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Unraveling financial exclusion during the COVID-19 pandemic: A gender perspective in Latin American countries

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ABSTRACT

The COVID-19 pandemic has affected mainly the most vulnerable population in developing countries. This research focuses on financial inclusion, with an emphasis on digital financing among men and women in Latin American countries. The analysis combines a qualitative and quantitative perspective. We first perform a comprehensive literature review of financial inclusion in developing countries, with a focus on gender gap, pre- and post-COVID. An extensive sample of Latin American countries is then studied in detail through the World Bank Global Findex Questionnaire. A series of questions is identified in relation to financial inclusion, such as financial and mobile account ownership and their use for bill payments, or debit and credit card ownership, and the differences in terms of gender are analyzed statistically. This analysis is complemented by an econometric modelization to identify the significance and strength of the variables that determine financial inclusion.

Among our main results, we highlight the positive post-COVID evolution of financial inclusion for both genders. However, this positive influence is much stronger for men than for women. Before COVID, women scored slightly higher on all financial inclusion indicators under consideration for the whole of Latin America. However, this balance is markedly reversed post-COVID. Our results thus reinforce previous findings on the economic, social, and financial repercussions suffered by women in developing countries from COVID-19. We also formulate tentative suggestions for policy makers to reinforce the financial education and inclusion of women.

1. Introduction

Sustainable Development Goal number five affirms that gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous, and sustainable world (United Nations, 2016). However, the effects of the COVID-19 pandemic could reverse the progress that has been made on gender equality and women's rights (Ramos, 2020). COVID-19 not only created a sanitary emergency but also a deep economic breakdown, from which the world is still recovering. The World Bank estimates a 3.3 % decrease of Gross Domestic Product (GDP) worldwide in 2020 with a further slow-down estimated in 2023 (2.6 %) and an even worse expectation of 2.4 % for 2024 (World Bank, 2024).

To reduce virus transmission during the initial COVID phase, many countries imposed strict lockdowns that affected every company and person. Moreover, women were comparatively harder hit across many spheres from health and the economy to security and social protection (Kabeer et al., 2021). Women played a larger role in responding to the virus, including as frontline healthcare workers (OECD, 2020). Women were also harder hit by the economic effects of COVID-19, as they are much more likely than men to have to work at home, in the informal economy, or in insecure labour markets, putting them at greater risk of falling into poverty (CARE, 2020). These gender differences have been identified in several regions and countries with very diverse economic profiles, suggesting that the pandemic reinforced existing structural gender inequalities (Seck et al., 2021; Bazarkulova and Compton, 2021).

The research explores how COVID-19 has influenced financial inclusion and microfinancing access. Bank accounts, essential for

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accessing financial systems, have seen global ownership rise to 76 % of adults, driven by mobile money adoption in many developing countries. Having a bank account is the gateway to the financial system including products such as a debit card, credit card or digital wallet (Ozili, 2021). Despite progress, a significant gender gap persists, with many women in developing economies excluded from formal financial systems. They rely on cash, lack safe saving or investment options, and have limited access to credit, hindering economic opportunities (Doss et al., 2019). The World Bank's Global Findex 2021 highlights potential to expand digital financial inclusion but notes that two-thirds of unbanked adults need help using financial accounts, with women particularly vulnerable to financial abuse. To address these challenges, investments in financial literacy, user capabilities, and consumer protections are essential to foster trust and equitable financial access.

The objective of this research is to analyze the evolution of women's financial inclusion in Latin American (LAM) countries before and after the COVID-19 pandemic, and to identify the variables that determine this financial inclusion. Note that these objectives are in line with with Kazemikhasragh and Buoni Pineda (2022), who identify the effects of COVID-19 on gender equality, financial education and the use of technology in LAM countries and the Caribbean. However, we aim to provide a more comprehensive and detailed study, comparing financial inclusion before and after COVID-19 pandemic and detailing the results by country. To achieve these goals, the following research questions (RQ) were defined:

RQ1: What is the evolution of financial inclusion in LAM countries for men and women before and after COVID-19?
RQ2: What are the variables that determine bank account ownership in LAM?
RQ3: What variables influence the holdership and use of financial instruments in LAM before and after COVID-19?

RQ2 deals with basic financial inclusion (owning a bank account), and a relatively wide range of potentially explanatory variables will be analyzed, including age, gender, level of education, COVID-19, but also whether respondents receive public sector wages or support. In RQ3, the focus will lie on more advanced aspects of financial inclusion, from holding a debit and credit card, to purchases or bill payments through a mobile phone, and we will center more specifically on the influence of COVID-19 and gender.

To answer these research questions, we have completed the following steps. First, we have performed an extensive bibliometric analysis of global institutional reports as well as of academic research. This bibliometric analysis allows to identify the key topics in the literature related to the gender gap in terms of financial inclusion in developing countries in all regions worldwide, before and after COVID, and is the main subject of Section 2. From there on, we will focus our quantitative analysis on Latin America, arguing the particular relevance of Latin America in this context. In Section 3, we explain the sample and instruments used to analyze the case of Latin America, with World Bank 2020 and 2021 Global Findex questionnaires, as well as the econometric models. Section 4 contains the main quantitative analysis of our research in Latin America. This consists essentially of three parts. The first part (Section 4.1) contains a descriptive statistical analysis of the main indicators with regard to financial inclusion of men and women. The second part (Section 4.2) uses an econometric model to identify the significance of interrelationships on bank account ownership of a series of variables, including gender as well as several other indicators. The third part (Section 4.3) also presents an econometric analysis, but with a specific focus on gender pre- and post-COVID, combined with a selection of key indicators for advanced and digital financial inclusion, such as credit and debit card ownership, or the use of a mobile phone for bill payments or online purchases. We conclude in Section 5, where we discuss the post-COVID effect on financial inclusion, with special attention for the gender gap. In particular, we highlight that, whereas women in LAM had a slight advantage with respect to men in terms of bank account ownership and other financial inclusion indicators before COVID, this trend was reversed in post-COVID years, and there is now a substantial gap to the detriment of women. We discuss some possible reasons for this effect, and stress the importance of financial education for women in developing countries, and in LAM in particular.

2. Bibliographic mapping

We have conducted a literature review and performed a bibliometric mapping of the publications regarding the effects of the COVID-19 pandemic on the economics of developing countries, gender gap and financial inclusion. Articles and reports had been identified through an electronic search of two databases: FinDev Gateway's COVID-19 Resource Hub and Web of Science. We have selected those two databases for practical and academic reasons. From the practical point of view, FinDev Gateway is a comprehensive database that hosts more than 8,000 publications about microfinance and financial inclusion covering nearly all countries. From the academic point of view, Web of Science (WoS) is a multidisciplinary database of complete academic bibliographic references with impact and demonstrated scientific quality. WoS provides access to the electronic collections of Clarivate Analytics and allows the joint search of all its databases. The search terms used were "Gender gap; Financial inclusion; Microfinance; Developing countries". Titles and abstracts were reviewed to make sure that the key focus of the document was indeed on gender, financial inclusion and microfinance in developing countries, and to extract the necessary data for the subsequent classification.

2.1. Reports

First, we have used the FinDev Gateway's COVID-19 Resource Hub to identify documents, published in the 2022 database, addressing several aspects of the challenges faced, as well as the solutions implemented, by the principal MFIs (MicroFinance Institutions) because of the pandemic (FinDev Gateway, 2022). We have completed this with recent articles and reports on financial inclusion and technological issues that may affect women in developing countries, obtained through web pages accessed immediately through FinDev Gateway links. In total, 204 documents were retained, including reports, brief notes, working papers, and research papers. The geographical scope of these documents is wide, with Sub-Saharan Africa (24 %), South Asia (23 %), and East Asia and the Pacific (15 %) the most studied regions. 28 % of the documents do not have a country-specific focus or present comparative case studies from countries in different regions. Note that none of the publications identified addresses the Latin American experience in any comprehensive way.

Fig. 1 shows the 15 main topics identified in the papers, related to the challenges faced during the COVID-19 outbreak. The most frequently mentioned topic is payments, followed by gender and women empowerment, and digital financial services.

