. This can also be seen in Figure 3, panel (b), which plots the average country-level gender gap in the use of fintech products on the vertical axis, and the gender equality index on the horizontal axis. There is no systematic correlation between the two variables. Of course, discrimination varies also across regions or occupations within counties, so our results do not preclude that discrimination plays a role in explaining the gap. Indeed, the fact that the suitability of products and services explains a significant part of the gap could suggest that fintech products do currently not cater sufficiently to the needs of female users. Such a scenario could arise from a lack

of capital flowing into female-founded startups (Hellmann et al., 2019; Hebert, 2020). However, an important aspect to keep in mind when interpreting our results is that the analysis is based on an online survey. To the extent that there are differences in attitudes and preferences between the online survey sample and the overall population, our results do not necessarily generalise. Further research could shed light on overall fintech adoption.

Overall, our results suggest that new technology alone cannot close the gender gap in access to financial services. It might need to be accompanied by inclusive public policy, but the appropriate policy response hinges crucially on the cause of the observed gap. Policies that aim to enhance financial inclusion through fintech will hence have to grapple with the reasons for the fintech gender gap. If differences in adoption rates are based on differences in preferences, e.g. in risk aversion, then the scope for interventions through policy is limited. Should, however, the observed outcome be the result of discrimination or social norms and laws that disadvantage women, then policy that addresses and remedies these factors could help to promote financial inclusion through financial innovation.

References

Acquisti, Alessandro, Curtis Taylor, and Liad Wagman. 2016. The economics of privacy, *Journal of Economic Literature* 54 (2), pp 442–92.

Agarwal, Sumit, Wenlan Qian, Bernard Y Yeung, and Xin Zou. 2019. Mobile wallet and entrepreneurial growth, *AEA Papers and Proceedings* 109, pp 48–53.

Ahnert, Toni, Sebastian Doerr, Nicola Pierri, and Yannick Timmer. 2022. Does it help? Information technology in banking and entrepreneurship, *BIS Working Paper* 998.

Alesina, Alberto, Paola Giuliano, and Nathan Nunn. 2013. On the origins of gender roles: Women and the plough, *Quarterly Journal of Economics* 128 (2), pp 469–530.

Armantier, Olivier, Sebastian Doerr, Jon Frost, Andreas Fuster, and Kelly Shue. 2021. Whom do consumers trust with their data? US survey evidence, *BIS Bulletins* 42.

Arner, Douglas W., Ross P. Buckley, Dirk A. Zetzsche, and Robin Veidt. 2020. Sustainability, fintech and financial inclusion, *European Business and Organization Law Review* 21, pp 7–35.

Bachas, Pierre, Paul Gertler, Sean Higgins, and Enrique Seira. 2021. How debit cards enable the poor to save more, *Journal of Finance* 76 (4), pp 1913–1957.

Barboni, Giorgia, Erica Field, Rohini Pande, Natalia Rigol, Simone Schaner, and Charity Troyer Moore. 2018. A tough call: Understanding barriers to and impacts of women's mobile phone adoption in india, *Harvard Kennedy School*.

Bartlett, Robert, Adair Morse, Richard Stanton, and Nancy Wallace. 2022. Consumer-lending discrimination in the fintech era, *Journal of Financial Economics* 143 (1), pp 30–56.

Bergemann, Dirk, Alessandro Bonatti, and Tan Gan. 2022. The economics of social data, *The RAND Journal of Economics* 53 (2), pp 263–296.

Boot, Arnoud, Peter Hoffmann, Luc Laeven, and Lev Ratnovski. 2021. Fintech: what's old, what's new?, *Journal of Financial Stability* 53 (100836).

Breza, Emily, Martin Kanz, and Leora F Klapper. 2020. Learning to navigate a new financial technology: Evidence from payroll accounts, *NBER Working Paper*.

Brock, J. Michelle and Ralph De Haas. 2022. Discriminatory lending: Evidence from bankers in the lab, *American Economic Journal: Applied Economics*.

Brown, James R, J Anthony Cookson, and Rawley Z Heimer. 2019. Growing up without finance, *Journal of Financial Economics* 134 (3), pp 591–616.

Buchak, Greg, Gregor Matvos, Tomasz Piskorski, and Amit Seru. 2018. Fintech, regulatory arbitrage, and the rise of shadow banks, *Journal of Financial Economics* 130 (3), pp 453–483.

Bucher-Koenen, Tabea, Rob J Alessie, Annamaria Lusardi, and Maarten Van Rooij. 2021. Fearless woman: Financial literacy and stock market participation, *NBER Working Paper*.

Carlin, Bruce, Arna Olafsson, and Michaela Pagel. 2019. Generational differences in managing personal finances, *AEA Papers and Proceedings* 109, pp 54–59.

Célerier, Claire and Adrien Matray. 2019. Bank-branch supply, financial inclusion, and wealth accumulation, *Review of Financial Studies* 32 (12), pp 4767–4809.

Cole, Shawn, Thomas Sampson, and Bilal Zia. 2011. Prices or knowledge? what drives demand for financial services in emerging markets?, *Journal of Finance* 66 (6), pp 1933–1967.

Corbett-Davies, Sam and Sharad Goel. 2018. The measure and mismeasure of fairness: A critical review of fair machine learning, *arXiv preprint arXiv:1808.00023*.

Cornelli, Giulio, Sebastian Doerr, Lavinia Franco, and Jon Frost. 2021. Global investment in fintech: patterns, drivers and implications, *BIS Quarterly Review* September.

Croson, Rachel and Uri Gneezy. 2009. Gender differences in preferences, *Journal of Economic Literature* 47 (2), pp 448–474.

Demirgüç-Kunt, Asli, Leora Klapper, and Dorothe Singer. (2017) *Financial inclusion and inclusive growth: A review of recent empirical evidence*, The World Bank.

Demirgüç-Kunt, Asli, Leora Klapper, Dorothe Singer, Saniya Ansar, and Jake Hess. (2018) *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*, The World Bank.

Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp, and Gert G Wagner. 2011. Individual risk attitudes: Measurement, determinants, and behavioral consequences, *Journal of the European Economic Association* 9 (3), pp 522–550.

Ernst and Young. (2019) *Global FinTech Adoption Index 2019*, Ernst and Young.

Falk, Armin and Johannes Hermle. 2018. Relationship of gender differences in preferences to economic development and gender equality, *Science* 362 (6412), pp 1–6.

Farrelly, Matthew C, Jeremy W Bray, Terry Pechacek, and Trevor Woollery. 2001. Response by adults to increases in cigarette prices by sociodemographic characteristics, *Southern Economic Journal* 68 (1), pp 156–165.

Frost, Jon, Leonardo Gambacorta, Yi Huang, Hyun Song Shin, and Pablo Zbinden. 2019. BigTech and the changing structure of financial intermediation, *Economic Policy* 34 (100), pp 761–799.

Fuster, Andreas, Matthew Plosser, Philipp Schnabl, and James Vickery. 2019. The role of technology in mortgage lending, *Review of Financial Studies* 32 (5), pp 1854–1899.

G20. 2022. Communique of the G20 finance ministers and central bank governors meeting.

