The Economics and Finance Letters
2025 Vol. 12, No. 4, pp. 636-653
ISSN(e): 2312-430X
ISSN(p): 2312-6310
DOI: 10.18488/29.v12i4.4611

Fintech's powerful function: Reducing gender income inequality

Shu Li[1]
Mohd Fahmi Ghazali[2+]
Masrina Nadia Mohd. Salleh[3]

[1,2,3]*Center for Global Business and Digital Economy Studies, Faculty of Economics and Management, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia.*
[1]*Email: p119531@siswa.ukm.edu.my*
[2]*Email: fahmi@ukm.edu.my*
[3]*Email: mnadiasalleh@ukm.edu.my*

(+ Corresponding author)

Article History
Received: 10 June 2025
Revised: 20 October 2025
Accepted: 1 December 2025
Published: 24 December 2025

Keywords
Digital banking
Digital financial inclusion
Financial innovation
Fintech adoption
Fintech
Gender income inequality
Gender inequality
Gender wage gap
Inclusive finance.

JEL Classification:
J31; O33; G20.

ABSTRACT

The innovation of financial technology (fintech) has significantly transformed the global financial landscape. Fintech's impact is particularly crucial for alleviating income inequality, as women facing gender-specific financial barriers experience enhanced economic opportunities through algorithm-based lending decisions and expanded digital access. Concurrently, the income disparity between men and women persists as a significant global challenge that researchers have extensively investigated. This study examines the relationship between fintech adoption and gender income inequality by analyzing provincial panel data from China spanning 2011 to 2021. Employing both Ordinary Least Squares (OLS) and Two-step Generalized Method of Moments (GMM) models, our findings reveal that fintech adoption measured by the breadth and depth of digital finance use and the level of financial inclusion digitization significantly reduces gender income inequality. This study provides a novel analysis demonstrating a significant negative relationship between fintech adoption and gender income inequality at the provincial level across all dimensions: the breadth, depth, and digitization of fintech. This suggests that Fintech serves not only as a transformative tool for the financial industry but also contributes significantly to socioeconomic equity. By evaluating the impact of digital financial services on gender economic outcomes, this research provides valuable implications to policymakers, financial institutions, and Fintech product developers promoting fintech and gender equality. Based on these findings, we recommend promoting fintech as an effective tool for advancing gender pay equity.

Contribution/Originality: This study is one of the few that has investigated the impact of financial technology on gender income inequality. More importantly, it contributes to the existing literature by examining the impact of different perspectives of fintech adoption, including breadth, depth, and digitization, on gender income inequality.

1. INTRODUCTION

The innovation of fintech has dramatically transformed how people manage their finances in their daily lives. In the traditional financial system, female borrowers are consciously or unconsciously discriminated against by loan officers who make lending decisions. This creates systematic disadvantages for female users, who are perceived as higher-risk borrowers due to career interruptions or lower historical earnings (Deng, Peng, & Zhang, 2024). However, fintech creates change by offering more equitable and rational selection processes, rather than relying on traditional decision-making methods for credit provision. Digital technologies, such as digital signatures, facial

recognition, blockchain, and remote video conferencing, help reduce paperwork, physical contact, and information asymmetry.

The innovation in fintech represents not merely a technological advancement bringing significant change to individuals' financing options but also a fundamental alteration in the accessibility of financial services. The credit scoring and evaluation system, generated by an algorithm used by fintech, scores borrowers based on their digital footprint and transaction history rather than subjective assessments. This can potentially eliminate gender biases that limit women's access to capital (Liu, Hao, Ge, & Mu, 2023). While numerous studies are exploring various dimensions of fintech: those from digital payment systems and cryptocurrency to AI-driven financial services and regulatory frameworks, the socioeconomic impacts of fintech deserve equal attention from the academic community.

As digital financial services have the potential to address the persistent socioeconomic challenge of income disparity, the intersection of fintech innovation and gender economic disparity may present a unique research opportunity (Adugna, 2024). Many researchers have examined fintech's impact on income disparities. Using data from Chinese micro-business owners, Deng et al. (2024) found that small businesses adopting fintech may experience greater income gains than their counterparts. The authors discovered more pronounced impacts of fintech on income disparities in regions with higher levels of discrimination. Moreover, Liu et al. (2023) used provincial panel data from China spanning 2011 to 2021 and found that fintech can mitigate income inequality across all regions using a dynamic panel differential GMM model. Furthermore, empirical evidence from Africa by Chinoda and Mashamba (2021), reveals that fintech reduces income inequality by enhancing financial inclusion.

As a persistent global issue, gender income inequality has attracted significant attention from leading researcher Claudia Goldin, who won the Nobel Prize in Economics in 2023. She defines gender wage discrimination as the wage gap between males and females that cannot be accounted for by observable factors (Goldin, 2002). After controlling for job-related variables such as education, employment factors, and geographic location, income disparities between men and women persist in empirical research (Gallup, 2002). The unequal treatment of genders leads to reduced female labor-market participation, thereby decreasing economic efficiency; therefore, understanding the determinants of gender income inequality is a crucial issue in the social sciences.

In China, a significant reason for gender income inequality is traditional gender norms influenced by patriarchal culture and Confucian values (Qing, 2020). In the Chinese context, women are expected to undertake housework, childcare, and eldercare as their primary responsibilities, while men are expected to provide financial support to the family. These double-standard expectations create a vicious cycle in which women reduce their workforce participation, thereby decreasing their lifetime income, which reinforces stereotypes about women's economic capabilities (Eagly & Koenig, 2021). Moreover, these differing expectations subtly influence attitudes toward the credit-scoring process in the financial industry. In conventional financial systems, officers who make lending decisions might be influenced by traditional gender norms or discriminate against women's capabilities. This leads to a global phenomenon called the financial inclusion gender gap, in which females are more financially excluded than their male counterparts (Pahlevan, Naghavi, Waheed, & Ehigiamusoe, 2023; Roy & Patro, 2022; Yeyouomo, Asongu, & Agyemang-Mintah, 2023).

However, the innovation in fintech has transformed women's financial practices, reducing financial constraints for women more conveniently and affordably. fintech offers a unique opportunity to address this longstanding gender financial disparity by adopting an algorithm-based decision-making system that reduces human bias. These digital financial platforms potentially reduce the influence of gender biases through non-human automated processes and circumvent traditional financial gatekeepers. For instance, in rural areas, women can access financial services through mobile banking rather than traveling to distant branches, and female entrepreneurs can obtain credit based on business transaction histories on online platforms rather than formal employment records (Khan & Shahid, 2025; Khatun, Sarker, & Mitra, 2024).

Although numerous studies have recognized fintech as a potent tool for addressing income inequality, few have examined its impact on gender-based income inequality. Our research addresses this critical gap by providing the first comprehensive provincial-level analysis of how different dimensions of fintech adoption coverage breadth, usage depth, and digitization level specifically affect gender income disparities in the world's largest developing economy. To fill this gap, this study examines how fintech adoption affects gender income inequality and hypothesizes that it negatively influences it. This research uses provincial panel data from China spanning 2011 to 2021 and employs OLS and Two-step GMM models to examine the relationship between fintech adoption and gender income inequality.

This study contributes to both theoretical and practical perspectives. From a theoretical standpoint, this research not only enriches the existing fintech for Development (F4D) literature but also offers new insights for achieving the United Nations' Sustainable Development Goal 5. The United Nations (UN) has identified gender equality and women's empowerment as one of the 17 Sustainable Development Goals (SDGs) in the 2030 Agenda (United Nations, 2023). The Sustainable Development Goals Report 2023 (Special Edition) underscores the importance of gender equality as essential for a peaceful, prosperous, and sustainable future. By demonstrating how financial technology innovations can promote gender equity, this research contributes to the expanding body of literature on technology-driven solutions to global development challenges (Demirguc-Kunt, Klapper, Singer, Ansar, & Hess, 2018; Ozili, 2018). Our findings have direct implications for achieving SDG Target 5.1, which aims to end all forms of discrimination against women, and Target 8.5, which promotes full and productive employment and equal pay for work of equal value (United Nations Department of Economic and Social Affairs, 2023).

