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The role of board age diversity in the performance of publicly listed Fintech entities

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ABSTRACT

The present study addresses the important demographic of director age in relation to the performance of the constituent firms of Fintech-focused Exchange Traded Funds (ETFs). While private Fintech boards accommodate generally young officers, regulatory and market forces contribute to notable shifts in the board age composition of seasoned, publicly listed Fintech entities. Within the fast-moving and evolving context of Fintech, we assess how board age composition impacts on such firms' return-on-assets, sales-on-assets, cash flow proficiencies, and market-to-book value. Our study findings suggest *age* diversity exhibits a significant inverse relation with the first three of these performance measures. Fintech entities with lower board age dispersion achieve stronger performance in the key metrics. Such a finding holds in cross-sectional terms (i.e. without material change in the average age of board members across the study period). Within our study context, we also assess the age gap between non-executive directors (NEDs) and executive officers (EDs). For most sample firms, average NED age markedly exceeds ED age. Through a battery of tests, we demonstrate more seasoned (i.e. less young) EDs support Fintech firm performance. The presence of more experienced EDs serves in narrowing the age gap with older and more seasoned NEDs.

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Financial technology (Fintech); director age; board age diversity; executive versus non-executive directors; firm financial performance

1. Introduction

The present research inquiry assesses the relationship between Fintech companies' board age demography and performance. We ask whether board age diversity supports Fintech firms' financial performance. We specifically address the age gap between non-executive and executive board members. This pursuit extends both upper echelons theory (Hambrick and Mason 1984) and agency accounts (Fama and Jensen 1983) of corporate strategy and performance. It does so by delving into an emerging and structurally evolving industry that increasingly infuses all aspects of modern business.

Fintech entities face multi-faceted and largely different governance challenges to non-Fintech companies. Specifically, Fintech firms engage in a terrain characterized by business models, regulatory challenges, and market contestability issues that are radically different to those confronting entities in more traditional business domains. The complexity and evolution of Fintech products, markets, and regulations require special diligence and oversight. Moreover, given the rapid pace of innovation in this business sector,

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legal/regulatory structures often lag markedly behind Fintech market developments. Within this specific context, strong internal governance mechanisms are of even greater importance (Deloitte 2019; Du et al. 2022; Eliasson-Norris 2023; Govenda 2021; Stephen and Pluck 2023). Accordingly, the extant governance-firm performance literature for non-Fintech firms provides only limited guidance on the appropriate models relevant to Fintech.

As a major contribution, we assess governance through the lens of board demography, and most particularly the age diversity of Fintech entities. We conjecture that the unique challenges facing Fintech require a careful balance between the speedy deployment of growth options and the implementation of well-calibrated risk management models. In achieving this balance, the age composition of a Fintech board is likely overarching. While instructive, a mixed pattern of results emerges from the extant literature on the board age diversity-firm performance dyad for non-Fintech entities. On the one hand, findings for non-Fintech firms suggest younger management teams fare better in complex and challenging business environments (Wiersema and Bantel 1992). The literature also suggests younger officers' overarching role in the exercise and deployment of growth options (Berger, Kick, and Schaeck 2014; Farag and Mallin 2018; Henderson, Miller, and Hambrick 2006; Krause and Semadeni 2014; McGuinness 2021; Serfling 2014; Yim 2013). However, the inclusion of more experienced and therefore older board officers confers network and resource advantages (Pfeffer and Salancik 1978). As noted in Johnson, Schnatterly, and Hill (2013), board officer age proxies 'for both experience and risk aversion.' (Page 238). As predicated on non-Fintech entities, such countervailing effects invite context-driven outcomes. Indeed, the influence of board age diversity on non-Fintech firm performance varies in relation to the market, time-frame, and industries scrutinized (Ali, Ng, and Kulik 2014; Chan, Cheng, and Leung 2011; Cheng, Chan, and Leung 2010; Gardiner 2022; Goergen, Limbach, and Scholz 2015; Talavera, Yin, and Zhang 2018; Talavera, Yin, and Zhang 2021).

A firm's failure to seize growth options swiftly and decisively serves as an existential threat in the Fintech domain. Board age diversity may well prove to be deleterious to success if it spawns conflict on the choice of growth options. Nonetheless, it remains an empirical question as to whether Fintech boards possessing generally less experienced board members fare better or worse than those combining a mix of less seasoned and more seasoned officers. The present inquiry adds novelty to analysis of the board age diversity-firm performance dyad by (1) recognizing its contingent nature, and (2) extending analysis to the new and fast-evolving Fintech domain.

The issue of age diversity is especially important in relation to environments of information ambiguity and complexity. Publicly listed Fintech entities offer a unique prism through which to view and test the important demographic of board officer age. Relative to other board demographics, such as gender and nationality, director age exhibits considerable heterogeneity (Orlando and Shelor 2002). This issue is even more profound in Fintech, given the limited representation of women at board level. In the present study context, female CEOs account for less than 3 percent of all firm-year cases. In contrast, notable age differences exist between non-executive and executive board members in the Fintech domain.[1]

Additionally, the picture of a context-driven age diversity-firm performance link differs somewhat from other major demographics, such as gender diversity. Findings for the latter, though still very much context-based, often point to a positive relation with financial outcomes.[2] By way of contrast, empirical findings on the relation between age diversity and firm performance appear inconclusive. This background accentuates the importance of the issues investigated herein. There is also considerable prescriptive value in ascertaining whether age diversity has positive or negative impact on financial outcomes. Such guidance is topical given the unrelenting changes wrought by AI, block-chain technologies, robotics, and wider digitalization trends, on virtually all business models.