Gelbach, Jonah B. 2016. When do covariates matter? And which ones, and how much?, *Journal of Labor Economics* 34 (2), pp 509–543.

Gomes, Francisco, Michael Haliassos, and Tarun Ramadorai. 2021. Household finance, *Journal of Economic Literature* 59 (3), pp 919–1000.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2004. Does local financial development matter?, *Quarterly Journal of Economics* 119 (3), pp 929–969.

Guiso, Luigi and Luana Zaccaria. 2021. From patriarchy to partnership: Gender equality and household finance, *Working Paper*.

Hau, Harald, Yi Huang, Hongzhe Shan, and Zixia Sheng. 2018. Fintech credit, financial inclusion and entrepreneurial growth, *Working Paper*.

Hebert, Camille. 2020. Gender stereotypes and entrepreneur financing, *Working Paper*.

Hellmann, Thomas, Ilona Mostipan, and Nir Vulkan. 2019. Be careful what you ask for: Fundraising strategies in equity crowdfunding, *NBER Working Paper*.

Hyland, Marie, Simeon Djankov, and Pinelopi Koujianou Goldberg. 2020. Gendered laws and women in the workforce, *American Economic Review: Insights* 2 (4), pp 475–490.

Jagtiani, Julapa and Catharine Lemieux. 2018. Do fintech lenders penetrate areas that are underserved by traditional banks?, *Journal of Economics and Business* 100, pp 43–54.

Jones, Charles I and Christopher Tonetti. 2020. Nonrivalry and the economics of data, *American Economic Review* 110 (9), pp 2819–2858.

Ke, Da. 2021. Who wears the pants? gender identity norms and intra-household financial decision making, *Journal of Finance* 76 (3), pp 1389–1425.

Kleinberg, Jon, Himabindu Lakkaraju, Jure Leskovec, Jens Ludwig, and Sendhil Mullainathan. 2018. Human decisions and machine predictions, *Quarterly Journal of Economics* 133 (1), pp 237–293.

Kleinberg, Jon, Jens Ludwig, Sendhil Mullainathan, and Ziad Obermeyer. 2015. Prediction policy problems, *American Economic Review* 105 (5), pp 491–495.

le Cessie, Saskia, Jan Debeij, Frits R Rosendaal, Suzanne C Cannegieter, and Jan P Vandenbrouckea. 2012. Quantification of bias in direct effects estimates due to different types of measurement error in the mediator, *Epidemiology* 23 (4), pp 551–560.

Lee, Jean N, Jonathan Morduch, Saravana Ravindran, Abu Shonchoy, and Hassan Zaman. 2021. Poverty and migration in the digital age: Experimental evi-

dence on mobile banking in Bangladesh, *American Economic Journal: Applied Economics* 13 (1), pp 38–71.

Okat, Deniz, Mikael Paaso, and Vesa Pursiainen. 2020. Trust in finance and consumer fintech adoption, *Working Paper*.

Philippon, Thomas. 2020. On fintech and financial inclusion, *BIS Working Paper* 841.

Sahay, Ratna, Ulric Eriksson von Allmen, Amina Lahreche, Purva Khera, Sumiko Ogawa, Majid Bazarbash, and Kimberly Beaton. 2020. The promise of fintech: Financial inclusion in the post COVID-19 era, *IMF Departmental Papers*.

Suri, Tavneet and William Jack. 2016. The long-run poverty and gender impacts of mobile money, *Science* 354 (6317), pp 1288–1292.

Tang, Huan. 2019a. Peer-to-peer lenders versus banks: Substitutes or complements?, *Review of Financial Studies* 32 (5), pp 1900–1938.

Tang, Huan. 2019b. The value of privacy: Evidence from online borrowers, *Working Paper*.

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

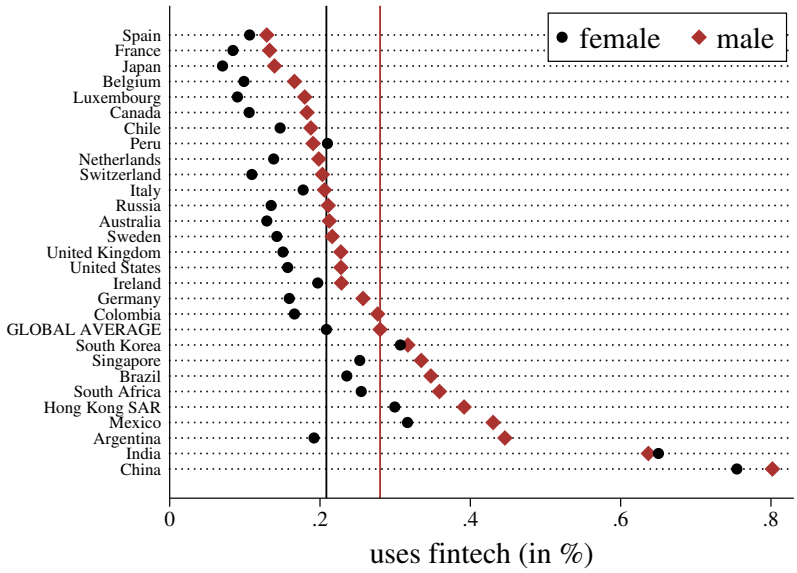
VanderWeele, Tyler J. 2016. Mediation analysis: a practitioner's guide, *Annual Review of Public Health* 37, pp 17–32.

Yang, Keer. 2020. Trust as an entry barrier: Evidence from fintech adoption, *Working Paper*.