2.2. Academic bibliometric analysis

Additionally, we have performed a bibliometric review by applying science mapping to comprehensively examine the field of study. Our review makes use of the open-source Science Mapping Analysis Tool (SciMAT) to analyze the emergence and evolution of the main themes of study in the field before and after the COVID-19 pandemic (Cobo et al., 2011, 2012). SciMAT analyzes bibliographic networks based on keyword co-occurrence or co-citation. This proceeds first by counting the number of documents where two keywords co-appear and applying an equivalence measure index. A clustering algorithm then identifies the main themes, determines the strength of their links, and maps their evolution in terms of centrality and density. The full process consists in four consecutive steps:

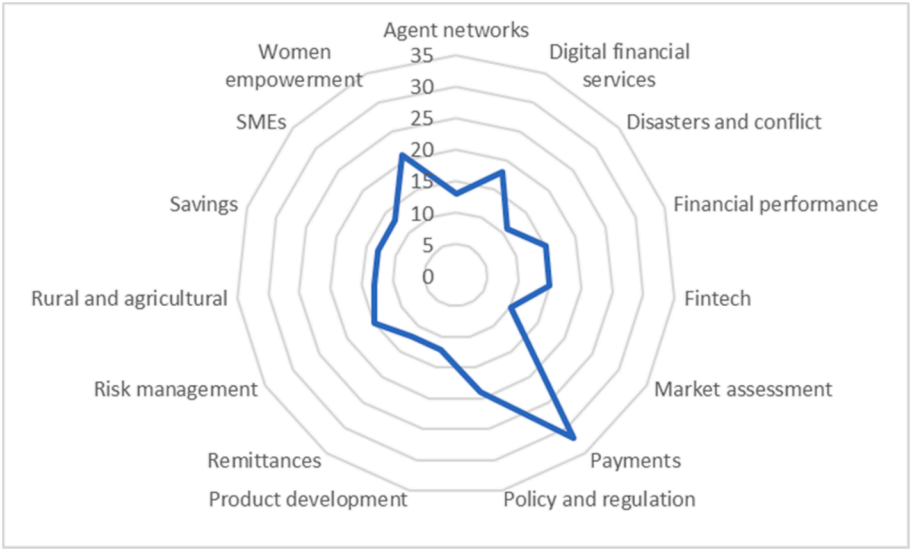

Fig. 1. Main topics identified in FinDev documents.).
Source: Authors' compilation with data from FinDev Gateway COVID-19 hub (2022

(1) Determination of keywords. As mentioned before, we have used gender gap, financial inclusion, microfinance and developing countries.
(2) Data collection: These keywords were used to identify all relevant articles from the Web of Science (WoS) database published between 1998 and 2022. These articles were manually reviewed to make sure that their main objective aligns with the field of research, and 2,326 articles were retained.

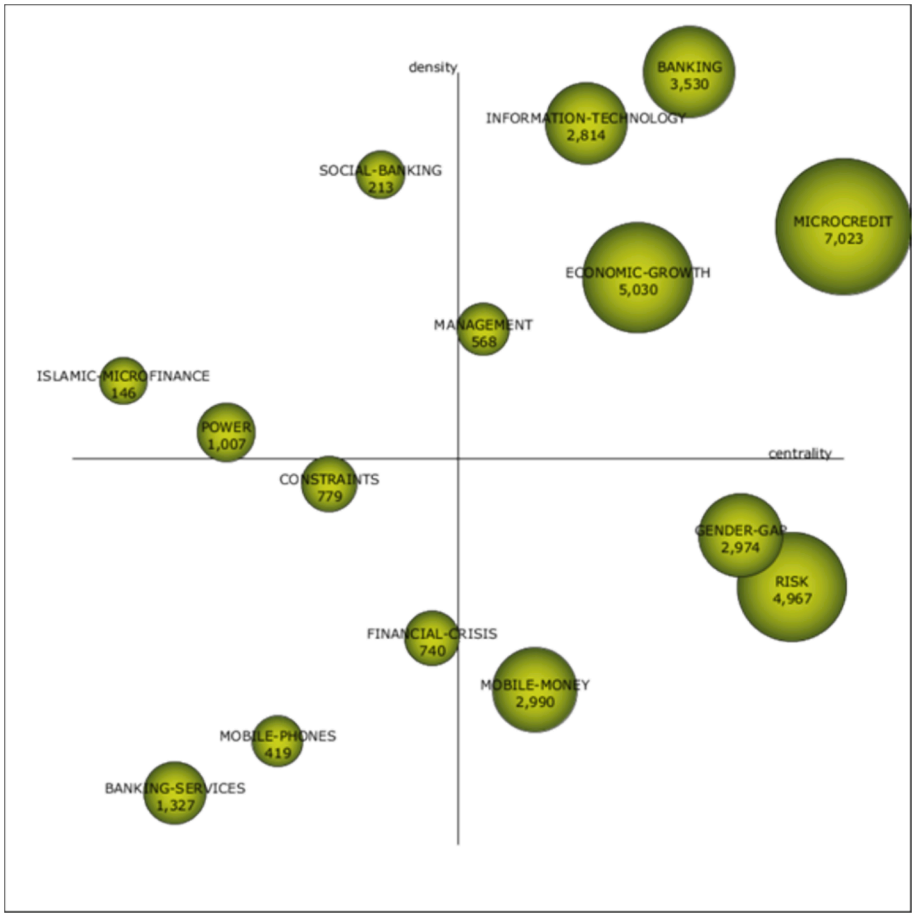

Fig. 2. Period 1 themes) for period 1998–2019.
Source: Authors -Themes detected by SciMAT from articles gathered from the Web of Science (core collection

(3) Determination of themes: the articles selected in the WoS were analyzed with the SciMAT software to detect and classify the field's central themes in the periods before and after COVID-19.
(4) Categorization of themes and visualization in a strategic diagram, based on the two parameters "density" and "centrality".

Using Scimat, we have analyzed the co-ocurrence of 5,671 words in 2,326 articles related to gender, financial inclusion, microfinance and developing countries published between 1998 and 2022. Although the analysis starts in 1998, research in this field has really taken off around 2010. Even more striking is that 1,464 of all the obtained articles (63 %) were published in the brief period since COVID-19, showing the tremendous increase of interest for this field of research. Since we are precisely interested in the effect of COVID-19, we have split the time range into two periods, 1998 to 2019 or pre-COVID, and 2020 to 2022 or post-COVID, to analyze the trends in the key subjects.

In the first period analyzed, from 1998 to 2019, the motor themes, in the upper right quadrant in Fig. 2 (high centrality and high density), were microcredit, economic growth, banking and information technology. Gender gap and mobile money appeared as basic themes (bottom right quadrant). Mobile phones and banking services were classified as emerging themes (bottom left quadrant).

The most cited research works in this period are Ozili (2018); Munyegera and Matsumoto (2016); Zins and Weill (2016); Aggarwal, Goodwill and Selleck (2015); Demirgüç-Kunt and Klapper (2012); Donovan (2012); Sarma and Pais (2011). The main issues dealt with in the literature in this period are the interrelations among microfinance, financial inclusion and their determinants, as well as their relation to economic growth. Variables such as population, poverty, income inequality and gender (Neaime and Gaysset, 2018; Allen et al., 2018) are primary determinants of financial inclusion success (Swamy, 2014). More sophisticated variables such as financial services (Demirgüç-Kunt and Klapper, 2012), financial training and financial literacy (Grohmann, Klühs and Menkhoff, 2018) were analyzed as determinants of successful financial inclusion and shown to be key factors to sustainable economic development. In the mid-2010 s, Information and Communication Technologies became a crucial device for the microfinancing area. Gender is found to be more determinant on social groups' development and trust than on achieving economic inclusion (Ghosh and Vinod, 2017; Aggarwal, Goodell and Selleck, 2015; Bjorvatn and Tungodden, 2015). Accessible and timely financial training together with microfinance products result much more effective (Mushtaq and Bruneau, 2019). Furthermore, mobile banking and digital finance have contributed to the efficiency of financial infrastructure facilitating developing countries' economic growth (Farah, Hasni and Abbas, 2018; Donovan, 2012). Concrete examples of mobile banking success have been analyzed along the years such as m-pesa in Kenya (Kim et al, 2018). Finally, remittances, through mobile bank use, have been analyzed as a bridge to fill the financial inclusion gap (Munyugera and Matsumoto, 2016; Anzoategui, Demirguc-Kunt and Peria, 2014).

In the second period, from 2020 to 2022 (Fig. 3), the motor themes are innovation technology, microcredit, financial stability, banking, digital financial inclusion and carbon emissions. Gender gap does not appear as a basic theme anymore, but it has been included in digital financial inclusion which is an emerging motor theme. We can also notice that mobile phones and mobile money have disappeared and are replaced by innovation technology and digital technology as an emerging theme.

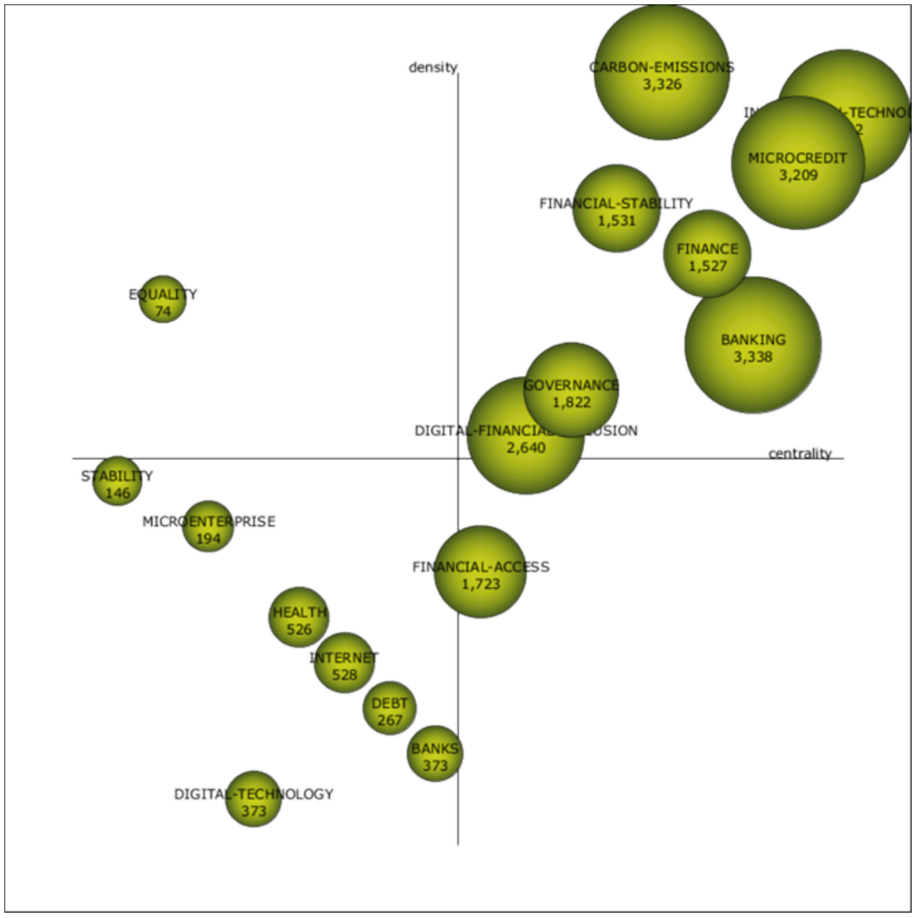

Fig. 3. Period 2 themes.) for period 1998–2019.
Source: Authors -Themes detected by SciMAT from articles gathered from the Web of Science (core collection