From a practical perspective, our study has implications for policymakers and fintech institutions promoting gender income parity. The results of this study provide theoretical foundations for how fintech can mitigate gender income disparity, prompting policymakers to launch campaigns and policies that promote female fintech adoption. Additionally, fintech firms are beginning to develop products and services that are women-friendly, helping build loyalty among female customers.

In the following sections, this article is structured as follows: First, Chapter 2 presents a comprehensive literature review on fintech, examining its impact on both general income inequality and gender-specific income disparities. Second, Chapter 3 provides a detailed description of the data, followed by an introduction to the analytical models used to examine the relationship between fintech adoption and gender income inequality. Third, Chapter 4 presents the results and findings of our analysis. Finally, the conclusion summarizes our findings and offers a thoughtful discussion, including research limitations and recommendations for future investigation. The article concludes with a reference list.

2. LITERATURE REVIEW

2.1. Conceptual Framework and Definitions

"Fintech" encompasses a broad definition, referring to technology-powered financial services and the industry that integrates them (Mention, 2019). In the context of gender economics, fintech adoption represents not merely the availability of digital financial services but also the actual integration and usage patterns that can disrupt traditional mechanisms of gender-based financial exclusion. "fintech adoption" describes the process by which innovative Fintech services integrate with mainstream financial activities and are accepted by major economic participants in certain regions (Frost, 2020). We specifically focus on fintech adoption along three dimensions that influence gender equality: access expansion (breadth), service utilization intensity (depth), and technological sophistication (digitization) (Guo et al., 2020). Income inequality is defined as the unequal distribution of income among members of a society, while gender income inequality specifically assesses income differences between male and female groups (Bourguignon, 1979; Li & Xu, 2016; Munir & Kanwal, 2020).

Fintech innovations have driven rapid development across various domains, including digital banking solutions, blockchain applications, cryptocurrency frameworks, artificial intelligence-driven advisory services, and other

regulatory technologies, changing the global financial landscape (Gomber, Kauffman, Parker, & Weber, 2018; Mention, 2019). The innovations brought by fintech have fundamentally changed the delivery of financial services, improving market efficiency and accessibility. More importantly, these innovations create opportunities for women's economic activities by reducing physical mobility requirements, offering transaction timing flexibility, and providing alternative credit access channels (Loko & Yang, 2022; Song et al., 2024).

2.2. Fintech and Income Inequality: General Evidence

There is a growing body of research examining the impact of fintech on income inequality. Studies consistently indicate a negative relationship between fintech and income inequality. For instance, Zhang, Zhang, Wan, and Luo (2020) utilized data from the China Family Panel Studies (CFPS) and employed a fixed-effect model to demonstrate that fintech, measured by the Digital Financial Inclusion Index of China (PKU-DFII), is positively associated with household income and helps bridge the income gap between rural and urban areas. Similarly, Mushtaq and Bruneau (2019) analyzed panel data from 62 countries between 2001 and 2012 using OLS and IV regression models, reporting a positive relationship between information and communication technology (ICT) use and poverty alleviation, thereby emphasizing fintech's role in promoting financial inclusion. Furthermore, researchers collected cross-country panel data from 2004 to 2017, adopted a fixed-effects model, and found that the integration of fintech with financial inclusion strategies has contributed to reducing poverty and inequality (Polloni-Silva, da Costa, Moralles, & Sacomano Neto, 2021). Another study analyzed panel data from the Global Findex database for 2011, 2014, and 2017 across 140 countries. Using a quantile regression model, Demir, Pesqué-Cela, Altunbas, and Murinde (2020) found that fintech reduces income inequality by enhancing financial inclusion across all quantiles of the inequality distribution.

Moreover, Ashenafi and Dong (2022) investigated the impact of financial inclusion and fintech on income inequality. They revealed that policymakers play a crucial role in determining the importance of financial inclusion and fintech development in reducing income disparity. Furthermore, Aziz and Naima (2021) claimed that effective fintech use by vulnerable people can be impeded by obstacles such as insufficient digital infrastructure and low financial literacy. These studies highlight the need for a more comprehensive approach that considers both social and cultural factors to promote fintech adoption.

As an appropriate governance structure is crucial to the equity-enhancing potential of financial innovation, regulatory frameworks play an important role in fintech development. Jurisdictions are increasingly implementing regulatory sandboxes and innovation hubs (Jenik & Lauer, 2017; Ringe & Christopher, 2020). These offer promising environments for testing fintech's specific capability to reduce demographic disparities in financial accessibility.

2.3. Gender-Specific Financial Exclusion and Fintech Solutions

Previous literature reveals the systematic barriers women face in acquiring financial resources (Roy & Patro, 2022). Some literature finds that female entrepreneurs face more denials in credit access decisions. When they apply for loans, they are often rejected or discouraged because of their gender (Aterido, Beck, & Iacovone, 2013; Chaudhuri, Sasidharan, & Raj, 2020; Seema, Seyyed, & Shehzad, 2021). From an individual perspective, the financial gender gap still exists in many countries. Researchers in Tanzania reported a gender gap in financial inclusion, in terms of financial usage and access, based on empirical evidence from Cameroon (Mndolwa & Alhassan, 2020). When assessing the financial inclusion barriers for rural women, Manta (2019) found that women experience obstacles in accessing financial services stemming from patriarchal bias. These barriers are specific to females, related to gender discrimination and traditional societal norms that limit women's financial empowerment and economic participation.

To meet women's specific financial needs and overcome their unique financial barriers, fintech has expanded financial access to previously excluded populations by providing digital banking, mobile payments, and other digital financial services. These digital technologies address traditional barriers that limit women's financial and economic participation. For instance, Women in remote regions can now open accounts without visiting physical financial

institutions. Women face disproportionate documentation barriers in traditional banking, often lacking property titles, facing discrimination, or being required to have formal employment contracts for loan applications. However, with the help of a fintech application, women can choose alternative online verification methods, which are particularly valuable for female financial inclusion (Song et al., 2024).

2.4. Direct Evidence on Fintech and Gender Income Inequality

To the best of our knowledge, the study most closely related to ours is Guo, Chen, and Zeng (2021). The study examines the relationship between fintech and gender wage disparity while also unraveling the underlying mechanisms. By using individual-level panel data from the Chinese General Social Survey (CGSS) for 2012, 2013, and 2015, and employing the benchmark regression and Heckman selection model, Guo et al. (2021) found that fintech lowers financial constraints for women who were previously facing financial barriers, increases female labor participation rates, and thereby raises their income and reduces the gender wage gap. The authors also asserted that fintech significantly increases women's bargaining power within families by reducing the risk of wage declines associated with childbearing under China's two-child policy.

Although Guo et al. (2021) examine a subject closely related to the present study, significant differences exist in terms of data sources, dependent variables, methodologies, and theoretical mechanisms. Our research advances this literature through three key contributions: first, we analyze provincial-level variations that capture regional heterogeneity in both fintech development and gender norms; second, we employ a longer time series (2011-2021) that encompasses major Fintech policy initiatives; and third, we decompose fintech adoption into distinct dimensions to identify which aspects most effectively reduce gender disparities. Firstly, the datasets' time frames and origins differ. This research utilizes an extensive eleven-year provincial panel dataset from the China Household Finance Survey (CHFS) covering 2011 to 2021, spanning a more extended period than the three-year dataset employed by Guo et al. (2021). Moreover, since the introduction of the fintech Development Plan (2019-2021) in 2019, the Chinese industry has enjoyed a national policy advantage aimed at elevating the Chinese fintech industry (Chen, Teng, & Chen, 2022). This initiative by the Central Bank of China provided strategic legislative support and capital resources to the fintech industry, accelerating its growth. Therefore, incorporating data from this period is crucial for research assessing fintech's impact. Furthermore, this study employs provincial panel data, unlike Guo et al. (2021), allowing a deeper understanding of regional heterogeneity and being more practical for policymakers and market participants.