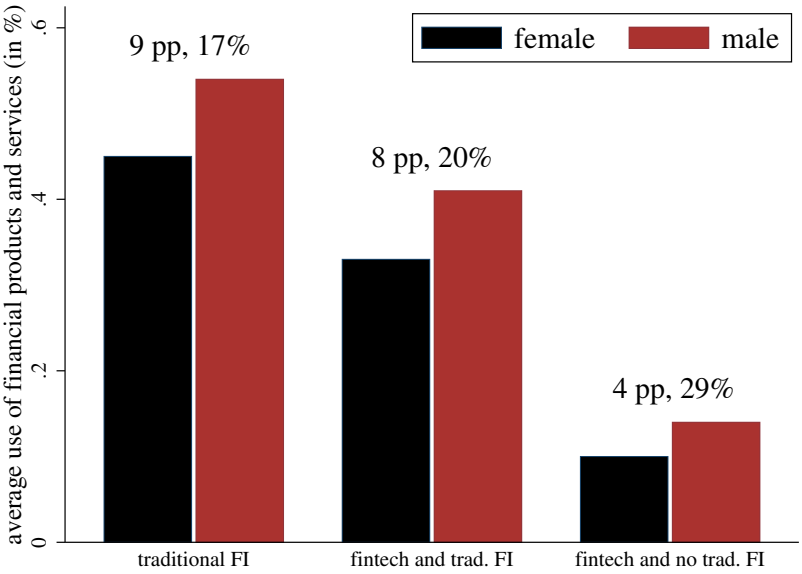
Figures and tables

Figure 1: **The fintech gender gap**

(a) By country



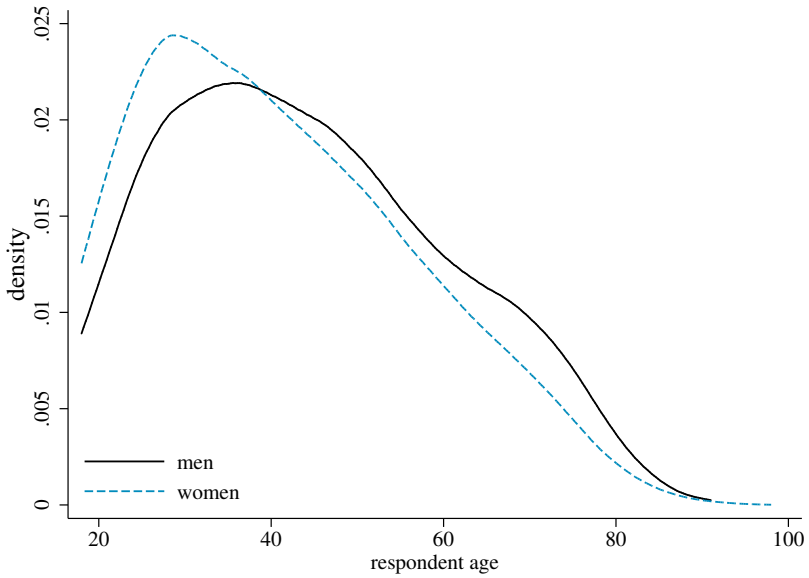
(b) By traditional FI usage



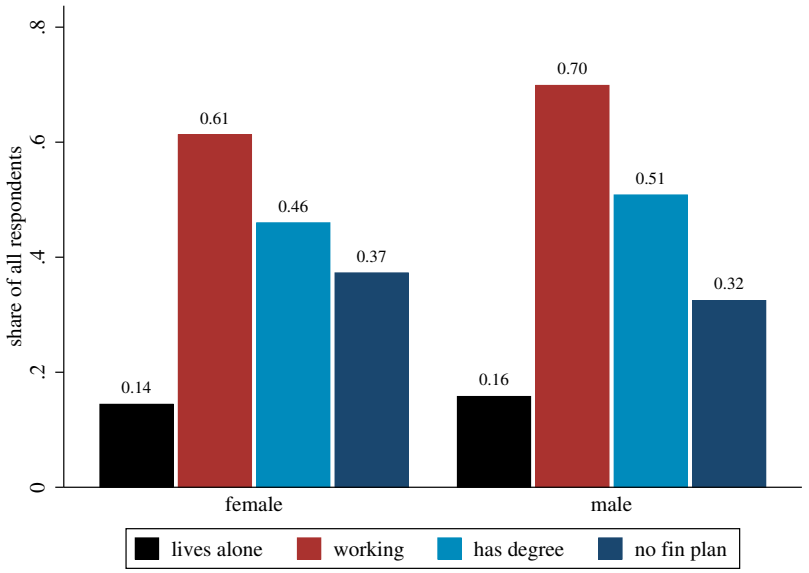
Note: Panel (a) shows the average share of female (black dots) and male (red diamonds) respondents that use products offered by fintech entrants for each country. Vertical lines denote the unweighted sample average. Panel (b) reports the average share of female (black bars) and male (red bars) respondents that use fintech products. The left bars report the share of female and male respondents that use traditional FIs for these services, the center bars report the share that uses fintech entrants but also use traditional FIs, and the right bars report the share that uses fintech entrants but does not use traditional FIs.

Figure 2: **Summary statistics by gender**

(a) Age distribution



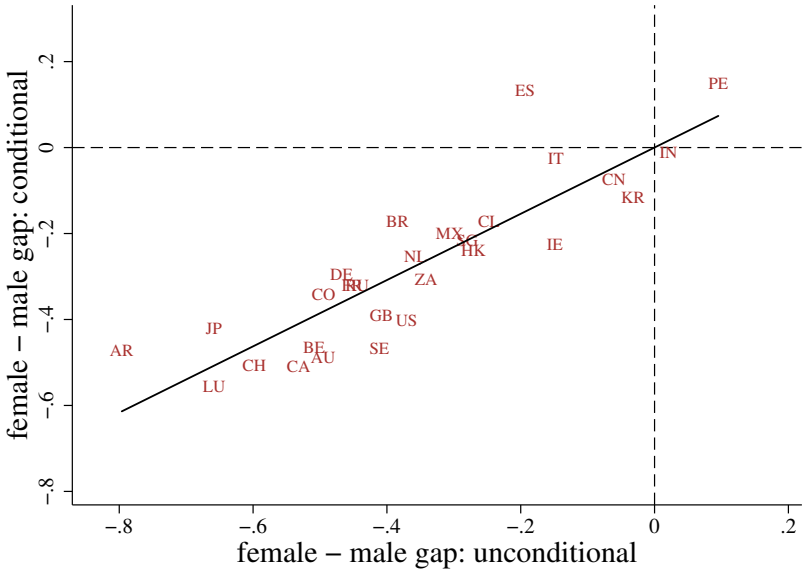
(b) Individual characteristics



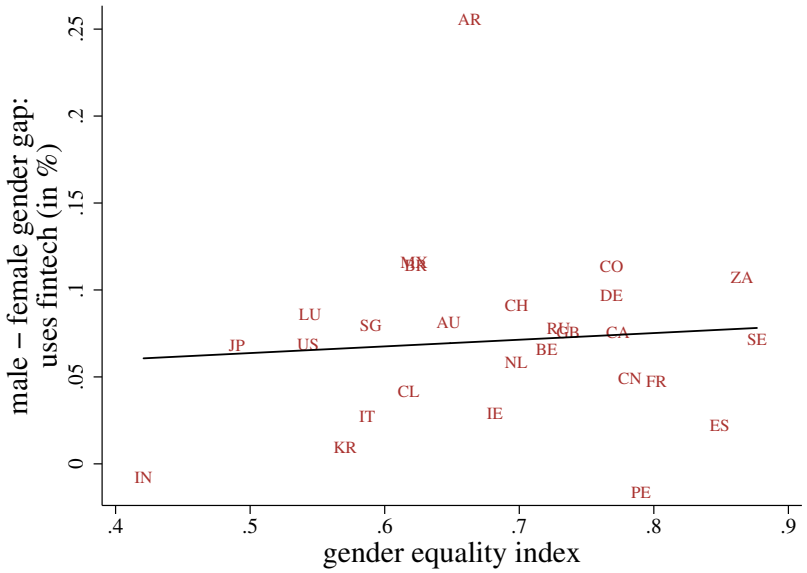
Note: This figure shows the age distribution by gender, as well as the sample average of respondents by gender that reports living alone, is employed or self-employed, has a higher education degree, and is unsure how to best plan for their future.

Figure 3: **The fintech gender gap and country-level variables**

(a) Conditional vs unconditional



(b) Gender equality index



Note: Panel (a) plots the female-to-male gender gap in the use of fintech entrants by country, standardized by the average share of respondents that use fintech entrants in each country. The horizontal axis plots the unconditional standardized gap. The vertical axis plots the conditional gap, i.e. coefficient β in Equation 1, conditional on individual controls and estimated separately for each country, standardized by the average share of respondents that use fintech entrants in each country. Panel (b) provides a country-level scatter plot of the fintech gender gap on the vertical axis against the gender equality index on the horizontal axis (both conditional on log GDP). The black line denotes the linear fit.