In the period 2020–2022, the most cited authors are Goyal and Kumar (2021) and Ozili (2021). Their systematic reviews of the field between 2000 and 2019 have categorized financial literacy, financial planning and financial education as major themes, and they conclude that financial innovation and technology (FinTech) were recent critical factors for financial inclusion, which also help to reduce income inequalities (Sharma and Tao, 2021; Schuetz and Venkatesh, 2020; Arner, Auer and Frost, 2020; Senyo and Osabutey, 2020). Financial innovation is described as new financial instruments, technologies, products and services that improve the delivery of financial services, and includes blockchain-based technologies as well as mobile banking, Information Communication Technology and Artificial Intelligence (Ozili, 2021). In 2020, an important issue is the effect of financial inclusion on poverty reduction, women empowerment and economic growth. Financial inclusion can be improved through financial education, appropriate banking products and financial services, geographical access and digital technologies (Koomson, Villano and Hadley, 2020; Churchill and Marisetty, 2020; Adegbite and Machethe, 2020; Demirguc-Kunt et al., 2020; Zimmerman et al., 2020). Regarding women's financial inclusion, several articles stress that women still have less access to managerial and financial resources (Si et al., 2021; Bourgault and O'Donnell, 2020; Martinez and Jayawarna, 2020; Sangem, 2020). Finally, it is worth mentioning that the relation between financial inclusion and ecological sustainability, in particular carbon dioxide emission reduction, is an important emerging topic (Ullah et al., 2022).

2.3. Financial inclusion, microfinance and gender gap: The case of Latin America

After an initial focus on developing economies, this research shifts to Latin America and the Caribbean (LAM), where poverty affects 201 million people (32.1 % of the population), including 82 million (13.1 %) in extreme poverty (Social Panorama 2022). The pandemic worsened existing vulnerabilities including informal labor markets, dependence on sectors requiring physical-proximity like tourism, fragile healthcare systems, and inequal access to digital tools. Unemployment rose to 10.4 % in 2020 (22.2 % for women), and female labor force participation dropped by six percentage points, erasing a decade of progress (CEPAL, 2020). Rising inequality further compounded the economic and social challenges, disproportionately impacting women's autonomy.

LAM is particularly interesting in terms of financial inclusion. Microfinance institutions (MFIs) globally reached 140 million low-income clients in 2018, with a loan portfolio of $124 billion (Microfinance Barometer 2019). South Asia had the majority of borrowers (85.6 million or 63 %) compared to LAM's 22.2 million (15.9 %). However, LAM had the largest share of the global loan portfolio, holding $48.3 billion (38.9 %) versus South Asia's $36.8 billion (29.7 %). While South Asia saw 89 % of borrowers as female, LAM had limited rural reach, with rural clients accounting for just 23 % of its total (see Table 1).

Table 1
Financial Inclusion beneficiaries and Gross loan portfolio by region.

Region	Number of beneficiaries (million)	Total gross loan portfolio (US $ Billion)
Latin America and Caribbean	22.2	48.30
Eastern Europe and Central Asia	2.5	5.70
Middle East and North Africa	2.5	1.50
South Asia	85.6	36.80
Africa	6.3	10.30
East Asia and pacific	20.8	1.50
Total	**139.9**	**124.10**

Source: Author's own compilation, from Microfinances Barometer 2019.

A key reason to study Latin America and the Caribbean (LAM) is the success of digital promotion campaigns during COVID-19 in countries like Brazil and El Salvador (MasterCard, 2023). Before the pandemic, much of LAM's low-income population relied heavily on cash, with 81 % of retail purchases paid in cash in 2018 (World Bank, 2020). Even bank account holders often withdrew funds immediately in cash. However, COVID-19 lockdowns accelerated the adoption of digital technologies, particularly through government subsidies and Conditional Cash Transfer programs. Notable examples include Brazil's real-time digital transfer system, PIX, integrated into welfare programs like CadUnico and Bolsa Familia, and similar initiatives by Central Banks in Costa Rica and Argentina. Additionally, private P2P networks in Colombia and Peru have further expanded digital payment usage.

3. Methodology and sample

Our analysis is based on the World Bank Global Findex database which contains data regarding financial inclusion obtained from surveys in over 140 countries. These surveys were held in 2011, 2014, 2017 and 2021. The questions are similar in each edition and focus on whether and how adults have access to formal or informal financial services. To observe the association of COVID-19 and financial inclusion in LAM, we have focused on the 2017 and 2021 surveys, and selected all LAM countries that were included in both editions, namely Argentina (ARG), Bolivia (BOL), Brazil (BRA), Chile (CHL), Colombia (COL), Costa Rica (CRI), Dominican Republic (DOM), Ecuador (ECU), El Salvador (SLV), Honduras (HND), Panama (PAN), Nicaragua (NIC), Paraguay (PRY), Peru (PER), Uruguay (URY) and Venezuela (VEN). An important absentee is Mexico, since the only available data was for 2017. However, the selected countries are well representative of the region and reflect 70 % of the Latin American GDP in 2022 (World Bank, 2024).

We have selected a series of questions from the questionnaires related to the ownership and use of basic financial instruments, see Table 2. This selection is inspired by the results obtained in the bibliometric analysis presented above in Section 2, and thus reflects the issues that are typically considered relevant in the academic literature on the subject, and in particular with respect to a developing region such as Latin America (Kazemikhasragh and Buoni Pineda, 2022; Mousa and Ozili, 2022; Kelikume, 2021; Si et al., 2021; Farah et al., 2018; Kim et al., 2018).

To answer RQ1, we have performed a frequency analysis of the answers to the first block of selected questions (up to Fin31b: mobile phone utility payment), detailing data before and after COVID- 19 per gender, for the whole of LAM (see Table 3) as well as per country (see Figs. 3 to 6), see Section 4.1. Note that the last four variables in Table 2 (Fin16-30-33-37) will not be analyzed as such, they merely serve as independent variables in the econometric models to be discussed next (Fig. 7).

RQ2 and RQ3 are addressed through two econometric regression models. For RQ2, in particular, we will use financial account ownership ("Account fin") as dependent variable, as this is a crucial indicator for basic financial inclusion, and study the influence of the following variables: Fin16-30-33-37 from Table 2; whether the respondent owns a mobile phone (yes/no); their level of education (primary school or less; secondary education; tertiary education or more; age (in years); gender (female or not); COVID (pre or post); as well as the cross-effect COVID&female.

For RQ3, we will focus more exclusively on the effect of COVID (pre or post) and gender (female or not), again adding the cross-effect COVID&female, on a series of dependent variables that are characteristic for concrete aspects of financial inclusion, in particular Fin2 (debit card), Fin7 (credit card), Fin14a (mobile phone bill payments) and Fin 14b (mobile phone on-line purchases), as well as Fin31a (bank account utility payment) and Fin 31b (mobile phone utility payment), of Table 2, which cover key aspects of more advanced financial inclusion. The only additional independent variable is age, since it is reasonable to expect age to play an important role in financial inclusion, especially related to

Table 2
Findex questionnaire questions selected for the analysis.

CODE	SUBCODE	VARIABLE	VALUES	
Account fin		Do you have an account at a financial institution?	1 2	YES NO
Account mob		Do you have a mobile money account?	1 2	YES NO
Fin 2		Do you, personally, have a debit card?	1 2	YES NO
Fin 7		Do you, personally, have a credit card?	1 2	YES NO
Fin 14	a	In the PAST 12 MONTHS, personally, used a mobile phone or the Internet to make bill payments	1 2	YES NO
	b	In the PAST 12 MONTHS, personally, used a mobile phone or the Internet to make bill payments or buy something online		
Fin 31	a	In the PAST 12 MONTHS, personally, made payments for electricity, water, OR trash collection with an account at a bank or another formal financial institution	1 2	YES NO
	b	In the PAST 12 MONTHS, personally, made payments for electricity, water, OR trash collection with a mobile phone		
Fin 16		In the past 12 months, have you personally, saved or set aside any money for your old age?	1 2	YES NO
Fin 30		In the past 12 months, have you personally, made regular payments for electricity, water or trash collection?	1 2	YES NO
Fin 33		In the past 12 months have you been employed by the government, military, or public sector?	1 2	YES NO
Fin 37		In the past 12 months, have you personally, received any financial support from the government? This money could include payments for educational or medical expenses, unemployment benefits or subsidy payments. Please do not include wages or any payments related to work	1 2	YES NO

Source: World Bank Global Findex database (2017 and 2021).