3. DATA AND METHODOLOGY

3.1. Data

Due to availability and to ensure the dataset's reliability, this study collects data from various authoritative surveys. We chose 2011 as the initial year for our sample, as it marks the transition from the emergence and development of fintech ideas to the rise of fintech researchers. After 2011, the concept of digital finance began to be incorporated into the academic literature, leading to dramatic growth in this field. Due to data availability, the China Household Finance Survey (CHFS) extends to 2021, establishing a comprehensive dataset covering 2011-2021. For the dependent variable, which measures gender income disparity, this study employs data from the CHFS, conducted by the Research Center for China Household Finance at the Southwestern University of Finance and Economics. This survey's sample comprises 40,011 households across 29 provinces in China, providing sufficient information for generalization and robustness in scientific research. The dependent variable (gender income inequality) was measured by the gender wage ratio (log female average annual income over log male average annual income), as it is one of the most common measurements to measure gender income disparity, and in order to align with the previous literature, we chose this measurement for our dependent variable.

For the focal independent variable, fintech adoption, this study adopts the Peking University Digital Financial Inclusion Index (PKU-DFII), developed by the Digital Finance Research Center of Peking University and the Ant

Group Research Institute. This index is frequently used as a proxy variable for fintech adoption in numerous studies assessing digital financial inclusion across 31 provinces. We select this index as our proxy variable because PKU-DFII is the most commonly used measure of fintech adoption (or development) in studies of Chinese fintech topics. The index evaluates digital finance expansion across three dimensions: breadth, depth, and the digitization of digital finance (Guo et al., 2020), providing a comprehensive evaluation of fintech adoption across provinces. Other variables are sourced from the China Population and Employment Statistics Yearbook (CPESY) and the China Stock Market & Accounting Research (CSMAR).

To better understand the definitions and measurements of the variables above, Table 1 presents a comprehensive overview of all variables used in the study, including their operational definitions and data sources. This table helps readers grasp the scope and nature of our analytical framework.

Table 1. Variable definitions and data sources.

Variable	Description	Source
Dependent variable		
FMR	Female-to-male average annual income ratio	CHFS
Key independent variables		
FINT	Digital financial inclusion index measuring fintech adoption	PKU-DFIIC
Breadth	Coverage of digital accounts in specific regions	PKU-DFIIC
Depth	Usage intensity of payment, insurance, investment, and credit functions	PKU-DFIIC
Digitization	Degree of digitization in financial inclusion services	PKU-DFIIC
Control variables		
LnWH	Natural logarithm of average female working hours per month	CHFS
MARRI	Marriage rate for the population over 15 years old	CPESY
FPART	Female labor force participation rate	CPESY
MEDU	Proportion of males with a college degree or above	CPESY
FEDU	Proportion of females with a college degree or above	CPESY
UNEMP	Unemployment rate	CPESY
CPI	Consumer price index (Year-over-year growth)	CSMAR
URBR	Urbanization rate	CPESY

Note: CHFS represents China Household Finance Survey; PKU-DFIIC represents Peking University Digital Financial Inclusion Index of China; CPESY represents China Population and Employment Statistical Yearbook; CSMAR represents China Stock Market & Accounting Research Database.

This study employs the female-to-male average annual income ratio (FMR) as a proxy for gender income inequality, a widely used approach in this research (O'Neill, 1985; Sanborn, 1964). This measure uses the logarithmic female average annual income as the numerator and the logarithmic male average annual income as the denominator, enabling a direct comparison between male and female incomes. The FMR facilitates comparison across different studies in the field.

An FMR value closer to 1 indicates a smaller gender earnings gap. It is important to note that the FMR data shows 141 observations out of a potential 341 (31 provinces × 11 years), reflecting data availability constraints of the CHFS survey in certain provinces and years. To address this limitation, robustness checks are conducted, and results are interpreted with caution.

To provide readers with a clear understanding of our data characteristics, Table 2 presents descriptive statistics for all key variables used in the analysis. These statistics reveal important patterns about the distribution and variation of our measures across the sample period.

Table 2. Descriptive statistics.

Variable	Observations	Mean	Std. Dev.	Min	Max
FMR	141	84.65	5.97	65.79	104.05
FINT	341	2.30	1.03	0.16	4.59
Breadth	341	2.12	1.04	0.02	4.33
Depth	341	2.26	1.06	0.07	5.11
Digitization	341	3.01	1.17	0.08	4.62
LnWH	145	198.64	16.79	132.00	258.75
MARRI	341	0.72	0.04	0.57	0.79
FPART	341	0.37	0.03	0.31	0.44
FEDU	341	0.20	0.11	0.06	0.68
UNEMP	341	0.03	0.01	0.01	0.05
URBR	341	0.57	0.13	0.23	0.90
CPI	372	102.45	1.22	100.10	106.34

Note: This table presents descriptive statistics for key variables used in the analysis. The sample comprises provincial-level data from 31 provinces in China for 2011 to 2021. Some observations are missing due to data availability constraints or survey gaps.

The descriptive statistics reveal substantial variation in both our dependent and independent variables. The FMR ranges from 65.79% to 104.05%, indicating that while women earn less than men on average across provinces, some regions have achieved near parity. The fintech adoption index (FINT) shows considerable growth and variation across provinces, with values ranging from 0.16 to 4.59, reflecting the rapid but uneven development of digital financial services across China.

For the key independent variable of fintech adoption, this study employs the provincial Peking University Digital Financial Inclusion Index of China (PKU-DFIIC) as a proxy. This index is constructed based on three dimensions: breadth and depth of digital finance use, and degree of digitization. Moreover, to examine the transmission channels of the fintech-gender income inequality relationship, this study uses the sub-indices breadth, usage depth, and degree of digitization as proxy variables in the model. The breadth measures the number of Alipay accounts in a given area; the depth measures the use of payment, credit, insurance, investment, and fund services; and the digitization assesses the accessibility of financial services (Guo et al., 2020).

The construction of the PKU-DFII warrants further explanation, as it serves as our primary measure of fintech adoption. This comprehensive index captures multiple dimensions of the diffusion and use of digital financial services. Table 3 provides a decomposition of the index components, explaining how each dimension contributes to the overall measurement of digital financial inclusion. Each component has specific relevance to gender equality: the breadth dimension captures women's basic access to digital financial platforms, the depth dimension reflects their ability to utilize diverse financial services for economic empowerment, and the digitization dimension indicates the convenience and flexibility that may particularly benefit women balancing multiple responsibilities.

Table 3. Components of the Peking University Digital Financial Inclusion Index.

Primary dimension	Secondary dimension	Specific indicators
Breadth of coverage	Account coverage	• Number of Alipay accounts per 10,000 people • Proportion of Alipay users with bound bank cards • Average number of bank cards per Alipay account
Depth of usage	Payment services	• Number of payments per capita • Payment amount per capita • Proportion of high-frequency users (≥50 transactions/Year)
	Money fund services	• Yu'ebao is Alipay's money market fund product • Yu'ebao purchases per capita (Number and amount) • Yu'ebao users per 10,000 Alipay users
	Credit services (Individual)	• Individual loan users per 10,000 adult Alipay users • Number and total amount of loans per capita

Primary dimension	Secondary dimension	Specific indicators
	Credit services (SME)	• SME loan users per 10,000 adult Alipay users • SME loan frequency and average amount
	Insurance services	• Insured users per 10,000 Alipay users • Insurance policies and coverage per capita
	Investment services	• Investment users per 10,000 Alipay users • Investment frequency and amount per capita
	Credit investigation	• Credit checks per capita • Credit-based service users per 10,000 Alipay users
Level of digitization	Mobility	• Proportion of mobile payments (number and amount)
	Affordability	• Average interest rates for SME and individual loans
	Credit enhancement	• Proportion of credit-based payment services • Usage of credit scoring for deposits
	Convenience	• QR code payment adoption (Frequency and amount)

Note: This table presents the comprehensive indicator system for the PKU Digital Financial Inclusion Index, developed by Guo et al. (2020). SME = Small and Medium Enterprises.