Table 1: **Summary statistics**

	all	female	male	gap
	mean	mean	mean	mean
Uses fintech entrants	0.25	0.21	0.29	0.08
...for payments	0.21	0.17	0.24	0.07
...to invest	0.09	0.07	0.12	0.05
...to borrow	0.06	0.05	0.08	0.03
...for financial planning	0.06	0.05	0.07	0.02
...for insurance	0.09	0.07	0.11	0.04
Uses traditional FI	0.49	0.45	0.54	0.09
...for payments	0.40	0.37	0.44	0.07
...to invest	0.13	0.10	0.17	0.07
...to borrow	0.08	0.07	0.09	0.02
...for financial planning	0.09	0.08	0.10	0.02
...for insurance	0.16	0.13	0.18	0.05
Willing to share financial data	0.37	0.33	0.42	0.09
...with fintechs	0.23	0.19	0.27	0.08
...with other financial institutions	0.30	0.26	0.34	0.07
...with non-financial services companies	0.17	0.15	0.20	0.05
Worry about security online	0.69	0.70	0.68	-0.02
Would use digital bank	0.37	0.32	0.42	0.09
Unsure how to plan for financial future	0.35	0.37	0.31	0.06
Observations	27103	13569	13534	27103

Note: This table shows summary statistics for the main variables. It provides the average share of respondents that agreed or strongly agreed with each statement. Column *all* refers to the sample average, columns *female* and *male* to the average for female and male respondents. Column *gap* indicates the average male-female gap. For details, see text.

Table 2: **The use of fintech services**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	uses FT	uses FT	uses FT	uses FT prod	uses FT prod	uses FT prod	uses FT prod
female	-0.084***	-0.059***	-0.052***	-0.011***	-0.011***	-0.017***	
	(0.005)	(0.005)	(0.005)	(0.001)	(0.001)	(0.001)	
female × complement						0.009***	0.009***
						(0.001)	(0.001)
Observations	27,103	27,103	27,103	514,957	514,957	514,957	514,957
R-squared	0.009	0.168	0.222	0.076	0.090	0.091	0.364
Controls	-	✓	✓	✓	✓	✓	-
Country FE	-	-	✓	✓	✓	✓	-
Product FE	-	-	-	-	✓	✓	✓
Individual FE	-	-	-	-	-	-	✓
Mean of y	0.25	0.25	0.25	0.05	0.05	0.05	0.05

Note: This table estimates Equation 1 in columns (1)–(3). The dependent variable is dummy *uses FT*, which takes on a value of one if a respondent has used fintech entrants over the last six months, and zero otherwise. Column (4)–(7) estimate regressions at the respondent-product level for 19 distinct fintech products. For each product, the dependent variable *uses FT prod* is a dummy that takes on a value of one if a respondent has used fintech entrants for that product over the last six months, and zero otherwise. Dummy *female* takes on a value of one if a respondent is female, and zero otherwise. Dummy *complement* takes on a value of one for fintech products that complement traditional financial products offered by FIs. *Product FE* denote 19 distinct product-level fixed effects, *Individual FE* denote fixed effects at the respondent level. Each regression uses robust standard errors, shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: **Fintech entrants and traditional FIs**

	(1)	(2)	(3)	(4)	(5)	(6)
	uses FI	uses no FI				
VARIABLES	uses FT	uses FT	uses FI	uses FT or FI	uses FT or FI	uses FT or FI
female	-0.075***	-0.034***	-0.071***	-0.068***	-0.072***	
	(0.008)	(0.005)	(0.006)	(0.004)	(0.006)	
fintech					-0.248***	-0.248***
					(0.005)	(0.005)
female × fintech					0.008	0.008
					(0.007)	(0.007)
Observations	13,326	13,777	27,103	54,206	54,206	54,206
R-squared	0.178	0.123	0.116	0.123	0.187	0.670
Controls	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓
Individual FE	-	-	-	-	-	✓
Mean of y FE	0.38	0.12	0.49	0.37	0.37	0.37

Note: This table estimates Equation 1 in columns (1)–(3). The dependent variable *uses FT* is a dummy that takes on a value of one if a respondent has used fintech products offered by fintech entrants over the last six months, and zero otherwise. The dependent variable *uses FI* is a dummy that takes on a value of one if a respondent has used fintech products offered by traditional FIs over the last six months, and zero otherwise. Dummy *female* takes on a value of one if a respondent is female, and zero otherwise. Column (1) restricts the sample to the set of respondents that use fintech products offered by traditional FIs. Column (2) restricts the sample to the set of respondents that do not use fintech products offered by traditional FIs. Column (3) uses the baseline sample. Columns (4)–(6) estimate regressions at the respondent-product provider level. The dependent variable *uses FT or FI* is a dummy that takes on a value of one if a respondent has used fintech products offered by fintech entrants or traditional FIs over the last six months, and zero otherwise. Dummy *fintech* takes on a value of one if the provider is a fintech entrant and zero if it is a traditional FI. Each regression includes individual-level controls and country fixed effects and uses robust standard errors, shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: **Differences in attitudes**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	worry sec	FT technology	FT pricing	FT products	uses FT	uses FT	uses FT	uses FT
female	0.026***	-0.042***	-0.039***	-0.035***	-0.053***	-0.031***	-0.023***	-0.022***
	(0.006)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.004)	(0.004)
worry about security					0.018***	0.020***	0.015***	0.011**
					(0.005)	(0.005)	(0.005)	(0.005)
FT technology						0.525***	0.427***	0.271***
						(0.011)	(0.011)	(0.013)
FT pricing							0.296***	0.257***
							(0.011)	(0.012)
FT products								0.269***
								(0.011)
Observations	27,103	27,103	27,103	27,103	27,103	27,103	27,103	27,103
R-squared	0.076	0.216	0.155	0.219	0.222	0.299	0.322	0.344
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Mean of y	0.69	0.38	0.20	0.26	0.25	0.25	0.25	0.25

Note: This table estimates Equation 1. In column (1), the dependent variable *worry sec* is a dummy that takes on a value of one if a respondent agrees to the statement 'I worry about my security when dealing with companies online', and zero otherwise. In column (2), the dependent variable *FT technology* is the first principal component of a set of questions that measure individuals' attitudes towards new financial technology. In column (3), the dependent variable *FT pricing* is the first principal component of a set of questions that measure individuals' attitudes towards potential price advantages of fintech entrants. In column (4), the dependent variable *FT products* is the first principal component of a set of questions that measure individuals' attitudes towards better-tailored products offered by fintech entrants. In columns (5)–(8), the dependent variable *uses FT* is a dummy that takes on a value of one if a respondent has used fintech entrants over the last six months, and zero otherwise. Dummy *female* takes on a value of one if a respondent is female, and zero otherwise. Each regression includes individual-level controls and country fixed effects and uses robust standard errors, shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: **Mediation analysis**