Table 3
Basic characteristics of Findex questionnaire respondents.

Number of respondents	2017 female 6357	 male 9683	2021 female 9217	 male 6800
Age (years)	mean 27.86	standard dev. 17.88	max. 85	
Education level (%)	primary 32.7	secondary 52.7	tertiary or more 14.0	
Mobile phone ownership (%)	yes 85.0	no 14.0		

Source: World Bank Global Findex database (2017, 2021), compiled by the authors.

digital tools.

Our main objective is to provide clear and robust insights into the relationships between the variables at hand. We therefore aim to use a straightforward and easily interpretable model. While ordinary least squares (OLS) regression might be an obvious candidate for simplicity, it is not suitable in this context. This is because the dependent variables in both regression models are dichotomous, since financial account ownership (Account fin, the dependent variable in RQ2), as well as the different dependent variables in RQ3 just listed, have "yes" and "no" as possible answers, see Table 2 above. The same holds true for most of the independent variables. OLS, on the contrary, assumes continuous dependent variables and can produce predicted probabilities outside the meaningful 0–1 range.

For these reasons, we employed a logit model of the form

$$P(y) = \frac{1}{1 + e^{(\beta_0 + \beta_1 X_1 + \cdots + \beta_n X_n)}},$$

where $P(y)$ represents the probability for the dependent variable y. The logit model is specifically designed for binary outcomes, and also allows us to interpret coefficients easily as changes in the odds ratios of the outcome. Thus, a value larger than 1 for these odds ratios indicates a positive (reinforcing) effect, a value smaller than 1 a negative effect. To be more specific, when the independent variable x_i is itself binary, then an odds ratio of a means that the dependent variable y is a times more likely to be true if x_i is true than if x_i is false, all other variables regarded as constants, see the results in Sections 4.2 and 4.3 below for concrete examples. If x_i is continuous (e.g., age), then the odds ratio indicates the effect of incrementing x_i by one unit (Woolridge, 2010).

While more advanced models could potentially yield more precise and apparently more significant estimates, introducing such complexity without a strong theoretical basis may lead to a risk of overfitting, especially if there is no a priori reason to expect a correspondingly complicated relationship between the variables. Also, the logit model used here has produced significant results and very reasonable McFadden pseudo-R^2 values (McFadden, 1972), confirming its suitability for our dataset and research questions, as detailed in Sections 4.2 and 4.3.

Some basic characteristics of the Findex questionnaire respondents are shown in Table 3. Note that there are no noticeable gender differences with respect to the age of the respondents.

4. Results and discussion

4.1. Interrelations between financial inclusion, gender and COVID-19 in Latin American countries

Between 2011 and 2021, important advances in financial inclusion have taken place worldwide. Bank or mobile account ownership increased by 50 % between 2011 and 2021, up to 76 % of adults worldwide. COVID-19 has not only drastically increased this percentage, but also implied a major digitalization of finances, in terms of payment methods, financing strategies and savings. This worldwide trend is also seen in LAM in particular. Bank account ownership has increased between 2017 and 2021. However, as Table 4 shows, there are marked gender differences, with a much stronger increase in bank account ownership for men (+40.7 %) than for women (+3%). As a result, almost 40 % of women remain unbanked in 2021, versus 30 % among men. The main reasons why people do not have accounts are lack of money (69 %), the costs of financial services (48 %), lack of trust in financial institutions (34 %) and lack of documentation (22 %) (WorldBank Global Findex, 2021). A specific study about Argentina mentions that women are less likely to own a bank account because they prefer an account with non-financial entities that offer them prepaid cards instead of credit cards (Ministerio Economía Argentina, 2022). Note that COVID-19 has thus reversed the gender situation with respect to account holdership: women had an advantage compared to men before COVID-19 (+8.3 percentage points or pp for financial account, +2.7 pp for mobile account), but after COVID-19, men have a roughly 10 pp advantage on both variables.

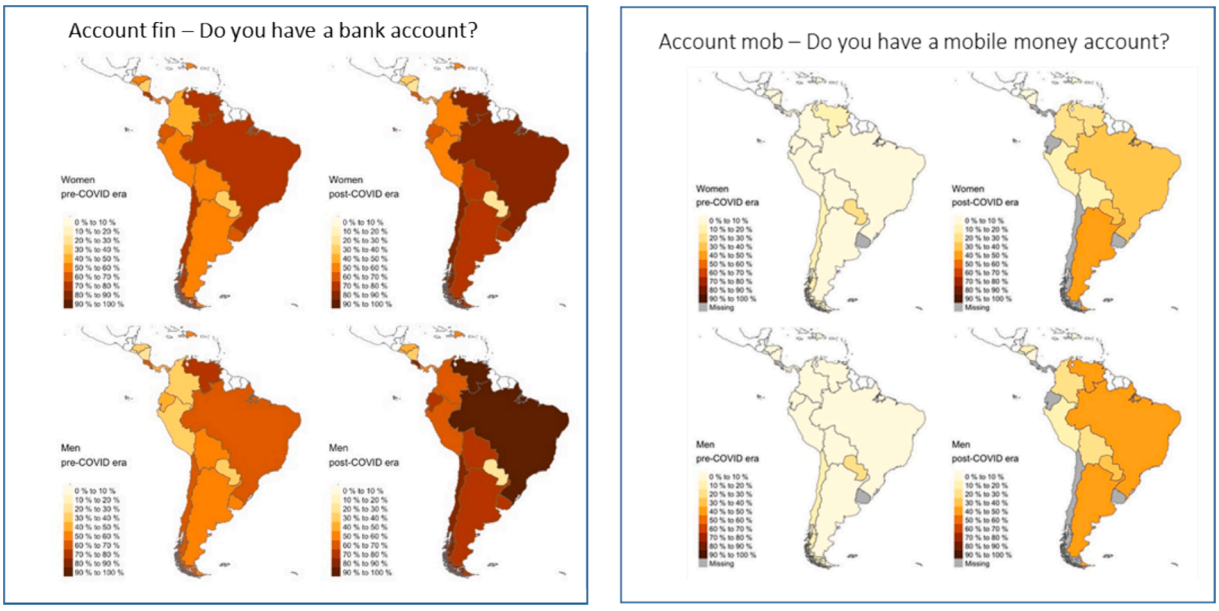

Fig. 4. Financial and mobile account holdership per country and gender pre and post-COVID. .
Source: World Bank Global Findex database (2017, 2021), compiled by the authors

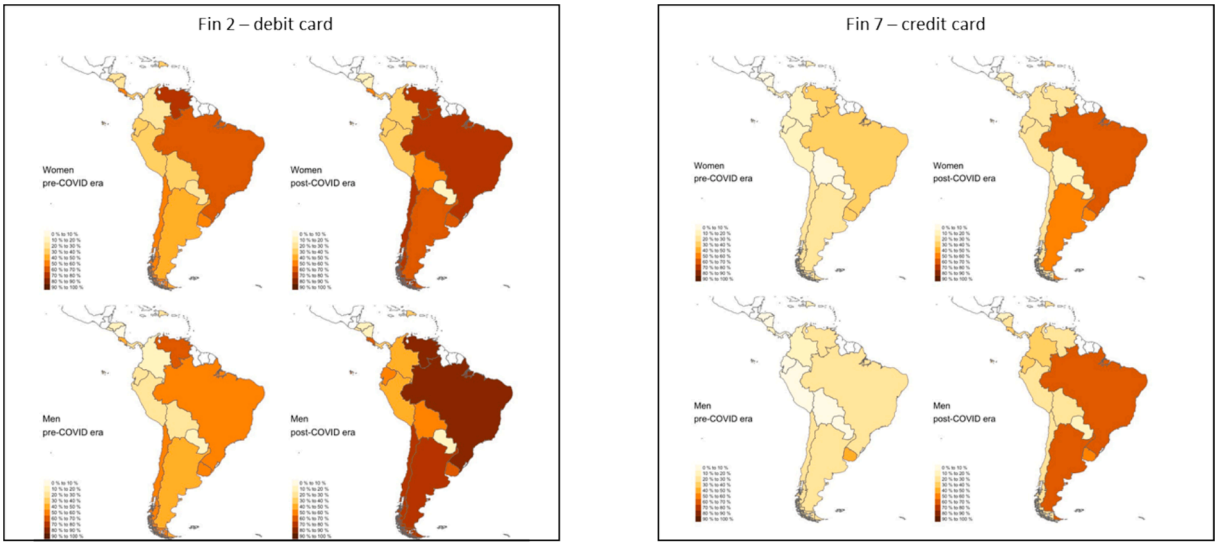

Fig. 5. Debit card and credit card ownership (Fin2 y Fin7). .
Source: World Bank Global Findex database (2017, 2021), compiled by the authors

This pattern is true for all eight variables shown in Table 4. All changes are statistically very significant (extremely low p-values against the null hypotheses of no change) because of the large sample sizes involved. COVID has increased the affirmative percentages for all variables, for both women and men, with the only exception of debit card ownership among women (Fin2), which has remained stable at 40 %. So in general terms, COVID has contributed to the financial inclusion of both genders in Latin America. With respect to gender differences, the evolution is the following. Women had a larger percentage of affirmative response than men before COVID-19, with advantages typically on the order of 3–5 pp, with a maximum difference of 9 pp for Account_Fin and Fin2 (debit card). After COVID-19, men take advantage of 6–8 pp (Fin7 (credit card), Fin14a (mobile phone bill payments)) up to 12 pp (Fin2 (debit card)), with most differences in the 10 pp range. In other words, before COVID-19, a slightly larger percentage of women compared to men had a financial account, a mobile money account, a debit card, a credit card, used the internet to make bill payments or make purchases, and paid utility bills using an account or a mobile phone. After COVID-19, a sizably larger percentage of men answered affirmatively on all these questions.