We also delve into the age differential between non-executive and executive directors. In relation to the present study sample, non-executive directors are on average nearly seven years older than executive directors. We extend the literature on the relative importance of independent and non-independent directors (Ahmed and Duellman 2007; Kim, Mauldin, and Patro 2014; Masulis et al. 2022) by assessing the impact of the average age of the two sub-groups on Fintech firm performance. We show that the inclusion of more experienced (i.e. less young) executive directors undergirds performance. This outcome is congruent with our central finding that lower age diversity boosts performance.

2. Institutional & Fintech background, literature review, and the development of research hypotheses

2.1. Overview of major Fintech developments and emerging research themes

The emergence of Fintech has caused major disruption to the financial services landscape (see, for example, Bollaert, Lopez-de-Silanes, and Schwienbacher 2021; Philippon 2016). Rapid developments in digitalization challenge the very existence of traditional intermediation channels. In response, banks and venture capitalists have invested extensively in Fintech (Bollaert, Lopez-de-Silanes, and Schwienbacher 2021).

While technological advancement does not always result in lower intermediation costs (Philippon 2015), it offers a means to develop new business models and approaches in virtually all facets of financial services (Philippon 2016). Fintech also democratizes financial services, attracting new categories of investor and funding sources (Bollaert, Lopez-de-Silanes, and Schwienbacher 2021). The migration of BigTech firms into financial services has added further impetus and momentum to digitalization trends. BigTech firms now constitute some of the world's largest financial institutions (FSB 2019).

Financial technology has also had a major role in eliminating market barriers, spurring efficiency gains in traditional financial service providers (Zhao et al. 2022). Nonetheless, the development of new and alternative sources of finance introduces new agency problems.[3]

The growing Fintech literature has several directional themes. One important strand assesses the impact of Fintech on financial stability (see, for example, Philippon 2016). Other fields of inquiry assess the disruptive effects of Fintech on traditional banks' longstanding business practices (King 2018), and the role of alternative finance in the disintermediation process (Farag and Johan 2021). Another strand of the literature emphasizes the role of Fintech in driving the burgeoning and unregulated shadow-banking industry (Buchak et al. 2018).

Despite the above developments, the literature provides only limited guidance on how governance shapes Fintech firm performance.[4] As Fintech is continually evolving, the antecedent factors necessary for success are unlikely to be in a state of stasis. The rapid pace of innovation in this sector also means that legal/regulatory structures lag market developments. Strong internal governance mechanisms are thus essential in circumventing problems that potentially arise from the absence of significant external legal remedies. Rather unsurprisingly, the extreme complexity, contestability, and regulatory challenges facing Fintech entities suggest that internal governance approaches within the non-Fintech sphere offer at best only partial solutions.

In the present inquiry, we shed light on the role of board age composition on Fintech firm performance for the recent 2010–2022 period. The selection of this timeframe reflects the evolutionary trends of Fintech, which for the most part arose in the years following the post-global financial crisis recovery period.[5] We surmise that the specific challenges confronting Fintech firms require rapid deployment of growth options, as counter-balanced by rigorous and diligently managed risk management approaches. We conjecture that board member age, which acts as an indicator of a firm's posture toward growth options (see, for example, Graham, Harvey, and Puri 2013), is potentially decisive in determining Fintech firm performance.

2.2. The relation between the average age of board members and Fintech firm performance

This study's first research question addresses the link between board member age and Fintech firm performance. The literature on non-Fintech entities suggests that outperformance often arises in firms accommodating younger, more dynamic board officers. For instance, younger board officers may exhibit greater optimism and a stronger propensity to consider and exploit risky but potentially lucrative investment opportunities (see, among others, Berger, Kick, and Schaeck 2014; Farag and Mallin 2018; Krause and Semadeni 2014; McGuinness 2021; Serfling 2014; Yim 2013).[6] As far as we are aware, little to no in-depth analysis features within this literature on the board officer age/Fintech firm performance dyad. This area is of interest given the contestable nature of Fintech entities' markets.

There is of course a risk that more seasoned decision-makers' greater experience may be supplanted by greater levels of risk aversion (Johnson, Schnatterly, and Hill 2013). Such a trade-off is particularly worrisome in relation to Fintech. Success, if not survival, in this realm depends on board officers' ability to sanction growth possibilities and embrace first-mover opportunities. Informed decision-making, and the selection and management of growth options, is thus crucial to Fintech success. The spectacularly high failure rates for small to medium sized firms in this sector highlight the gravity of this issue (Magnuson 2018, 1212–1213).