Specification	**Coefficient estimate**
1. Baseline gender gap	-0.0839***
2. Gender gap with all controls	-0.0234***
Mediation – contribution to coefficient change by:	
3. Individual controls	-0.006***
4. Country fixed effects	-0.006***
5. Attitudes	-0.049***

Note: The table shows the results from mediation analysis following Gelbach (2016). The *baseline gender gap* in row 1 refers to the unconditional difference in the use of fintech products and services across genders, *gender gap with all controls* in row 2 is the gap resulting from a regression with individual-level controls, country fixed effects and the attitude variables. Rows 3–5 show the contribution to the overall decline in the coefficient from row 1 to 2 by the different potential mediators. *** p<0.01, ** p<0.05, * p<0.1

Table 6: **Sub-sample analysis**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	worry sec	share data yes	dig bank yes	literate	accounts	live alone	working
VARIABLES	uses FT	uses FT	uses FT	uses FT	uses FT	uses FT	uses FT
female	-0.053***	-0.034***	-0.065***	-0.048***	-0.074***	-0.052***	-0.061***
	(0.006)	(0.012)	(0.009)	(0.006)	(0.010)	(0.011)	(0.006)
Observations	18,677	6,288	10,047	17,650	7,942	4,095	17,775
R-squared	0.228	0.218	0.198	0.210	0.251	0.199	0.220
Controls	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓	✓
Mean of y	0.26	0.53	0.42	0.22	0.35	0.19	0.31

Note: This table estimates Equation 1. The dependent variable is dummy *uses FT*, which takes on a value of one if a respondent has used fintech entrants over the last six months, and zero otherwise. Column (1) restricts the sample to the set of respondents that worries about their security when dealing with companies online. Column (2) restricts the sample to the set of respondents that is willing to share date with fintech entrants for better offers. Column (3) restricts the sample to the set of respondents that is willing to use a digital bank. Column (4) restricts the sample to the set of respondents that has a high literacy score. Column (5) restricts the sample to the set of respondents that has financial accounts at more than three companies. Column (6) restricts the sample to the set of respondents that lives alone. Column (7) restricts the sample to the set of respondents that is employed or self-employed. Dummy *female* takes on a value of one if a respondent is female, and zero otherwise. Each regression includes individual-level controls and country fixed effects and uses robust standard errors, shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Online Appendix

Variable definitions

Variable	Description
uses FT	Dummy with value 1 if respondent has used any of the 19 fintech products and services offered by fintech entrants over the last six months
uses FI	Dummy with value 1 if respondent has used any of the 19 fintech products and services offered by traditional financial institutions over the last six months
uses FT prod	Dummy with value 1 if respondent has used a specific fintech product or service offered by fintech entrants over the last six months
worry sec	Dummy with value 1 if respondent agrees or strongly agrees to the statement "I worry about the security of my personal data when dealing with companies online"
FT technology	First principal component of a set of questions that measure individuals' attitudes towards new financial technology.
FT pricing	First principal component of a set of questions that measure individuals' attitudes towards potential price advantages of fintechs.
FT products	First principal component of a set of questions that measure individuals' attitudes towards better-tailored products offered by fintechs
share data yes	Dummy with value 1 if respondent agrees or strongly agrees to the statement "I would be comfortable with my main bank securely sharing my financial data with other organizations if it meant that I received better offers"
dig bank yes	Dummy with value 1 if respondent agrees or strongly agrees to the statement "I would be comfortable to use a digital, branchless financial services provider"
female	Dummy with value 1 if respondent is female
financial planning	Dummy with value 0 if respondent agrees or strongly agrees to the statement "I am unsure how to plan best for my financial future"
live alone	Dummy with value 1 if respondent answers the question "Which of the following best describes your household? " with "Living alone"
working	Dummy with value 1 if respondent answers the question "What is your current employment status? " with "Employed full-time", "Employed part-time" or "Self employed"

Principle components. The variables *FT technology*, *FT pricing* and *FT products* are based on the first principal component of a set of questions.

FT technology: First principal component based on five dummies, 27% of variance explained. The five dummies reflect the given answers to the following questions:

- Q: What are the most important reasons for using a FinTech company instead of a traditional financial services company? A: Easier to set up an account.
- Q: What are the most important reasons for using a traditional financial services company instead of a FinTech company? A: Not aware or limited understanding of how FinTech companies work.
- Q: Thinking about non-financial companies providing financial products (e.g. banking, borrowing, payments, insurance and investing), which of the following applies to you? A: I would be happy to use them, if they were working with a FinTech company.
- Q: I would prefer to chat with my bank through social media rather than through the bank's own apps or traditional channels? A: Disagree or strongly disagree.
- Q: I would be comfortable to use a digital, branchless financial services provider? A: Agree or strongly agree.

FT pricing: First principal component based on three dummies, 39% of variance explained. The three dummies reflect the given answers to the following questions:

- Q: What are the most important reasons for using a FinTech company instead of a traditional financial services company? A: More attractive rates or fees.
- Q: I would be comfortable with my main bank securely sharing my financial data with other organizations if it meant that I received better offers from FinTech companies? A: Agree or strongly agree.
- Q: Imagine you are thinking about buying a new financial policy or product. Which of the following providers would you typically turn to first? A: Options suggested by a price comparison site.

FT products: First principal component based on five dummies, 29% of variance explained. The five dummies reflect the given answers to the following questions:

- Q: What are the most important reasons for using a FinTech company instead of a traditional financial services company? A: Easier to set up an account.

- Q: What are the most important reasons for using a FinTech company instead of a traditional financial services company? A: Access to different and more innovative products and services than those available from traditional financial institutions.
- Q: What are the most important reasons for using a FinTech company instead of a traditional financial services company? A: Better experience, for example, better product features and quality of service.
- Q: What are the most important reasons for using a FinTech company instead of a traditional financial services company? A: Greater level of trust than with traditional financial institutions.
- Q: What are the most important reasons for using a FinTech company instead of a traditional financial services company? A: Better fit with my lifestyle and aspirations.

Product categories. The survey contains 19 distinct product categories.