In more detail, ownership of debit (Fin2) and credit (Fin7) cards have both strongly increased because of the boost in the digitalization of payments during COVID-19. However, whereas credit card ownership has increased by a factor 2.78 for men (24 pp), for women this factor is only 1.74 (13 pp). Even more markedly, debit card ownership has increased by 65 % for men, but has remained at the same level for women. As a result, the percentage of men holding either type of card is now substantially larger than for women.

The ownership of mobile accounts (Account_mob) and the use of mobile payment (Fin14a (mobile phone bill payments) and Fin 14b (mobile phone on-line buyings)) has also strongly increased over the observed period. But again, there are marked gender differences. Men

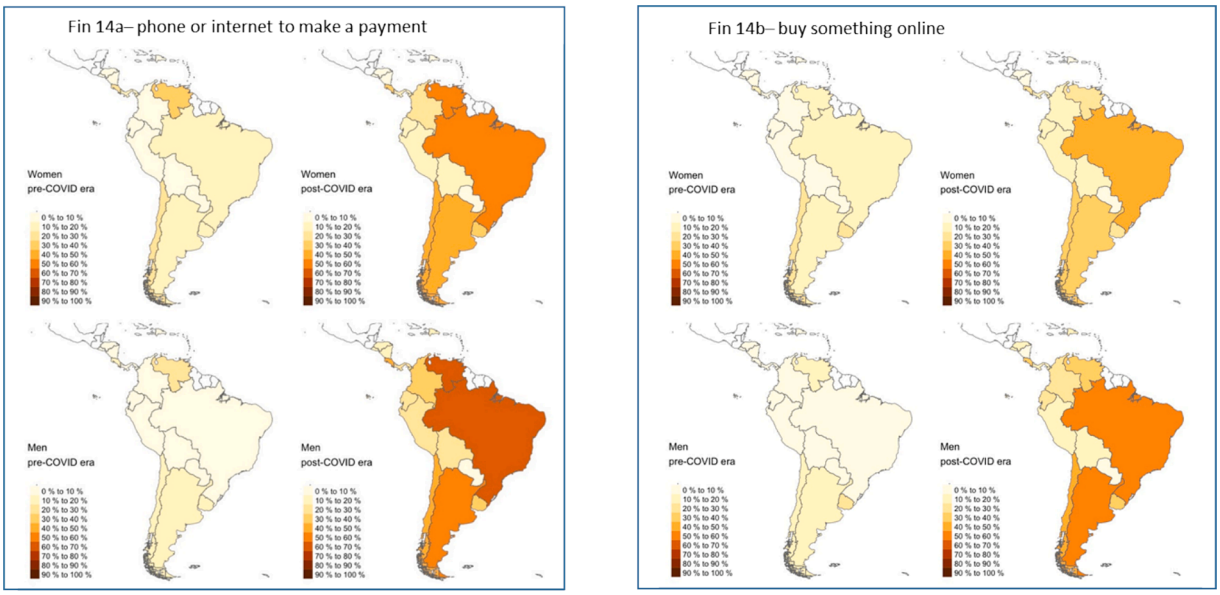

Fig. 6. Use of mobile phone to make a bill payment (Fin14a) or online purchase (Fin14b). .
Source: World Bank Global Findex database (2017, 2021), compiled by the authors

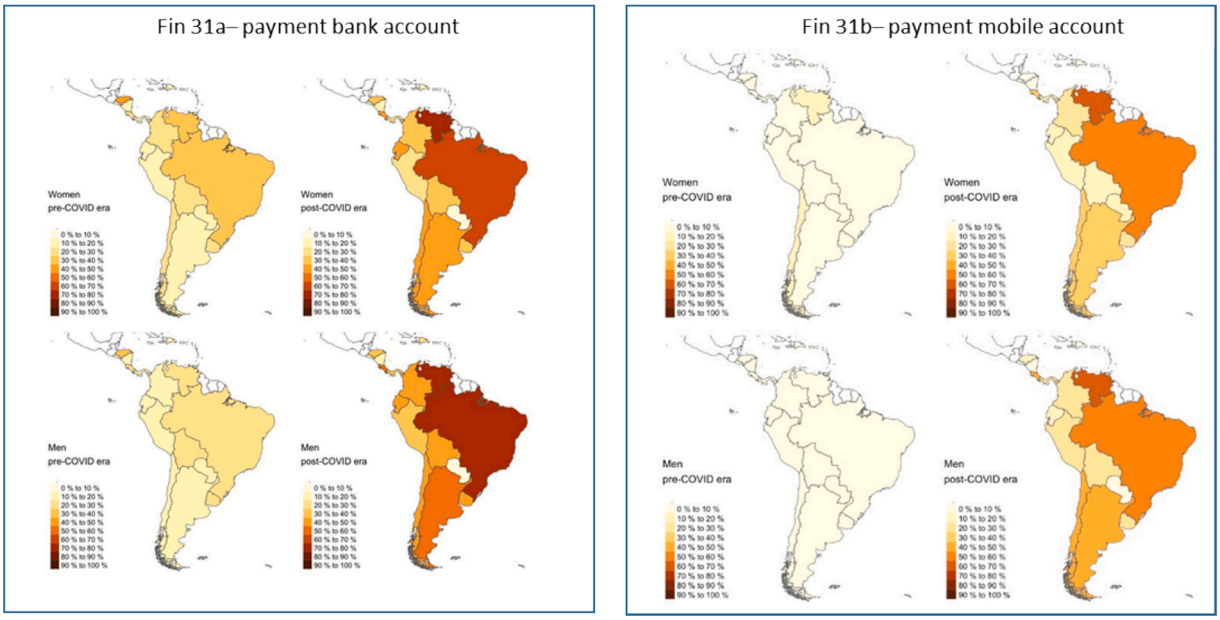

Fig. 7. Bill payment through bank account or mobile account. .
Source: World Bank Global Findex database (2017, 2021), compiled by the authors

increase positive responses by a factor of 5 (Account_mob) and almost 4 (Fin14a (mobile phone bill payments)-Fin 14b (mobile phone online purchases)), versus 2.2 (Account_mob) and 1.7 (Fin14a-b) for women, with the final percentages much larger for men. This difference cannot be explained by alleging that women have fewer mobile phones. Indeed, more than 80 % of the adult population has a mobile phone or smartphone in Latin America, with a gender gap of only 2 % (GMSA, 2023). However, women are less likely than men to be aware of mobile internet (GMSA, 2023), to be able to read or send SMSs (Bourgault and O'Donnell, 2020), or even to answer and end a call (Giri and Aadil, 2020).

Similar observations are valid for bill payments, both through a bank account (Fin31a (bank account utility payment)) or with a mobile phone (Fin31b (mobile phone utility payment)), where the improvement factors are 1.6 and even 2.2 times higher for men than for women, respectively, and the absolute final percentage is also substantially higher among men.

We do not have quantitative data to explain these trends. However, in general terms, it is clear that cultural and social norms can influence the financial behavior of individuals and households. For example, in some cultures, men may be more likely to control household finances and manage banking relationships. Also, women in LAM are much more likely than men to operate in informal economic sectors, and hold a smaller percentage of government jobs (CARE, 2020; Zimmerman et al., 2020; IFC UN Women and European Union, 2020). Thus, women are more likely to be paid in cash rather than via a bank or mobile transfer, have benefited less from government-planned digital payment schemes, and were also more likely to simply lose their source of income. Indeed, women represent 39 percent of total employment, but 54 percent of total

Table 4
Financial inclusion data before and after COVID-19.