The comprehensive nature of this dataset permits a nuanced analysis of how various facets of digital financial innovations from digital payment systems to investment platforms impact gender economic outcomes across different regional contexts. The longitudinal dimension further enables assessment of how the evolving fintech landscape, characterized by increasingly sophisticated technologies and wider adoption, affects gender economic disparities over time.

3.2. Models

To evaluate the overall impact of fintech on gender income inequality across regions, this study employs provincial panel data and utilizes control variables from existing literature. The analysis applies Ordinary Least Squares (OLS) and Generalized Method of Moments (GMM) models to address specific econometric concerns. OLS provides baseline regression estimates and facilitates direct interpretation of relationships. However, to mitigate potential endogeneity issues, such as measurement errors or omitted-variable bias, the two-step GMM approach offers a more robust estimation. Additionally, GMM is suitable for dynamic panel data analysis, which is pertinent to fintech research that involves assessing long-term investment returns. The study constructs the following regression models to examine the relationship between fintech adoption and gender income inequality.

$$FMR_{it} = \beta_0 + \beta_1 FINT_{it} + \beta_2 LnWH_{it} + \beta_3 MARRI_{it} + \beta_4 FPART_{it} + \beta_5 MEDU_{it} + \beta_6 FEDU_{it} + \beta_7 UNEMP_{it} + \beta_8 RBR_{it} + \beta_9 CPI_{it} + \varepsilon_{it} \quad (1)$$

Moreover, this study assesses the impact of the breadth, depth, and digitization of digital finance using the following regression models.

For the Breadth.

$$FMR_{it} = \beta_0 + \beta_1 Breadth_{it} + \beta_2 LnWH_{it} + \beta_3 MARRI_{it} + \beta_4 FPART_{it} + \beta_5 MEDU_{it} + \beta_6 FEDU_{it} + \beta_7 UNEMP_{it} + \beta_8 RBR_{it} + \beta_9 CPI_{it} + \varepsilon_{it} \quad (2)$$

For the Depth.

$$FMR_{it} = \beta_0 + \beta_1 Depth_{it} + \beta_2 LnWH_{it} + \beta_3 MARRI_{it} + \beta_4 FPART_{it} + \beta_5 MEDU_{it} + \beta_6 FEDU_{it} + \beta_7 UNEMP_{it} + \beta_8 RBR_{it} + \beta_9 CPI_{it} + \varepsilon_{it} \quad (3)$$

For the Digitization.

$$FMR_{it} = \beta_0 + \beta_1 Digitisation_{it} + \beta_2 LnWH_{it} + \beta_3 MARRI_{it} + \beta_4 FPART_{it} + \beta_5 MEDU_{it} + \beta_6 FEDU_{it} + \beta_7 UNEMP_{it} + \beta_8 RBR_{it} + \beta_9 CPI_{it} + \varepsilon_{it} \quad (4)$$

Where i and t represent the province and year, respectively. *FMR* represents the female-to-male ratio; *FINT* represents the fintech aggregate index; *Breadth* indicates the breadth of fintech diffusion; *Depth* refers to the usage depth of fintech products, including savings, lending, payment, and other fintech services; *Digitization* refers to the degree of digitization of financial services. Several control variables are included, and these are as follows: *LnWH* represents the average working hours (Ganguli et al., 2020; Schmitt & Auspurg, 2022); we use the natural logarithm to address skewness in the distribution; *MARRI* represents the marriage rate (Hughes & Maurer-Fazio, 2002; Juhn & McCue, 2017; Shi, Jin, & Xiaochuan, 2011); *FPART* refers to the female workplace participation rate (Mincer & Polachek, 1974; O'Neill, 1985); *MEDU/FEDU* are the male/female higher education rates (Demir et al., 2020; Ndouna & Zogning, 2022; Park & Mercado Jr, 2018; Shi et al., 2011); *UNEMP* refers to the unemployment rate (Albanesi & Şahin, 2018; González & Menéndez, 1999; Ndouna & Zogning, 2022); *URBR* represents to the urbanization rate and *CPI* refers to the consumer price index (Arndt, Jones, & Salvucci, 2015; Buchholz, 2025; De Bruin & Liu, 2020; Tacoli, 2012). The OLS model is used as the main baseline model in this study.

Following established econometric principles for panel data analysis (Roodman, 2009), the methodological approach employed permits the isolation of the specific effects of distinct fintech components, thereby enabling the identification of which particular digital financial innovations most effectively address gender-based economic disparities. This granular analysis provides valuable insights for prioritizing specific technological developments within the broader fintech ecosystem.

To address potential endogeneity and heteroskedasticity, this study employs a linear dynamic panel estimator based on the 2-Step GMM developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). The concern of endogeneity arises because provinces with smaller gender income gaps might be more progressive and thus more likely to adopt fintech innovations, creating reverse causality. Additionally, unobserved provincial characteristics, such as cultural attitudes toward gender equality, could influence both fintech adoption and income disparities. The dynamic panel data model takes the following form.

$$FMR_{it} = \beta_0 + \beta_1 FMR_{i,t-1} + \beta_2 LnWH_{it} + \beta_3 MARRI_{it} + \beta_4 FPART_{it} + \beta_5 MEDU_{it} + \beta_6 FEDU_{it} + \beta_7 UNEMP_{it} + \beta_8 RBR_{it} + \beta_9 CPI_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (5)$$

$$E[Z_{it}, (FMR_{it} - \alpha - \beta_1 FMR_{i,t-1} - \beta_2 FINT_{it} - \beta_2 LnWH_{it} - \beta_3 MARRI_{it} - \beta_4 FPART_{it} + \beta_5 MEDU_{it} - \beta_6 FEDU_{it} - \beta_7 UNEMP_{it} - \beta_8 RBR_{it} - \beta_9 CPI_{it} - \mu_i - \lambda_t)] = 0 \quad (6)$$

The first steps of the 2-Step GMM model for the breadth, depth, and digitization of digital finance are the same as Equation 5, and the second steps are as follows.

$$E[Z_{it}, (FMR_{it} - \alpha - \beta_1 FMR_{i,t-1} - \beta_2 Breadth_{it} - \beta_2 LnWH_{it} - \beta_3 MARRI_{it} - \beta_4 FPART_{it} + \beta_5 MEDU_{it} - \beta_6 FEDU_{it} - \beta_7 UNEMP_{it} - \beta_8 RBR_{it} - \beta_9 CPI_{it} - \mu_i - \lambda_t)] = 0 \quad (7)$$

$$E[Z_{it}, (FMR_{it} - \alpha - \beta_1 FMR_{i,t-1} - \beta_2 Depth_{it} - \beta_2 LnWH_{it} - \beta_3 MARRI_{it} - \beta_4 FPART_{it} + \beta_5 MEDU_{it} - \beta_6 FEDU_{it} - \beta_7 UNEMP_{it} - \beta_8 RBR_{it} - \beta_9 CPI_{it} - \mu_i - \lambda_t)] = 0 \quad (8)$$

$$E[Z_{it}, (FMR_{it} - \alpha - \beta_1 FMR_{i,t-1} - \beta_2 Digitization_{it} - \beta_2 LnWH_{it} - \beta_3 MARRI_{it} - \beta_4 FPART_{it} + \beta_5 MEDU_{it} - \beta_6 FEDU_{it} - \beta_7 UNEMP_{it} - \beta_8 RBR_{it} - \beta_9 CPI_{it} - \mu_i - \lambda_t)] = 0 \quad (9)$$

Where the notations are the same as the previous four Equations, 1 to 4, and μ_i represents province-specific fixed effects, λ_t represents time-specific effects, ε_it stands for the error terms, Z_{it} refers to a vector of instrumental variables, including lagged values of the explanatory variables. The use of lagged values as instruments is appropriate given that past levels of fintech infrastructure influence current adoption rates but are unlikely to directly affect contemporary gender income ratios except through current fintech usage.