1. Online foreign exchange
2. Overseas remittances (substitute)
3. Digital-only branchless banking (substitute)
4. Peer-to-peer payments and non-bank money transfers (substitute)
5. In-store mobile phone payments (substitute)
6. Cryptocurrency eWallet
7. Online budgeting and financial planning tools
8. Online retirement and pensions management tools (substitute)
9. Lending on peer-to-peer platforms
10. Investments via crowdfunding platforms
11. Online investment advice and investment management
12. Online stock broking (substitute)
13. Online spreadbetting
14. Online-only loan provider
15. Online marketplaces and aggregators for loans
16. Online loan brokers and broker facilitation websites
17. Insurance premium comparison sites (substitute)
18. Insurance-linked smart devices (substitute)
19. App-only insurance

Measurement error in attitudes. A potential concern for our estimation of the fintech gender gap – and the extent to which respondents' attitudes mediate it – is measurement error, in particular in measuring attitudes. To understand how measurement error in our attitude variables (captures via principle component analysis) affects our estimates, we use the framework developed in le Cessie et al. (2012) (see also VanderWeele (2016)). For ease of interpretation, we replace the dummy *female* with the dummy *male*, so as to get a positive coefficient on the gender gap. Following le Cessie et al. (2012), we start with equation (ME1), which relates the use of fintech (FT) of respondent i to the respondent's gender and attitudes. As shown in Table 2 and Table 4, men use fintech products and services more than women (so $\beta_1 > 0$) and each attitude metric (ie *FT technology*, *FT pricing*, and *FT products*) is positively related to the use of fintech products and services (so $\beta_2 > 0$). In addition, Table 4 shows that the estimated coefficient on the dummy *male* enters with a positive sign in regressions with each attitude metric as dependent variable (so $\alpha > 0$ in equation (ME2)).

$$uses\ FT_i = \underbrace{\beta_1}_{>0}\ male_i + \underbrace{\beta_2}_{>0}\ attitude_i + \dots \tag{ME1}$$

$$attitude_i = \underbrace{\alpha}_{>0}\ male_i + \dots \tag{ME2}$$

Now, suppose there is measurement error in the attitude variable. Rather than *attitude*, we measure $attitude^*$, which is defined as $attitude^* = attitude + U$, where U refers to the measurement error. Under the assumption that U is normally distributed and independent of the mediator and treatment, this implies that the variance of $attitude^*$ equals $\sigma^2_{att^*} = \sigma^2_{att} + \sigma^2_U$. Using mis-measured $attitude^*$ rather than *attitude* yields:

$$uses\ FT_i = \underbrace{\beta^*_1}_{>0}\ male_i + \underbrace{\beta^*_2}_{>0}\ attitude^*_i + \dots \tag{ME3}$$

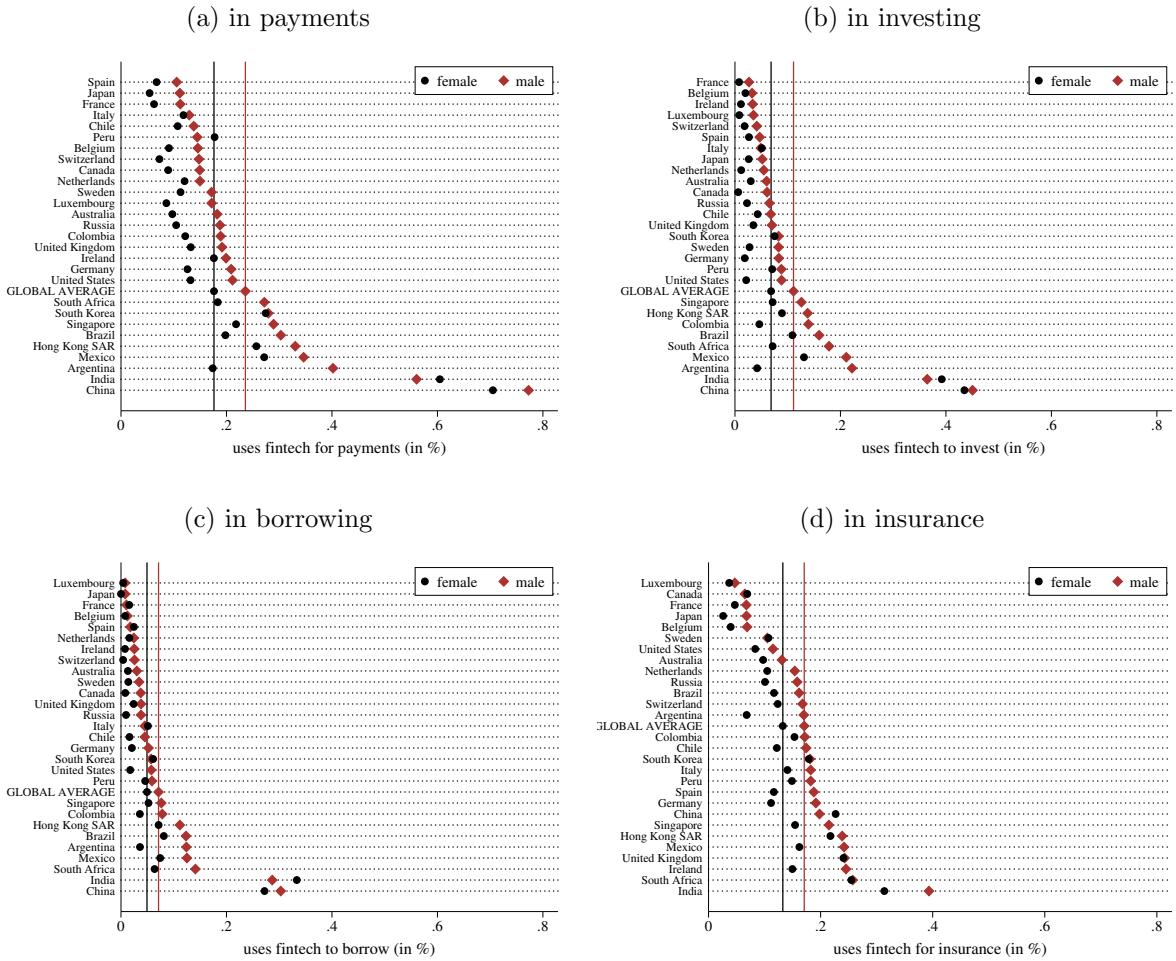
The bias in the direct effect of the gender dummy can then be calculated as

$$\beta^*_1 - \beta_1 = \underbrace{\beta^*_2}_{>0} \times \underbrace{\alpha}_{>0} \times \underbrace{(1-\lambda)}_{\in[0,1)} > 0, \tag{ME4}$$

where $\lambda = \frac{\sigma^2_{att}}{\sigma^2_{att}+\sigma^2_U} \leq 1$. Equation (ME4) shows that the bias increases with the variance of the measurement error U. As $\sigma^2_U \to 0$, $\lambda \to 1$ and the bias disappears; conversely, as $\sigma^2_U \to \infty$, $\lambda \to 0$ and the bias increases. Equation (ME4) further shows that in the presence of classical measurement error, the indirect effect (ie the effect 'explained' by the mediator) will be biased towards null, and the direct effect (ie what remains after conditioning on the mediator) will be biased away from null. In other words, in the presence of measurement error in the mediating variables, the coefficient on the gender dummy will likely remain 'too large', ie understate the extent to which the mediators explain the fintech gender gap.

Further Figures and Tables

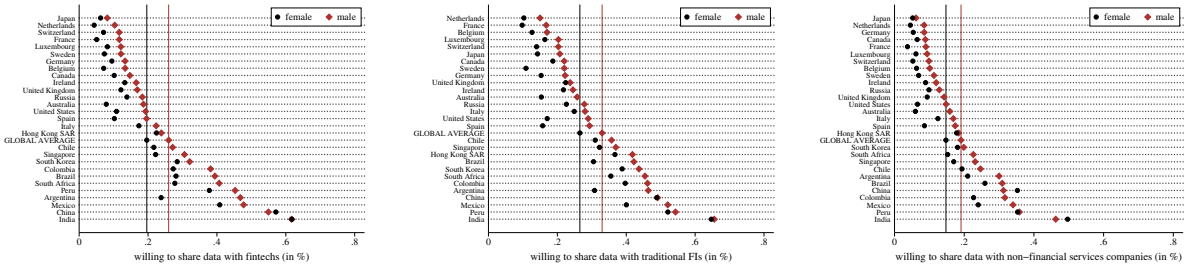
Figure OA1: The fintech gender gap by category



Note: This figure shows the average share of female (black dots) and male (red diamonds) respondents that use fintech for payments, to invest, to borrow, or for insurance, for each country. Vertical lines denote the unweighted sample average.