		Pre-Covid	Post- Covid	var. %	Pre-Covid	Post- Covid	var %
Account Fin	yes	58.25 %	60.04 %	3.07 %	49.95 %	70.28 %	40.69 %
	no	41.75 %	39.96 %	−4.29 %	50.05 %	29.72 %	−40.61 %
Account mob	yes	8.31 %	18.38 %	121.18 %	5.57 %	27.68 %	397.04 %
	no	91.69 %	81.62 %	−10.98 %	94.43 %	72.32 %	−23.42 %
Fin 2 (debit card)	yes	40.42 %	40.83 %	1.02 %	31.80 %	52.48 %	65.02 %
	no	59.58 %	59.17 %	−0.69 %	68.20 %	47.52 %	−30.32 %
Fin 7 (credit card)	yes	18.33 %	31.50 %	71.88 %	13.53 %	37.66 %	178.43 %
	no	81.67 %	68.50 %	−16.13 %	86.47 %	62.34 %	−27.91 %
Fin 14a (mobile phone bill payment)	yes	11.65 %	23.24 %	99.52 %	8.37 %	31.93 %	281.54 %
	no	88.35 %	76.76 %	−13.12 %	91.63 %	68.07 %	−25.71 %
Fin 14b (mobile phone on-line purchases)	yes	10.90 %	17.39 %	59.57 %	6.38 %	26.02 %	307.98 %
	no	89.10 %	82.61 %	−7.29 %	93.62 %	73.98 %	−20.98 %
Fin 31a (bank account utility payment)	yes	21.98 %	32.32 %	47.07 %	17.66 %	42.82 %	142.53 %
	no	78.02 %	67.68 %	−13.26 %	82.34 %	57.18 %	−30.56 %
Fin 31b (mobile phone utility payment)	yes	5.82 %	20.71 %	255.92 %	3.81 %	29.25 %	668.48 %
	no	94.18 %	79.29 %	−15.81 %	96.19 %	70.75 %	−26.45 %

Source: World Bank Global Findex database (2017, 2021), compiled by the authors.

job losses related to the pandemic, with a global job-loss rate 1.8 times higher than for men (Mirpourian and Kelly, 2021). Besides, many more women than men take care of the household, including aged parents and children, and this has further increased during COVID (Mirpourian and Kelly, 2021).

Another possible aspect that could deserve exploring is that men who work in factories or agriculture were not allowed to go to their work during the COVID-lockdown. Perhaps they took that as an opportunity to take up some financial responsibility in the household.

Finally, there are important differences in education that can affect how comfortable men and women are with technological applications, and with digital payment methods in particular. In general terms, the well-known gender gap in STEM has improved but is still important, worldwide and in Latin America in particular. Also in concrete terms of digital financial tools, women lag behind in terms of access, training, and trust. Women, especially in developing countries, need to receive financial training to understand basic financial concepts, such as how to open a bank account, understand what a budget is and what savings are (Walbey and Tan Yi Lu, 2020). They also need technical training with respect to digital technology and devices such as phone, tablet or computer (Goodwin-Groen et al., 2021; Sharma and Tao, 2021; Walbey and Tan Yi Lu, 2020). Digital ambassadors or key influencers could be identified to share their experience and increase women's confidence in these tools. Financial service providers could train mobile phone mentors that will teach others how to perform digital financial operations ("learning by doing"). Banks and financial institutions should be stimulated to carry out awareness and promotion campaigns directed specifically at women (IFC UN Women, 2021; Sharma and Thao, 2021; CARE, 2020; Giri and Aadil, 2020). They could also be incentivized to hire more women in order to engage and build a higher level of trust with female clients.

So far we have looked at overall tendencies in LAM. Figs. 3 to 6 below show a graphical analysis per country. In qualitative terms, most countries throughout the region obey the tendencies just described. However, there are a few exceptions, as well as strong disparities in the actual numbers, mainly related to the level of economic development of the country.

Fig. 4 analyzes bank account and mobile account holdership before and after COVID-19, detailed by gender and country. Regarding bank account ownership, this has increased relevantly for both men and women in most countries. This can be related to social programs developed during COVID-19. For instance, Argentina created a universal, costless account, and established a benefit program called Emergency Family Income (IFE), aimed at the most vulnerable sectors of the population, and paid through the National Social Security Administration (ANSES). According to Argentina's Central Bank, the percentage of people without any type of account decreased by half in three months' time, in part thanks to the government's efforts to make these payments remotely (Ministerio Economía Argentina, 2022). In Brazil, the pro-innovation regulatory landscape allowed digital banks to leverage new technologies, which have been critical for the growth in financial inclusion during the pandemic (Mastercard, 2023). Other countries such as Chile, Bolivia, Colombia or Uruguay have seen similar increases for both men and women. In the Dominican Republic, Paraguay and Peru, bank account ownership among men has increased notably but women have stagnated, while in Costa Rica, El Salvador, Honduras, Nicaragua and Panama, it has even decreased remarkably for women. In fact, in El Salvador, Honduras, Nicaragua and Panama, less than 50 % of women declare holding a bank account post-COVID, versus more than 80 % in Argentina, Brazil, Chile or Venezuela.

Mobile account holdership has increased relevantly among men and women throughout the LAM region, but with lower absolute numbers, and especially with large disparities between countries (more than 40 % of men, and 30–40 % of women, in Argentina, Brazil and Venezuela, versus 8–12 % of men and 5–7 % of women in the Dominican Republic, Honduras or Nicaragua). Paraguay, which scores in the lower range on most other variables studied, does very well here, both in absolute terms and in terms of gender equality, with 35 % among both men and women holding a mobile phone account. Colombia also shows almost perfect gender equality (29 %). In other countries, there is a relative gender gap of 40–60 %, even in countries such as Brazil or Venezuela with high absolute numbers.

Fig. 4 shows the ownership of debit (Fin2) and credit card (Fin7), again classified by gender, pre and post-COVID. Men have increased their debit and credit card ownership in all countries, with particularly strong increases of a factor 5–7 for credit card ownership in countries where this was originally low, such as Honduras, Ecuador or Nicaragua. For women, debit card ownership has increased only in Argentina, Bolivia, Brazil and Chile, and stagnated or even decreased in all other countries. Credit card ownership among women has increased outstandingly (+30–100 % in most countries), but much less so than for men (+165–300 %, and even more in the countries mentioned above). There is even a decrease in credit card ownership (−26 %) among women in Venezuela.

In Fig. 5 we observe the mobile or online bill payments and purchases (Fin 14a and Fin14b). For men, these have both increased very strongly in all countries, by a factor 4 to even 7 in many countries. For women, although the increase is important in most countries, increases are much lower, mostly on the order of 30–80 %, with the notable exception of Brazil (+400 % for Fin14a (mobile phone bill payments), +250 % for Fin14b (mobile phone on-line purchases). There are some curious decreases for women in Nicaragua (−27 % on Fin14a) and the

Dominican Republic (−6% for Fin14a, −24 % for Fin14b), where rates were already very low before COVID-19. In absolute terms, the most developed countries in LAM such as Argentina, Brazil or Chile have much higher mobile payment rates than economically less developed countries such as Nicaragua, Honduras or Paraguay.

Finally, Fig. 6 analyzes the payment of bills through a financial account (Fin31a) or mobile phone (Fin31b). Again, these have strongly increased for men in all countries, except Fin31a in Honduras (stagnates) and Paraguay (−77 %), with increases on Fin31a typically of 120–240 % and 400–1000 % or even more for Fin31b. For women, increases are also considerable but much more modest, mostly 20–80 % on Fin31a and 140–380 % on Fin31b. Financial account payments decrease among women in Honduras (−25 %), Paraguay (−68 %) and El Salvador (−36 %), where mobile payments also decrease (−18 %). Again, in absolute terms, there are strong disparities between more developed countries such as Brazil, Argentina, Chile or Costa Rica, where mobile phone payments among women reach 30 to 50 %, and 40 to even 60 % for men, and less developed ones such as the Dominican Republic, El Salvador or Nicaragua, where the percentages do not reach 10 % among women or men.

To sum up, financial inclusion has improved markedly in Latin American countries after COVID-19. However, the small pre-existing gender gap in favour of women has reversed into an almost 10 percentage point disadvantage for women in terms of financial or mobile money account holdership, debit and credit card ownership, digital bill payments or online purchases. Absolute numbers differ strongly among countries, mostly depending on their level of development, with even decreases for some variables in certain countries. However, in qualitative terms, the gender gap conclusion just stated is generally valid and independent of the level of development.

4.2. Variables determining bank account ownership in LAM countries pre and post COVID

Regarding research question 2, we analyze bank account ownership in LAM, as we understand this to be an unquestionable key indicator of basic financial inclusion. Therefore, it is important to study which variables determine the probability of owning a bank account in LAM. The independent variables chosen for this model were discussed in Section 3. The results are shown in Table 5, per country as well as in general.

In order to make the survey sample representative for the whole region, in the general (LAM-wide) model, we have given weights to the answers per country proportionally to each country's adult population.

The explanatory power of the model is measured by the McFadden pseudo-R^2 value (McFadden, 1972). It is relatively weak at the global (LAM) level, as evidenced by the low McFadden pseudo-R^2 value. This should come as no surprise, since several variables which are known to play a key influence on financial inclusion, such as income level, professional sector, or rural/urban residence, are not included. Nevertheless, for several individual countries with a McFadden ≥ 0.18, and especially Argentina, Brazil, Chile and Uruguay (McFadden > 0.2), it is in fact reasonably strong. Similar conclusions are obtained from other goodness-of-fit measures such as the Cragg-Uhler or AUC-ROC.

All independent variables selected from the Findex Questionnaire are highly significant in the general, LAM-wide model. The strongest positive influence (odds ratio > 1) comes from being employed by (Fin33), or receiving support from (Fin37) the government. For instance, the odds ratio of 2.63 for having received a public sector wage payment means that, according to this model, a person who has received such a public sector wage payment is 2.63 times more likely to own a financial account compared to someone who has not received such a public sector wage payment, and moreover this influence is highly significant (p-value < 0.001). Saving for old age (Fin16) and paying utility bills (Fin30), as well as owning a mobile phone, also have a positive, but smaller, effect. These tendencies are repeated in all countries under study, although the significance levels vary from country to country. The

Table 5
Variables that determine financial account ownership.