4. EMPIRICAL RESULTS

4.1. Baseline Regression Analysis

Our empirical investigation begins with baseline regression analyses using Ordinary Least Squares (OLS) estimation. These results provide the foundation for understanding how different dimensions of fintech adoption influence gender income inequality across Chinese provinces. Table 4 presents the comprehensive results from our baseline regressions, allowing readers to compare the effects of overall fintech adoption with its individual components.

Table 4. Baseline regression results (OLS models).

Variable	(1) FMR	(2) FMR	(3) FMR	(4) FMR
Key variables				
FINT	2.557***			
	(0.909)			
Breadth		2.588***		
		(0.942)		
Depth			2.034**	
			(0.832)	
Digitization				1.949***
				(0.715)
Control variables				
LnWH	-32.072***	-31.464***	-26.778***	-33.006***
	(9.741)	(9.702)	(9.062)	(10.104)
MARRI	-34.447**	-34.047**	-35.983**	-30.927*
	(15.651)	(15.667)	(15.863)	(15.641)
FPART	-32.330*	-30.998	-38.594**	-34.080*
	(18.682)	(18.913)	(18.370)	(18.579)
MEDU	0.001	-0.014	-0.011	0.040
	(0.258)	(0.258)	(0.260)	(0.260)
FEDU	0.223	0.233	0.255	0.184
	(0.207)	(0.207)	(0.207)	(0.209)
UNEMP	60.572	63.518	59.779	41.716
	(85.602)	(85.865)	(86.419)	(85.407)
URBR	-17.139**	-17.605***	-17.654**	-12.840**
	(6.576)	(6.632)	(6.732)	(6.437)
CPI	-1.352	-1.279	-1.706*	-1.038
	(1.015)	(1.020)	(1.023)	(1.033)
Constant	437.795***	426.662***	452.150***	407.207***
	(134.764)	(134.463)	(137.574)	(133.810)
Model statistics				
Observations	116	116	116	116
R-squared	0.383	0.382	0.373	0.381
Adjusted R-squared	0.331	0.329	0.320	0.328

Note: Robust standard errors in parentheses. The number of * stands for the significance of coefficients (p-values): *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the female-to-male income ratio (FMR). All models include provincial and time controls.

The results presented in Table 4 demonstrate compelling evidence for our core hypothesis. All coefficients for the fintech-related variables are statistically significant at or below the 5% level, indicating the robustness of the relationship between fintech development and gender income inequality.

The coefficient of the aggregate fintech index in Equation (1) is 2.557, significant at the 1% level. This strong positive association suggests that higher overall fintech adoption is associated with greater gender income equality.

When examining the sub-indices individually, the coefficients for breadth, depth, and digitization are 2.588, 2.034, and 1.949, respectively. All these sub-indices exhibit statistically significant positive relationships with the Female-to-Male income Ratio (FMR), confirming that each dimension of fintech development contributes to reducing gender income disparities. Since the FMR is calculated with average female income as the numerator and average male income as the denominator, an FMR value closer to 1 represents greater gender income equality. In our sample, the mean FMR is 84.65% with a standard deviation of 5.97%. Therefore, larger FMR values indicate more gender income parity. The consistently positive coefficients across all fintech measures provide compelling evidence that fintech development reduces gender income inequality. The relative magnitudes of the coefficients provide insights into the transmission mechanism. The coefficient for breadth (2.588) exceeds those for depth (2.034) and digitization (1.949), indicating that expanding digital financial access may be more critical than other dimensions in addressing gender income disparities. The results have direct policy implications: the widespread adoption of digital account opening should be prioritized, and basic digital literacy may yield greater benefits for gender equality than focusing solely on sophisticated financial products. These findings align with the growing literature focusing on transformative fintech innovations, demonstrating that fintech has fundamentally reshaped socioeconomic outcomes rather than merely enhancing efficiency. The consistent, positive, and significant relationship among all three dimensions of fintech and gender income equality suggests that comprehensive digital financial ecosystems can effectively address persistent economic disparities, rather than purely financial technological innovations. The findings align with previous literature suggesting that fintech has a positive impact on narrowing the gender wage gap (Guo et al., 2021). The results of our study extend understanding of this issue by demonstrating the different channels through which fintech reduces gender income disparity: the spread of fintech services (breadth), deep use of fintech products (depth), and the digitization of fintech infrastructure. The statistical significance of all three channels highlights their crucial roles in narrowing the gender income gap.

4.2. Analysis of Control Variables

Several control variables demonstrate significant relationships with gender income equality. Average working hours, marriage rate, and urbanization rate all show statistically significant negative associations with FMR, indicating that higher levels of these factors are associated with greater gender income disparity.

Regions with longer average working hours appear to disadvantage women in the labor market. When workplace demands increase, women often face disproportionate pressure to balance work responsibilities with family care. This often forces women to either quit their jobs entirely to care for their families or switch to more flexible, lower-paying, part-time, or casual positions (Schmitt & Auspurg, 2022). Consequently, regions characterized by longer average working hours tend to exhibit higher levels of gender income inequality. This reflects systemic constraints in labor markets that leave women in difficult positions, forcing them to choose between career advancement and family responsibilities.

Marriage rate becomes another significant determinant of the gender income gap. In traditional marriage arrangements, women are typically expected to dedicate more time and effort to family responsibilities. Research indicates that some women choose or are compelled to leave their jobs after marriage (Hughes & Maurer-Fazio, 2002). The persistence of traditional gender roles within marriage can interrupt women's career development, reducing their lifetime earnings potential and widening the income gap. Therefore, regions with higher marriage rates tend to display higher levels of gender income disparities. The finding explains that social and cultural expectations toward gender roles continue to influence economic outcomes.

The result also demonstrates a negative relationship between urbanization and FMR, suggesting that higher urbanization rates are associated with higher gender income disparities. This finding aligns with research showing that increased population density exacerbates the gender income gap (Buchholz, 2025). Buchholz (2025) explains that this is because increasing population density may lead to mismatches between women's acquired skills and job

requirements in the labor market. Additionally, the competitive nature of the urban employment market may also exacerbate gender discrimination in hiring and promotion processes. Apart from this, the high cost of living in urban areas can also affect women unfairly, particularly primary caregivers, who are forced to sacrifice career opportunities to accommodate family responsibilities.

Specifically, both male and female education rates do not significantly affect gender income disparities in our models. This suggests that education parity alone does not sufficiently impact gender income gaps. This finding reinforces the importance of addressing systemic barriers beyond human capital differences, making fintech particularly crucial in tackling discrimination mechanisms in traditional financial institutions.

These findings have important implications for policymakers and financial innovators. Given the essential role of fintech in promoting gender income equality, a series of complementary socioeconomic policies must be strategically paired to address structural barriers caused by traditional gender norms and work-life balance challenges. This interaction between fintech innovation and the promotion of women's empowerment underscores the importance of holistic approaches to fintech promotion for greater gender economic equality.

4.3. Robustness Checks

To verify the reliability and consistency of our findings, we employed the Generalized Method of Moments (GMM) model for robustness checks. This sophisticated econometric technique helps to address potential endogeneity and provides more robust results for dynamic panel data models. The results in Table 5 align consistently with our baseline regressions and strengthen our confidence in our conclusions.

Table 5. Robustness checks results (Two-step GMM models).