Figure OA2: Willingness to share data for better terms and conditions with

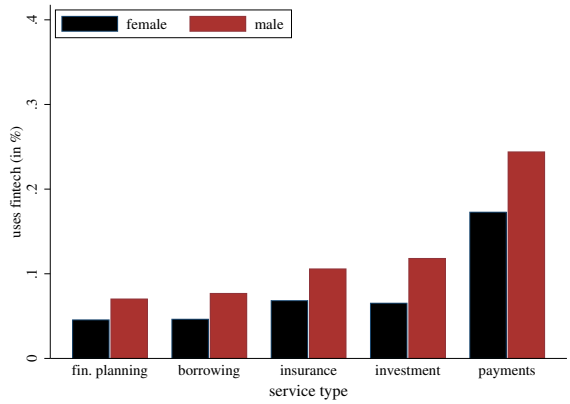
(a) fintech entrants (b) traditional FIs (c) non-fin. services companies



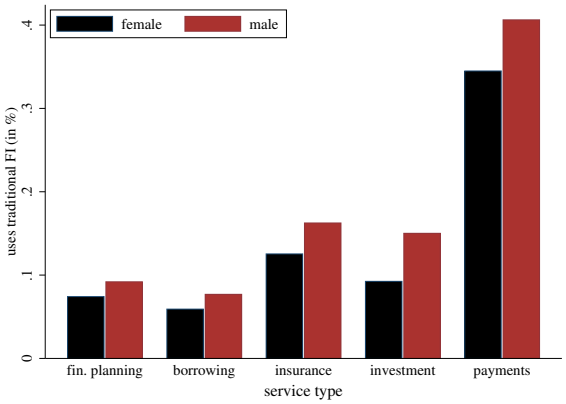
Note: This figure shows the average share of female (black dots) and male (red diamonds) respondents that are willing to share their data for better offers with fintech entrants, traditional FIs or non-financial services companies. Vertical lines denote the unweighted sample average.

Figure OA3: Fintech entrants vs traditional FIs

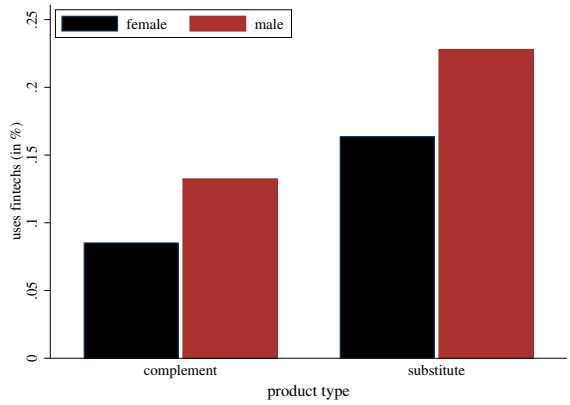
(a) Categories: Fintech entrants



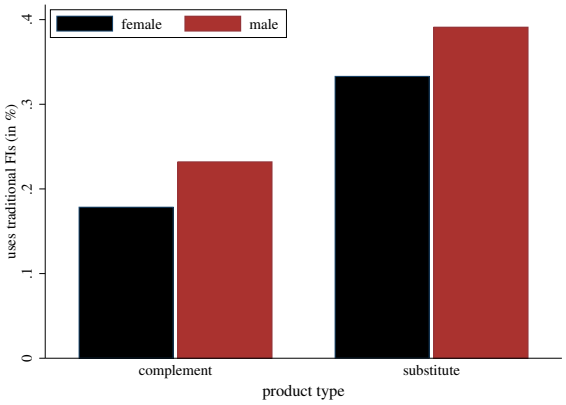
(b) Categories: Traditional FIs



(c) Complements vs substitutes: Fintech entrants

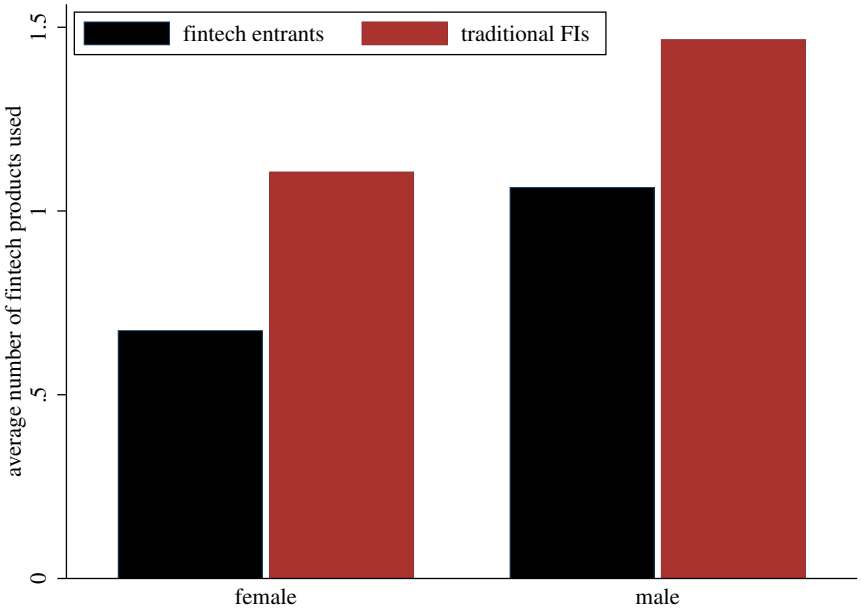


(d) Complements vs substitutes: Traditional FIs



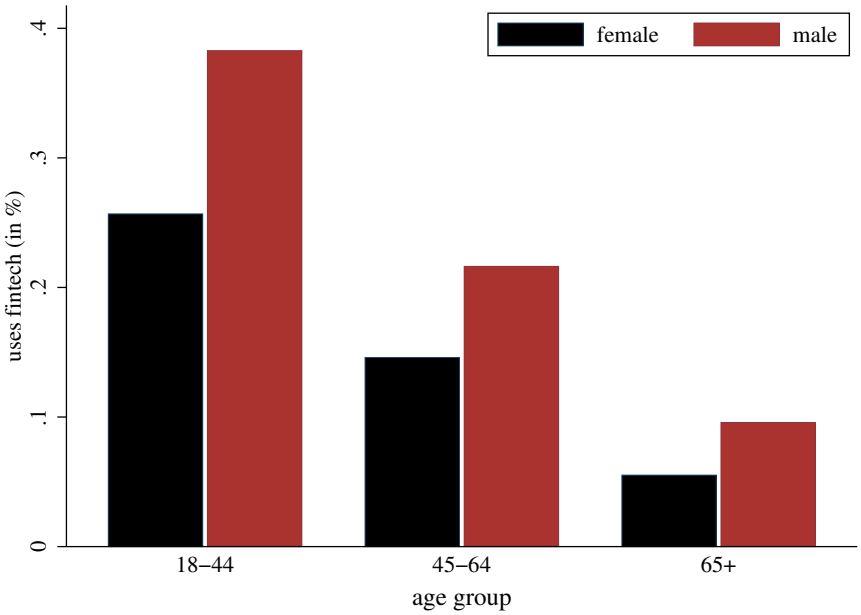
Note: This figure reports the average share of female (black bars) and male (red bars) respondents that use fintech products across different subsamples. We provide a detailed categorization of the 19 product categories into complements and substitutes at the beginning of the Online Appendix.