	Global	ARG	BOL	BRA	CHL	COL	CRI	DOM	ECU	SLV	HND	NIC	PAN	PRY	PER	URY	VEN
Saved for old age	1.74***	1.50	1.85**	1.46	1.92	3.25***	1.35	4.17***	1.93.	2.11*	1.89.	1.67*	2.49**	2.02*	1.93*	2.22.	0.58
Paid a utility bill	1.69***	1.81*	2.02***	1.84.	2.71**	1.52*	2.47***	1.58*	2.06**	1.79*	2.51***	1.43.	2.00**	2.02**	1.49	2.02**	1.87*
Received public sector wage payments	2.63***	4.44***	1.85**	4.82*	1.77	2.41**	2.92**	3.32***	1.71	2.38**	3.46***	2.06***	2.12*	8.59***	4.78***	5.54***	5.14**
Received a government transfer	3.47***	4.98***	1.48	2.88*	4.24**	3.92***	2.50***	2.48**	2.79	1.06	1.19	2.00*	1.57	2.62*	4.54**	3.06***	5.37*
Mobile owner	1.57***	0.43**	0.68	2.87**	7.01***	0.73	1.66	2.13***	0.99	1.05	1.51	0.78	0.87	0.27***	0.77	1.02	1.97.
Primary school or less	0.38***	0.28***	0.3***	0.37**	0.34**	0.75	0.48**	0.34***	0.34**	0.42***	0.46**	0.64*	0.49.	0.3***	0.41.	0.34***	0.25**
Higher education	3.11***	3.28**	2.63**	3.54	2.42.	5.79***	3.75**	1.48	3.16*	4.02***	3.82**	2.39***	2.06**	1.96**	2.08*	5.02*	2.66.
Age	1.01**	1.03***	1.02*	1.01	0.97**	1.00	0.99	0.99	1.02.	0.99	1.00	0.99	0.99	1.01	1.00	1.02.	1.04***
Female	1.06	1.07	0.69	1.21	1.58	0.99	1.28	1.03	1.19	1.00	0.58.	0.91	1.12	0.92	1.15	1.37	1.42
Post COVID	2.19***	2.19**	1.81*	3.77**	2.06	2.47***	2.36*	1.01	3.1**	1.21	0.68	1.02	1.93*	0.69	2.62**	3.15**	2.89**
Post COVID * Female	0.68*	0.95	0.91	0.59	0.70	0.77	0.68	0.75	0.49	0.63	1.09	0.64	0.81	1.28	0.57	1.26	0.71
McFadden	0.05	0.23	0.16	0.21	0.23	0.18	0.19	0.18	0.17	0.15	0.18	0.09	0.11	0.18	0.15	0.22	0.19

Dependent variable: Financial account ownership. Own elaboration. Data source: World bank Global Findex Database (2017, 2021). Significance levels: *** <0.001; ** <0.01; * <0.05; . < 0.1.

influence of education is very clear. Taking secondary education as the reference level, people with only primary education are strongly less likely to have a bank account (odds ratio < 1), while higher education increases this probability by a factor of 3. Again, the significance levels are high in the LAM-wide model, and for most countries. For instance, in Argentina, it is known that 80 % of people with secondary education or higher have a bank account, versus only 57 % of those with at most primary education (Ministerio Economía Argentina, 2022). Age is essential LAM-wide and in several countries, but with a small influence (odds ratio near 1).

Regarding gender and how COVID has influenced the gender gap, the following is observed. Gender is not a relevant factor, not generally nor in any of the countries studied. COVID has a strong positive influence, and this influence is highly significant LAM-wide, although not in all countries. Finally, the product combination of female gender with COVID is negative, but only lightly influential LAM-wide, not in any individual country. It is perhaps useful to recall that bank account ownership is quite high in most of LAM, see Table 3 and Fig. 3 above, thus the actual gender gap of roughly 10 pp, both LAM-wide and in most countries, is reasonably limited in relative terms. It is thus safe to conclude that gender is by itself not a strongly determinant factor for financial account ownership in LAM. Even in combination with COVID, there are other, more important explanatory factors which relegate the gender + COVID issue to secondary significance. Note that a similar conclusion holds true in terms of mobile account ownership: gender is not meaningful, not even in combination with COVID, and this is true LAM-wide and for each individual country.

However, as we will see in the next section, this does not mean that there are no outstanding gender differences before and after COVID in the different aspects of more advanced financial inclusion, expressed through the holdership and use of various financial instruments.

4.3. *Variables influencing the use of financial instruments in LAM countries before and after COVID-19*

Regarding RQ3, about the influence of gender and COVID on more advanced financial inclusion, we have constructed a multiple regression model with the variables explained in Section 3. The results are shown in Table 6.

Two preliminary remarks are in order. First, with very few exceptions, all country dummy variables are highly significant for all dependent variables. This testifies to the consistency of the model, as well as to the large diversity between LAM countries. Second, age is (highly) notable for all variables, but its influence is small (odds ratio near 1).

Post-COVID, gender, and the combined effect Post-COVID*gender are (highly) significant for all dependent variables, with very clear and strong influences. COVID has had a very large positive connection with all dependent variables, with odds ratios ranging from 3 (Fin2: debit card) or 5–6 (Fin7: credit card, and Fin31a: bank account utility payment), over 10–11 (Fin14a (mobile phone bill payments) and Fin 14b (mobile phone on-line purchases) up to a remarkable 23 (Fin31b: mobile phone utility payment). Gender by itself (without looking at COVID) also has a pertinent, but much less pronounced influence, and is in fact positive (odds ratio > 1) for the female gender. Thus, all other variables kept constant, and in particular taking pre- and post-COVID together, women have an odds ratio on the order of 1.5 on all dependent variables measured. However, the combined product influence of COVID and gender is also highly significant, and is very strongly in the detriment of women, with odds factors of 0.4–0.5 on all 6 dependent variables. As usual, care should be taken when interpreting these numbers, especially with regard to the product or interaction effect (Berry et al., 2010). However, the tendencies just discussed are very clear, and confirm what was seen from the descriptive analysis in Section 4.1. Thus, whereas women had a small advantage over men in terms of these advanced financial inclusion indicators before COVID, and have progressed substantially due to COVID, they have advanced less than men.

We are not aware of any similar analysis, let alone an attempt at explaining this phenomenon, in the academic literature. We will make some tentative explanatory observations in the Conclusions section.

5. Conclusions

Financial inclusion is essential in alleviating poverty and achieving inclusive economic growth (Deb and Kubzansky, 2012). Several studies show that access to financial products ensures people to start or expand new businesses, increase education, and improve living standards (Leatherman et al., 2012; Armendáriz and Morduch, 2010), as well as playing a powerful role in addressing gender gaps and empowering

Table 6
Links among impact of age, gender and COVID on the use of financial instruments.

	Fin2	Fin7	Fin14a	Fin14b	Fin31a	Fin31b
Argentina (ARG)	0.73***	0.23***	0.34***	0.48***	0.26***	0.18***
Bolivia (BOL)	0.36***	0.04***	0.07***	0.08***	0.28***	0.04***
Brazil (BRA)	1.17.	0.22***	0.40***	0.49***	0.63***	0.31***
Chile (CHL)	1.02	0.11***	0.40***	0.51***	0.27***	0.26***
Colombia (COL)	0.22***	0.08***	0.12***	0.14***	0.22***	0.08***
Costa Rica (CRI)	0.64***	0.07***	0.29***	0.25***	0.33***	0.22***
Dominican Rep. (DOM)	0.22***	0.07***	0.05***	0.06***	0.1***	0.03***
Ecuador (ECU)	0.30***	0.06***	0.09***	0.09***	0.23***	0.04***
Honduras (HND)	0.09***	0.03***	0.04***	0.04***	0.3***	0.05***
Nicaragua (NIC)	0.08***	0.03***	0.04***	0.04***	0.08***	0.02***
Panama (PAN)	0.23***	0.04***	0.09***	0.10***	0.14***	0.08***
Peru (PER)	0.24***	0.07***	0.07***	0.09***	0.13***	0.05***
Paraguay (PRY)	0.09***	0.03***	0.04***	0.03***	0.05***	0.03***
El Salvador (SLV)	0.11***	0.04***	0.04***	0.05***	0.07***	0.03***
Uruguay (URY)	0.83.	0.27***	0.25***	0.43***	0.28***	0.12***
Venezuela (VEN)	1.59***	0.12***	0.64***	0.22***	0.65***	0.42***
Age	1.00*	1.01***	0.97***	0.97***	0.99***	0.96***
Post-COVID	3.13***	4.93***	11.33***	10.03***	5.81***	23.03***
Female	1.45***	1.59***	1.36**	1.82***	1.51***	1.59*
Post-COVID*Female	0.43***	0.51***	0.49***	0.37***	0.47***	0.46***
McFadden	0.13	0.12	0.22	0.21	0.14	0.3

Compiled by the authors. Data source: World bank Global Findex Database (2017, 2021).
Dependent variable: the use of financial instruments. Independent variables: Fin 2: owning a debit card; Fin7: owning a credit card; Fin14a: mobile phone bill payments; Fin14b: mobile phone on-line purchases; Fin31a bank account utility payment; Fin 31b: mobile phone utility payments. Significance levels: *** <0.001; ** <0.01; * <0.05;. < 0.1. The explanatory power of the model is measured by the McFadden pseudo-R^2 value (McFadden, 1972).

women through social and collective participation (Zulfiqar, 2016; Meier zu Selhausen, 2015).