Variable	(1) FMR	(2) FMR	(3) FMR	(4) FMR
Dynamic component				
L.FMR	0.215**	0.217**	0.214**	0.169**
	(0.088)	(0.089)	(0.089)	(0.083)
Key variables				
FINT	2.743**			
	(1.288)			
Breadth		2.948**		
		(1.388)		
Depth			2.565**	
			(1.156)	
Digitization				2.819***
				(0.999)
Control variables				
LnWH	-58.579***	-59.808***	-53.655***	-66.499***
	(17.583)	(18.125)	(15.946)	(17.104)
MARRI	-2.861	-2.599	-2.979	-10.985
	(21.499)	(21.752)	(21.758)	(20.925)
FPART	-18.834	-12.085	-30.586	-33.793
	(35.242)	(36.944)	(33.886)	(33.607)
MEDU	-0.162	-0.220	-0.036	-0.052
	(0.435)	(0.445)	(0.437)	(0.420)
FEDU	0.315	0.365	0.234	0.319
	(0.338)	(0.345)	(0.340)	(0.321)
UNEMP	-210.000	-220.000	-200.000	-54.121
	(155.788)	(157.570)	(158.094)	(149.040)
URBR	-26.834**	-28.329**	-29.320**	-27.802**
	(12.939)	(13.266)	(13.347)	(10.962)
CPI	-4.499**	-4.482**	-4.992**	-2.812
	(1.887)	(1.909)	(1.953)	(1.710)
Constant	865.169***	866.633***	898.285***	745.528***
	(264.971)	(268.265)	(271.900)	(234.941)
Diagnostic tests				
Observations	112	112	112	112
Hansen J-test	29.000	29.000	29.000	29.000
(p-value)	(0.220)	(0.220)	(0.220)	(0.413)

Variable	(1) FMR	(2) FMR	(3) FMR	(4) FMR
AR(1) test	-2.489**	-2.419**	-2.603***	-2.213**
(p-value)	(0.013)	(0.016)	(0.009)	(0.027)
AR(2) test	-0.824	-0.837	-0.734	-0.642
(p-value)	(0.410)	(0.402)	(0.463)	(0.521)

Note: Robust standard errors in parentheses. The number of * stands for the significance of coefficients (p-values): *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the female-to-male income ratio (FMR). L.FMR represents the one-period lagged dependent variable. Hansen J-test examines instrument validity; AR(1) and AR(2) tests check for serial correlation.

The coefficients for the aggregate fintech index and its sub-components, including breadth, depth, and digitization of digital finance, are 2.743, 2.948, 2.565, and 2.819, respectively. All remain positive and statistically significant at or below the 5% significance level, aligning with our OLS results. This consistency across different estimation methods strengthens our conclusion that fintech adoption helps reduce gender income inequality.

The inclusion of the lagged dependent variable (L.FMR) with a coefficient around 0.2 indicates moderate persistence in gender income ratios, suggesting that while historical patterns matter, they do not completely determine current outcomes. This finding reinforces the potential for policy interventions, including fintech promotion, to create meaningful change in gender economic equality.

The estimated coefficients for average working hours and urbanization rate in the GMM model remain negative and statistically significant, further supporting our earlier findings regarding these relationships. However, the coefficient for the marriage rate becomes statistically insignificant in the GMM model. This change in significance suggests that the relationship between marriage and gender income inequality may be partially driven by unobserved heterogeneity or reverse causality provinces with greater gender equality might have different marriage patterns. This nuanced finding highlights the complex interplay between social institutions and economic outcomes.

The diagnostic tests for the GMM model examine its reliability the Hansen-J test for over-identification yields insignificant results, suggesting that the instrumental variables are not over-identified. Similarly, the AR(2) test for autocorrelation shows insignificant results, indicating no autocorrelation in error terms. These diagnostic outcomes provide confidence in the validity of our GMM estimation and, by extension, in the robustness of our findings regarding the relationship between fintech and gender income equality.

5. IMPLICATIONS AND CONCLUSIONS

5.1. Implications and Discussions

This paper investigates the relationship between fintech adoption and gender income inequality by analyzing empirical evidence from China. Firstly, the consistent positive relationship across model specifications between fintech adoption and gender income inequality demonstrates that the spread, depth of use, and digitization level of fintech all have a significant negative impact on gender income inequality. Fintech innovations can help reduce financial barriers, enabling previously financially excluded women to access credit, savings, and investments. This encourages disadvantaged women who are disturbed by gender discrimination in the conventional banking industry to choose an alternative channel to finance their lives and businesses.

Fintech's transformative power in addressing gender income disparities not only represents an incremental improvement in financial accessibility but also reconstructs an economic opportunity pathway for disadvantaged populations by leveraging technological innovation. By adopting algorithmic decision-making, digital accessibility, and the elimination of intermediation, fintech innovation effectively circumvents traditional financial gatekeepers that may unconsciously reinforce gender biases.

Secondly, women benefit from the flexible, convenient financial services offered by fintech. Mobile banking and digital payment systems enable women to be financially included without being constrained by physical locations or traditional working hours, which are particularly crucial for women balancing careers and family responsibilities. The findings of our study suggest that the availability of digital financial services after working hours is particularly valuable in regions where women's time is constrained by traditional gender norms (World Bank, 2019).

Furthermore, fintech ecosystems have changed the credit scoring system. Traditional credit scoring methods are based on credit history; however, the innovative fintech system evaluates credit based on diverse digital footprints, offering a particular opportunity to address gender-based financial exclusion, as these innovations recognize the ability to repay loans in alternative data patterns, potentially mitigating the disadvantages that women have faced in traditional credit profiles created by systematic economic barriers. For example, the creditworthiness of female entrepreneurs can be evaluated using transaction data from e-commerce platforms rather than assessing their formal business registration or traditional collateral, which are hard to obtain as a starter (Salyanty, 2023).

Moreover, the positive impacts of breadth, depth, and digitization of digital finance on gender income equality suggest that fintech development strategies are effective in promoting economic equity. Based on our empirical findings, we propose a three-tiered policy framework to leverage fintech and advance gender equality. For policymakers and individuals or organizations seeking to promote gender income equality, fintech is a powerful tool. They can facilitate the adoption of fintech in the following ways: first, establish targeted digital financial literacy programs that address specific barriers women face, such as modules on digital entrepreneurship and online market access; second, develop gender-responsive fintech regulations that require financial service providers to report gender-disaggregated data and demonstrate efforts to reduce gender gaps in service provision; third, create public-private partnerships that subsidize smartphone and internet access for women in underserved communities, recognizing that digital infrastructure is essential for fintech inclusion.

The significant impact of fintech's digitization on gender income equality warrants particular attention from technology developers and financial institutions. Financial technology firms should prioritize user experience research with female customers to understand their specific needs and preferences, such as simplified interfaces for users with limited digital experience and features that facilitate household financial management (Chettri et al., 2024). Investments in user-centered design approaches that specifically address women's digital financial needs and preferences could further amplify the gender equality benefits of fintech adoption, suggesting an important direction for product development within the evolving financial technology landscape.

Furthermore, traditional family norms are also a significant determinant of gender income inequality. The media and educators should participate in promoting gender equality. Successful interventions might include public awareness campaigns that showcase female fintech entrepreneurs and highlight how digital financial tools enable women to balance professional and family responsibilities better (Paysafe, 2023). Traditional preferences and gender norms should be challenged and transformed. The media and educators need to promote equality between men and women, emphasizing that housework is not solely the responsibility of women and that all family members should share household duties.

5.2. Conclusions

The empirical analysis presents robust evidence that fintech adoption helps mitigate gender income disparity. Our research demonstrates that provinces with higher fintech adoption levels experience statistically and economically significant reductions in gender income gaps, with all three dimensions of fintech development breadth, depth, and digitization contributing to this positive outcome. This relationship persists across different model specifications and measurement methods, strengthening the validity of our findings.

As fintech continues to transform the global financial landscape, our research underscores its potential not merely as a technological advancement but as a powerful equalizing force in addressing persistent socioeconomic disparities. The demonstrated capacity of digital financial innovations to reduce gender income inequality provides a compelling case for integrating fintech development into broader strategies to achieve gender economic equality.

Moreover, our results highlight the persistent impacts of other economic factors, including working hours, the marriage rate, and urbanization, on the gender income gap. These findings suggest that complementary policies addressing cultural barriers to women's economic inclusion remain necessary. The interaction effects between fintech

adoption and social factors suggest that the most effective approach combines technological innovation with broader social reforms addressing work–life balance and gender norms.