Figure OA4: Number of fintech product categories used



Note: This figure reports the average number of distinct product categories used by female and male respondents, separately for fintech entrants (black bars) and traditional FIs (red bars).

Figure OA5: The gender gap by age



Note: This figure reports the average share of female (black bars) and male (red bars) respondents that use fintech products by age group.

Table OA1: **The use of fintech products – individual fixed effects**

VARIABLES	(1) uses FT prod	(2) uses FT prod	(3) uses FT prod	(4) uses FT prod	(5) uses FT prod	(6) uses FT prod	(7) uses FT prod	(8) uses FT prod	(9) uses FT prod
female	-0.013***		-0.012***		-0.012***	-0.008***		-0.012***	
	(0.001)		(0.001)		(0.001)	(0.001)		(0.001)	
female × borrowing	0.007***	0.007***							
	(0.001)	(0.001)							
female × financial planning			0.006***	0.006***					
			(0.002)	(0.001)					
female × insurance					0.003**				
					(0.001)				
female × payments						-0.011***	-0.011***		
						(0.001)	(0.001)		
female × savings and investments								0.002**	0.002**
								(0.001)	(0.001)
Observations	514,957	514,957	514,957	514,957	514,957	514,957	514,957	514,957	514,957
R-squared	0.090	0.364	0.090	0.364	0.090	0.091	0.364	0.090	0.364
Controls	✓	-	✓	-	✓	✓	-	✓	-
Country FE	✓	-	✓	-	✓	✓	-	✓	-
Product FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Individual FE	-	✓	-	✓	-	-	✓	-	✓

Note: This table estimates regressions at the respondent-product level for 19 distinct fintech products. The 19 products are grouped into five categories. For each product, the dependent variable *uses FT prod* is a dummy that takes on a value of one if a respondent has used fintech entrants for that product over the last six months, and zero otherwise. Dummy *female* takes on a value of one if a respondent is female, and zero otherwise. *Product FE* denote 19 distinct product-level fixed effects, *Individual FE* denote fixed effects at the respondent level. Each regression uses robust standard errors. *** p<0.01, ** p<0.05, * p<0.1

Table OA2: **Probit – the use of fintech services**

VARIABLES	(1) uses FT	(2) uses FT	(3) uses FT	(4) uses FI uses FT	(5) uses no FI uses FT
female	-0.267***	-0.246***	-0.246***	-0.227***	-0.199***
	(0.017)	(0.018)	(0.018)	(0.024)	(0.030)
Observations	27,103	27,103	27,103	13,326	13,777
Controls	-	✓	✓	✓	✓
Country FE	-	-	✓	✓	✓

Note: This table estimates Equation 1 by fitting a maximum-likelihood probit model. The dependent variable is dummy *uses FT*, which takes on a value of one if a respondent has used fintech entrants over the last six months, and zero otherwise. Dummy *female* takes on a value of one if a respondent is female, and zero otherwise. *** p<0.01, ** p<0.05, * p<0.1

Table OA3: **Probit – differences in attitudes**

VARIABLES	(1) worry sec	(2) FT technology	(3) FT pricing	(4) FT products	(5) uses FT	(6) uses FT	(7) uses FT	(8) uses FT
female	0.065***	-0.189***	-0.209***	-0.208***	-0.249***	-0.141***	-0.113***	-0.110***
	(0.017)	(0.027)	(0.016)	(0.017)	(0.018)	(0.020)	(0.020)	(0.020)
worry about security					0.112***	0.113***	0.098***	0.083***
					(0.021)	(0.022)	(0.022)	(0.023)
FT technology						2.174***	1.802***	1.243***
						(0.041)	(0.044)	(0.049)
FT pricing							1.029***	0.948***
							(0.041)	(0.041)
FT products								1.026***
								(0.036)
Observations	27,103	27,103	27,103	27,103	27,103	27,103	27,103	27,103
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓	✓	✓

Note: This table estimates Equation 1 by fitting a maximum-likelihood probit model. In column (1), the dependent variable *worry sec* is a dummy that takes on a value of one if a respondent agrees to the statement 'I worry about my security when dealing with companies online', and zero otherwise. In column (2), the dependent variable *FT technology* is the first principal component of a set of questions that measure individuals' attitudes towards new financial technology. In column (3), the dependent variable *FT pricing* is the first principal component of a set of questions that measure individuals' attitudes towards potential price advantages of fintech entrants. In column (4), the dependent variable *FT products* is the first principal component of a set of questions that measure individuals' attitudes towards better-tailored products offered by fintech entrants. In columns (5)–(8), the dependent variable *uses FT* is a dummy that takes on a value of one if a respondent has used fintech entrants over the last six months, and zero otherwise. Dummy *female* takes on a value of one if a respondent is female, and zero otherwise.*** p<0.01, ** p<0.05, * p<0.1

Table OA4: **Probit – sub-sample analysis**

VARIABLES	(1) worry sec uses FT	(2) share data yes uses FT	(3) dig bank yes uses FT	(4) literate uses FT	(5) accounts uses FT	(6) live alone uses FT	(7) working uses FT
female	-0.239***	-0.121***	-0.215***	-0.293***	-0.320***	-0.319***	-0.311***
	(0.022)	(0.035)	(0.028)	(0.023)	(0.031)	(0.049)	(0.021)
Observations	18,677	6,288	10,047	17,650	7,942	4,095	17,775
Controls	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓	✓

Note: This table estimates Equation 1 by fitting a maximum-likelihood probit model. The dependent variable is dummy *uses FT*, which takes on a value of one if a respondent has used fintech entrants over the last six months, and zero otherwise. Dummy *female* takes on a value of one if a respondent is female, and zero otherwise. Column (1) restricts the sample to the set of respondents that worries about their security when dealing with companies online. Column (2) restricts the sample to the set of respondents that is willing to share date with fintech entrants for better offers. Column (3) restricts the sample to the set of respondents that is willing to use a digital bank. Column (4) restricts the sample to the set of respondents that has a high literacy score. Column (5) restricts the sample to the set of respondents that has financial accounts at more than three companies. Column (6) restricts the sample to the set of respondents that lives alone. Column (7) restricts the sample to the set of respondents that is employed or self-employed. Each regression includes individual-level controls and country fixed effects and uses robust standard errors. *** p<0.01, ** p<0.05, * p<0.1