In this research, we have performed a comprehensive analysis of how the COVID pandemic has affected financial inclusion and its digital development in Latin America, with a particular focus on the gender gap. We have first analyzed the research trends pre- and post-COVID from a qualitative and quantitative perspective, based on a bibliometric analysis of the co-ocurrence of 5,671 words in 2,326 articles related to gender, financial inclusion, microfinance and developing countries published between 1998 and 2022. The research field has strongly gained interest after the COVID-19 crisis, with 63 % of all publications encountered dating from the proportionally much briefer period since COVID-19. Prior to COVID-19, the motor themes were microcredit, economic growth, and banking and information technology. Gender gap and mobile money appeared as a basic theme. Mobile phones and banking services were classified as emerging themes. After COVID, the important areas are innovation technology, microcredit, financial stability, banking, digital financial inclusion and carbon emissions. Gender gap does not appear as a basic theme anymore, but has been included in digital financial inclusion which has become an emerging motor theme. Mobile phones and mobile money have disappeared, being replaced by innovation technology and digital technology as an emerging theme.

We have then empirically analyzed a sample of all Latin-American countries through the World Bank's Global Findex Questionnaire in order to answer RQ1 ("What is the evolution of financial inclusion in LAM countries for men and women before and after COVID-19?"). We have performed a detailed region-wide analysis, as well as looking at the numbers per country, which were represented graphically, differentiated by gender, pre- and post COVID, in order to provide an easy overview. In general terms, all indicators, from the holdership of a bank or mobile account, over the ownership of a credit or debit card, to digital bill payments and purchases, have strongly increased due to COVID. This is true for both genders, and for almost all countries, with some remarkable exceptions, such as Costa Rica, El Salvador, Honduras, Nicaragua and Panama, where the percentage of women holding a bank account has in fact decreased appreciably. The absolute numbers depend strongly on the individual countries, but there is a clear trend that economically more advanced countries, such as Argentina, Chile or Brazil, score better on all indicators than, for example, El Salvador, Nicaragua or Paraguay. Also, and most importantly, all indicators have increased much more strongly for men than for women. Thus, whereas women scored slightly better (LAM-wide) on all financial indicators than men, this has been reversed, and men now score appreciably better (again, LAM-wide) on all financial indicators.

For basic financial inclusion (RQ2: "What are the variables that determine bank account ownership in LAM?"), the econometric model classifies the effect of COVID*gender as only slightly significant at the LAM-wide level, and not significant at all in any of the individual countries. This can be understood in a double sense. First, the percentages of bank account ownership are quite high (60 % among women, 70 % among men, post-COVID; up from 58 and 50 %, respectively). Thus, although there is a LAM-wide gender gap of 10 pp, and even slightly more in Costa Rica, Ecuador, El Salvador or Honduras, proportionally, these differences are still reasonable. Second, there are other factors than gender which are much more determinant for whether people hold a bank account or not, such as education level, or receiving a wage or benefit from the government.

In terms of more advanced financial inclusion, however (RQ3: "What variables influence the holdership and use of financial instruments in LAM before and after COVID-19?"), such as holding a debit or credit card, or making digital bill payments or purchases, gender differences are clearer. Women have improved after COVID, but much less so than men, and find themselves notably lagging behind men. The differences are again on the order of 10 pp for most variables (from 6 pp for credit card holdership, up to 12 pp for debit cards), but in this case the absolute percentages are much smaller. For example, only 17–20 % of women hold a mobile account, or make digital (mobile or online) purchases or bill payments. Consequently, a 10 pp gender difference for these variables is clearly very important.

Thus, while COVID has improved both genders' situation in LAM in terms of financial inclusion, it has also created an important gender gap in terms of more advanced financial inclusion (owning a credit or debit card, and performing digital financial operations) to the detriment of women. Particularly worrisome is the situation in specific countries such as El Salvador, Honduras and Nicaragua, where female bank account and debit card ownership have both strongly decreased, while female digital financial inclusion lags very strongly behind the rest of LAM and has barely improved, or in some cases even decreased, after COVID.

Several reasons can explain gender disparities and financial inclusion gap, such as cultural and social norms, economic factors, or education and training. Regarding cultural and social norms, gender roles are deeply rooted in LAM countries and restrain women's opportunities. They are usually seen as family caregivers and bear unpaid household duties and thus have limited time for education and paid work. Additionally, economic factors explain the lower financial inclusion. Women are over-represented in informal, lower-paid and less-secure jobs such as domestic work, and there is a persistent wage gap, with women frequently earning less than men for the same job. Finally, despite improved access in education and training, disparities in quality and field choice remain, with women often steered away from STEM fields.

To sum up, COVID has had a dramatic impact on Latin Americans' relationship with money and finance, with a strong increase in the adoption of mobile financial services and a parallel reduction in the use of cash. COVID has thus had a beneficial influence on the financial inclusion of both men and women in LAM. This has been stimulated via government-driven projects, which have promoted digital payment schemes of wages and assistance benefits. Also, digital financial services themselves have strongly improved, for example through the implementation of interoperable and direct P2P payment schemes that have made digital payments easier, faster, cheaper, and more accessible and user-friendly in general. However, in all financial inclusion indicators analyzed, men have comparatively taken a strong advantage with respect to women, especially in more advanced, digital financial tools. 21 % of Latin Americans still remain financially excluded, and the use of more advanced products like credit, investments, insurance, and e-commerce is still low. Women are overrepresented among the financially excluded in LAM, especially in terms of digital financial tools. Thus, as already observed by other authors, digital tools can serve as effective means to reduce the financial gap in Latin America (Kazemikhasragh and Buoni Pineda, 2022). However, there is a lack of education, awareness and trust among women, especially in lower-developed countries, that hinders female access to digital financial inclusion.

In the future, it would be very interesting to study which concrete gaps or bottlenecks still put a brake on (digital) financial inclusion in Latin America, beyond the general observations just mentioned. It would also be interesting to verify how the situation in Latin America compares with Southeast Asia, or Africa, and whether some of the measures that have contributed to the spectacular increase in financial inclusion in LAM could be replicated in other regions, or vice versa. The situation in Africa is particularly interesting, in the sense that pre-COVID financial inclusion was very poor in many regions of Africa, and so digital finance has become a first-line tool for basic financial inclusion (Kelikume, 2021). A continent-wide study of the financial inclusion gender gap in Africa would, however, require reliable data, which has only recently started to become available for specific regions and countries.

Furthermore, as future research lines, we could analyze some ethical and political consequences of financial inclusion in developing countries. As seen in the bibliometric mapping, the increase in financial inclusion is mostly driven by innovation in technology, which brings

several ethical and economic considerations along. For instance, when assistance funds are distributed via bank accounts rather than in cash, there is an inherent increase in the ability to track and monitor how these funds are used. This can raise privacy concerns as recipients, and in particular women, may feel that their financial behaviors are being scrutinized. Also, the security of personal and financial data is important. There is a risk of data breaches, which can compromise sensitive information of welfare recipients. Also, increased surveillance can potentially infringe on individuals' autonomy, as they might feel constrained or judged based on their spending patterns. Finally, there is an ethical concern regarding the dignity of welfare recipients in developing countries. Cash payments can be more discreet, while digital transfers might carry a stigma or imply a lack of trust.

Regarding the economic considerations, digital tools can ensure that funds are disbursed quickly and directly to those in need. They can also prove more efficient than traditional methods, since they are likely to lead to a reduction of administrative costs and errors. Also, digital banking increases accessibility for individuals in remote areas, reducing the need for physical travel to receive funds.

There can also be positive political implications. For instance, the digital tracking of funds can lead to greater transparency and accountability in welfare programs. This can help ensure that funds are used for their intended purposes. Data from financial inclusion and ICTs usage can inform better policy design and implementation, providing insights into the spending behaviors and needs of recipients.

Therefore, the shift to more financial inclusion represents a complex interplay of ethical, economic, and possibly even political factors. While the potential benefits are substantial, particularly in terms of efficiency, gender gap and inclusion, the ethical concerns around privacy and autonomy cannot be ignored. Policymakers need to strike a balance, ensuring that the advantages of financial inclusion and technology do not come at the expense of individual rights and dignity. Robust frameworks for data protection, digital literacy programs, and safeguards against misuse of surveillance are essential to make this transition beneficial for all stakeholders.

CRediT authorship contribution statement

Marie-Anne Lorain: Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Jesús Barreal-Pernas:** Software, Methodology, Formal analysis. **Gil Jannes:** Writing – review & editing, Writing – original draft, Software, Methodology. **Elena Urquía-Grande:** Writing – original draft, Supervision, Investigation. **Pilar López-Sánchez:** Writing – review & editing, Investigation. **Javier Sierra:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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