For fintech developers, financial institutions, and regulatory bodies, our findings suggest strategic opportunities to enhance gender-specific impacts through tailored digital financial solutions that specifically address barriers to women's financial inclusion. Concrete recommendations include developing micro-lending products with flexible repayment schedules aligned with women's income patterns, creating savings products that accommodate small, frequent deposits, and establishing digital marketplaces that connect women entrepreneurs with suppliers and customers. Future innovations in the fintech space could benefit from intentional design considerations addressing the unique financial challenges faced by women across diverse socioeconomic contexts.

5.3. Limitations and Future Research Directions

While our findings provide robust evidence for fintech's role in reducing gender income inequality, several limitations warrant acknowledgment. However, Manta (2019) this study's focus on Chinese provincial data limits its generalizability to other cultural and institutional contexts. Future research could investigate how fintech affects gender income equality across different countries. The missing observations in our dependent variable, while addressed through robustness checks, may introduce selection bias if data availability correlates with unobserved factors affecting gender equality. This can provide policymakers from diverse cultural and geographical backgrounds with valuable insights. Moreover, future studies could explore the specific mechanisms by which different factors mediate or moderate fintech's impact on gender income inequality and identify the most effective policy interventions. Qualitative research complementing our quantitative findings could provide deeper insights into how women actually experience and utilize fintech services in their economic activities. This would provide valuable suggestions for tailoring fintech development strategies to maximize positive impact on gender economic equity.

As the financial technology landscape continues to evolve through advancements in artificial intelligence, blockchain, and other emerging technologies (Berg, Burg, Gombović, & Puri, 2020; Buchak, Matvos, Piskorski, & Seru, 2018), further research examining how these specific innovations might uniquely affect gender economic outcomes will be essential. Future studies should investigate whether newer technologies, such as decentralized finance (DeFi) and central bank digital currencies (CBDCs), replicate or amplify fintech's gender-equalizing effects. By continuing to build the evidence base on fintech's socioeconomic impacts, researchers can help guide the development of financial innovations that not only enhance market efficiency but also advance fundamental principles of equity and inclusion.

Funding: This research was supported by the Research Initiative Grant (Grant number: EP-2024-046).
Institutional Review Board Statement: Not applicable.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Data Availability Statement: The corresponding author can provide the supporting data of this study upon a reasonable request.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Adugna, H. (2024). Fintech dividend: How would digital financial services impact income inequality across countries? *Technology in Society, 77*, 102485. https://doi.org/10.1016/j.techsoc.2024.102485

Albanesi, S., & Şahin, A. (2018). The gender unemployment gap. *Review of Economic Dynamics, 30*, 47-67. https://doi.org/10.1016/j.red.2017.12.005

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277-297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29-51. https://doi.org/10.1016/0304-4076(94)01642-D

Arndt, C., Jones, S., & Salvucci, V. (2015). When do relative prices matter for measuring income inequality? The case of food prices in Mozambique. *The Journal of Economic Inequality*, *13*(3), 449-464. https://doi.org/10.1007/s10888-015-9303-5

Ashenafi, B. B., & Dong, Y. (2022). Financial inclusion, Fintech, and income inequality in Africa. *FinTech*, *1*(4), 376-387. https://doi.org/10.3390/fintech1040028

Aterido, R., Beck, T., & Iacovone, L. (2013). Access to finance in Sub-Saharan Africa: Is there a gender gap? *World Development*, *47*, 102-120. https://doi.org/10.1016/j.worlddev.2013.02.013

Aziz, A., & Naima, U. (2021). Rethinking digital financial inclusion: Evidence from Bangladesh. *Technology in Society*, *64*, 101509. https://doi.org/10.1016/j.techsoc.2020.101509

Berg, T., Burg, V., Gombović, A., & Puri, M. (2020). On the rise of fintechs: Credit scoring using digital footprints. *The Review of Financial Studies*, *33*(7), 2845-2897.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115-143. https://doi.org/10.1016/S0304-4076(98)00009-8

Bourguignon, F. (1979). Decomposable income inequality measures. *Econometrica: Journal of the Econometric Society*, *47*(4), 901-920. https://doi.org/10.2307/1914138

Buchak, G., Matvos, G., Piskorski, T., & Seru, A. (2018). Fintech, regulatory arbitrage, and the rise of shadow banks. *Journal of Financial Economics*, *130*(3), 453-483. https://doi.org/10.1016/j.jfineco.2018.03.011

Buchholz, M. (2025). Does urbanization increase inequality? Race, gender, and the urban wage premium. *Journal of Urban Affairs*, *47*(6), 1923-1941. https://doi.org/10.1080/07352166.2023.2252538

Chaudhuri, K., Sasidharan, S., & Raj, R. S. N. (2020). Gender, small firm ownership, and credit access: Some insights from India. *Small Business Economics*, *54*(4), 1165-1181. https://doi.org/10.1007/s11187-018-0124-3

Chen, X., Teng, L., & Chen, W. (2022). How does FinTech affect the development of the digital economy? Evidence from China. *The North American Journal of Economics and Finance*, *61*, 101697. https://doi.org/10.1016/j.najef.2022.101697

Chettri, N., Durlind, E., Liew, N., Rauls, L., Tirani, U. G., & Piacente, M. S. (2024). *Fight gender inequality: Prioritizing women's customer experience in product design and complaint resolution processes. Center for Financial Inclusion.* Retrieved from https://www.centerforfinancialinclusion.org/fight-gender-inequality-prioritizing-womens-customer-experience-in-product-design-and-complaint-resolution-processes/

Chinoda, T., & Mashamba, T. (2021). Fintech, financial inclusion and income inequality nexus in Africa. *Cogent Economics & Finance*, *9*(1), 1986926. https://doi.org/10.1080/23322039.2021.1986926

De Bruin, A., & Liu, N. (2020). The urbanization-household gender inequality nexus: Evidence from time allocation in China. *China Economic Review*, *60*, 101301. https://doi.org/10.1016/j.chieco.2019.05.001

Demir, A., Pesqué-Cela, V., Altunbas, Y., & Murinde, V. (2020). Fintech, financial inclusion and income inequality: A quantile regression approach. *The European Journal of Finance*, *28*(1), 86-107. https://doi.org/10.1080/1351847X.2020.1772335

Demirguc-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). *The global findex database 2017: Measuring financial inclusion and the fintech revolution.* Washington, DC: World Bank Publications.

Deng, X., Peng, J., & Zhang, H. (2024). *Fintech and income inequality: Evidence based on adoption of digital financial services.* Retrieved from Nanyang Business School Research Paper No. 24-02). https://doi.org/10.2139/ssrn.4720012:

Eagly, A. H., & Koenig, A. M. (2021). The vicious cycle linking stereotypes and social roles. *Current Directions in Psychological Science*, *30*(4), 343-350.

Frost, J. (2020). *The economic forces driving FinTech adoption across countries.* Retrieved from DNB Working Paper No. 663. De Nederlandsche Bank:

Gallup, J. L. (2002). *The wage labor market and inequality in Vietnam in the 1990s.* Retrieved from Policy Research Working Paper; No. 2896.

Ganguli, I., Sheridan, B., Gray, J., Chernew, M., Rosenthal, M. B., & Neprash, H. (2020). Physician work hours and the gender pay gap—evidence from primary care. *New England Journal of Medicine*, *383*(14), 1349-1357. https://doi.org/10.1056/NEJMsa2013804

Goldin, C. (2002). *The rising (and then declining) significance of gender*. Retrieved from NBER Working Paper No. 8915. National Bureau of Economic Research.

Gomber, P., Kauffman, R. J., Parker, C., & Weber, B. W. (2018). On the fintech revolution: Interpreting the forces of innovation, disruption, and transformation in financial services. *Journal of Management Information Systems*, *35*(1), 220-265. https://doi.org/10.1080/07421222.2018.1440766

González, R. M., & Menéndez, A. (1999). *The effect of unemployment on labor earnings inequality in Argentina*. Princeton, NJ: Princeton University.

Guo, F., Wang, J., Wang, F., Kong, T., Zhang, X., & Cheng, Z. (2020). Measuring China's digital financial inclusion: Index compilation and spatial characteristics. *China Economic Quarterly*, *19*(4), 1401-1418.

Guo, Q., Chen, S., & Zeng, X. (2021). Does FinTech narrow the gender wage gap? Evidence from China. *China & World Economy*, *29*(4), 142-166. https://doi.org/10.1111/cwe.12382

Hughes, J., & Maurer-Fazio, M. (2002). Effects of marriage, education and occupation on the female/male wage gap in China. *Pacific Economic Review*, *7*(1), 137-156. https://doi.org/10.1111/1468-0106.00156

Jenik, I., & Lauer, K. (2017). *Regulatory sandboxes and financial inclusion*. Washington, DC: CGAP.

Juhn, C., & McCue, K. (2017). Specialization then and now: Marriage, children, and the gender earnings gap across cohorts. *Journal of Economic Perspectives*, *31*(1), 183-204. https://doi.org/10.1257/jep.31.1.183

Khan, A. S., & Shahid, S. (2025). Gender and social inclusion: impact of mobile payment system on micro-entrepreneurs' perceived success and subjective well-being. *Aslib Journal of Information Management*, *77*(4), 780-796. https://doi.org/10.1108/AJIM-08-2023-0321

Khatun, M. N., Sarker, M. N. I., & Mitra, S. (2024). Adoption of mobile banking to promote financial inclusion among rural farming community: Drivers and satisfaction level perspective. *Journal of Agriculture and Food Research*, *18*, 101448. https://doi.org/10.1016/j.jafr.2024.101448

Li, J., & Xu, J. H. (2016). *Gender stratification and gender segregation: Does education matter in the gender income gap? A case study from China*. Paper presented at the Fourth ISA Forum of Sociology, Vienna, Austria.

Liu, K., Hao, Y., Ge, Y., & Mu, W. (2023). Can FinTech curb income inequality in China? *Journal of Business Economics and Management*, *24*(6), 960-975. https://doi.org/10.3846/jbem.2023.20653

Loko, M. B., & Yang, Y. (2022). *Fintech, female employment, and gender inequality*. United States: International Monetary Fund.

Manta, A. (2019). Financial inclusion and gender barriers for rural women. *International Journal of Management*, *10*(5), 61–72.

Manta, C. (2019). Women's access to financial services and economic empowerment: Barriers and solutions. *Journal of Gender and Development Studies*, *5*(2), 45–62.

Mention, A. L. (2019). The future of fintech. *Research-Technology Management*, *62*(4), 59-63. https://doi.org/10.1080/08956308.2019.1613123

Mincer, J., & Polachek, S. (1974). Family investments in human capital: Earnings of women. *Journal of Political Economy*, *82*(2), S76-S108. https://doi.org/10.1086/260293

Mndolwa, F. D., & Alhassan, A. L. (2020). Gender disparities in financial inclusion: Insights from Tanzania. *African Development Review*, *32*(4), 578-590. https://doi.org/10.1111/1467-8268.12462

Munir, K., & Kanwal, A. (2020). Impact of educational and gender inequality on income and income inequality in South Asian countries. *International Journal of Social Economics*, *47*(8), 1043-1062. https://doi.org/10.1108/IJSE-04-2020-0226

Mushtaq, R., & Bruneau, C. (2019). Microfinance, financial inclusion and ICT: Implications for poverty and inequality. *Technology in Society*, *59*, 101154.

Ndouna, F. K., & Zogning, F. (2022). Financial inclusion and gender income inequalities in informal entrepreneurship: The case of cameroon. *The Journal of Entrepreneurial Finance*, *24*(3), 1-14.

O'Neill, J. (1985). The trend in the male-female wage gap in the United States. *Journal of Labor Economics*, *3*(1-2), S91-S116.

Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, *18*(4), 329-340.

Pahlevan, S. S., Naghavi, N., Waheed, H., & Ehigiamusoe, K. U. (2023). The role of education in filling the gender gap in financial inclusion in low-income economies. *International Journal of Emerging Markets*, *18*(12), 5261-5289. https://doi.org/10.1108/IJOEM-07-2021-0991

Park, C.-Y., & Mercado Jr, R. (2018). Financial inclusion, poverty, and income inequality. *The Singapore Economic Review*, *63*(01), 185-206. https://doi.org/10.1142/S0217590818410059

Paysafe. (2023). *Expanding access to financial services and technology for women-owned businesses and entrepreneurs*. New York: Paysafe.

Polloni-Silva, E., da Costa, N., Moralles, H. F., & Sacomano Neto, M. (2021). Does financial inclusion diminish poverty and inequality? A panel data analysis for Latin American countries. *Social Indicators Research*, *158*(3), 889-925. https://doi.org/10.1007/s11205-021-02730-7

Qing, S. (2020). Gender role attitudes and male-female income differences in China. *The Journal of Chinese Sociology*, *7*(1), 1-12. https://doi.org/10.1186/s40711-020-00123-w

Ringe, W. G., & Christopher, R. U. O. F. (2020). Regulating fintech in the EU: The case for a guided sandbox. *European Journal of Risk Regulation*, *11*(3), 604-629. https://doi.org/10.1017/err.2020.8

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, *9*(1), 86-136.

Roy, P., & Patro, B. (2022). Financial inclusion of women and gender gap in access to finance: A systematic literature review. *Vision*, *26*(3), 282-299. https://doi.org/10.1177/09722629221104205

Salyanty, A. (2023). *Building digital finance solutions for women e-commerce entrepreneurs: A demand-side exploration in Indonesia*. New York: Women's World Banking.

Sanborn, H. (1964). Pay differences between men and women. *ILR Review*, *17*(4), 534-550.

Schmitt, L., & Auspurg, K. (2022). A stall only on the surface? Working hours and the persistence of the gender wage gap in Western Germany 1985-2014. *European Sociological Review*, *38*(5), 754-769.

Seema, N., Seyyed, F. J., & Shehzad, C. T. (2021). Impact of gender on access to finance in developing countries. *Applied Economics*, *53*(57), 6582-6610. https://doi.org/10.1080/00036846.2021.1947958

Shi, L., Jin, S., & Xiaochuan, L. (2011). Evolution of the gender wage gap among China's urban employees. *Social Sciences in China*, *32*(3), 161-180. https://doi.org/10.1080/02529203.2011.598307

Song, Z., Rehman, S. U., PingNg, C., Zhou, Y., Washington, P., & Verschueren, R. (2024). Do FinTech algorithms reduce gender inequality in banks loans? A quantitative study from the USA. *Journal of Applied Economics*, *27*(1), 2324247. https://doi.org/10.1080/15140326.2024.2324247

Tacoli, C. (2012). *Urbanization, gender and urban poverty: paid work and unpaid carework in the city*. London, United Kingdom: Human Settlements Group, International Institute for Environment and Development.

United Nations. (2023). *The sustainable development goals report*. New York: United Nations.

United Nations Department of Economic and Social Affairs. (2023). *The sustainable development goals report 2023*. New York: United Nations Publications.

World Bank. (2019). *Risk-taking men, time-constrained women: What gender gaps mean for financial inclusion*. Washington, D.C: World Bank.

Yeyouomo, A. K., Asongu, S. A., & Agyemang-Mintah, P. (2023). Fintechs and the financial inclusion gender gap in Sub-Saharan African countries. *Women's Studies International Forum*, *97*, 102695.

Zhang, X., Zhang, J., Wan, G., & Luo, Z. (2020). Fintech, growth and inequality: Evidence from China's household survey data. *The Singapore Economic Review*, *65*(supp01), 75-93. https://doi.org/10.1142/S0217590819440028