Older decision-makers may be less effective in adapting to new business paradigms and methods of engagement (Wiersema and Bantel 1992). Hildebrand, Anterasian, and Brugg (2021) report that older officers' past business experiences inhibit radical change. The effects of the COVID-19 pandemic on Fintech and ecommerce (Bao and Huang 2021; Berg, Fuster, and Puri 2021; Fuster et al. 2021; Ozik, Sadka, and Shen 2021; Zachariadis, Ozcan, and Dinçkol 2022) highlight the gravity of such changes. The literature also points to older board officers' preference for the slower but more predictable returns on offer from organic growth (Yim 2013).

Officer compensation may be a factor in younger directors' preference for acquisitive growth over organic growth. In respect to CEO compensation, Li, Low, and Makhija's (2017) analysis demonstrates the benefits to younger decision-makers from aggressive growth strategies. Such a fast-track orientation toward growth acts as an expedient against younger officers' weaker profile and visibility.

In contrast, a more carefully calibrated stance on firm growth may be possible for officers with a proven track-record of corporate success. On the one hand, such a picture might suggest older officers' better management of risk and more prudent selection of growth option channels. On the other hand, such painstaking deliberation may be inimical to success in Fintech where survival hinges on the rapid deployment of new and innovative business models.

In specific relation to firm-level innovation, recent evidence in Chindasombatchareon et al. (2022) highlights greater agency costs arising from older officers' aversion to risk. Such arguments offer a further layer of support for an inverse board age-firm performance link.[7] In terms of both board attendance and direct monitoring activities, Masulis et al. (2022) identify greater agency costs in firms with older directors. Such evidence suggests older officers are generally less attentive. Upper Echelons Theory (UET) prescriptions also resonate with such outcomes, suggesting firms' corporate strategy and decision-making processes reflect the characteristics of leading officers. The present framework extends UET prescriptions to consideration of both board age and Fintech.

In line with the foregoing, our first hypothesis, Hypothesis 1N, asserts,

Hypothesis 1N: Lower average officer age strengthens Fintech performance.

Notwithstanding the above arguments, Fintech entities typically have younger board officers than non-Fintech firms (White 2017). Non-Fintech evidence on the board officer age-firm performance relation may not therefore translate easily into the Fintech world. Specifically, a 'seasoned' Fintech player may still be young relative to a typical non-Fintech firm director. Consequently, more experienced Fintech board directors may be able to combine optimism with experience gained from participation in the early wave of digitalization.[8]

Fintech firms accommodating boards with more seasoned, yet comparatively young board officers, may also be better equipped to judge growth possibilities. Fintech firms with higher average board member age may also confer greater resources (Hillman et al., 2007; Jonson et al. 2020; Pfeffer and Salancik 1978). Specifically, more experienced officers' networks and connections may offer value in accessing equity funding, bank loans, financial intermediation services, and other advisory benefits. Such arguments offer possible reasons for rejection of Hypothesis 1N. Accordingly, and on such grounds, we offer an alternative hypothesis to 1N, in the form of H1A.

Hypothesis 1A: Higher average officer age strengthens Fintech performance.

In respect to Hypothesis 1 (both H1N & H1A), we also consider the average age of the respective non-executive director (NED) and executive director subgroups on a board. Within the NED subgroup we also partition members into independent and non-independent (i.e. potentially 'connected') categories. However, most NEDs in the study sample hold the title independent director.[9] Nonetheless, our analysis makes important distinction between NEDs that are classified as 'independent' as distinct from those that may have connection with ED board members.

2.3. The link between Fintech firms' board age diversity and financial performance

The combination of experienced, older board members with younger, more growth-driven directors may enable stronger performance. At one level, older board officers provide greater access to resources. For example, Fields, Fraser, and Subrahmanyam (2012) reveal that greater officer experience contributes to both board quality and more attractive debt terms. At another level, older officers contribute to the prudential management of resources and the more careful calibration of growth opportunities. Ji et al. (2021) provide evidence consistent with this theme. Specifically, they report lower stock return volatility in entities with greater variation in board officer tenure.

From an agency perspective, greater monitoring effects may arise in firms with pronounced officer age gaps. Fan et al. (2021) argue that the shared life experiences of similarly aged directors limit monitoring processes. Age diversity therefore cultivates a greater array of perspectives and opinions. In this light, age diversity instills more checks and balances, limiting potential agency costs.

Market conditions may also play a part in cementing a positive link between board age heterogeneity and firm performance. Goergen, Limbach, and Scholz (2015), for instance, reveal that firm value is an increasing function of the age gap between Chair and CEO during periods when markets are stable.

In line with the foregoing arguments, our second hypothesis, H2N, asserts,

Hypothesis 2N: Greater board age diversity supports Fintech firm performance.

Arguments can nonetheless be made for a direct alternative to Hypothesis 2N. Specifically, our alternative hypothesis, H2A, asserts an inverse relation between board age diversity and Fintech firm performance. In effect, situations may arise in which age similarity boosts performance.[10] Inter-generational conflicts offer one such context. As an example, Talavera, Yin, and Zhang (2018) report that greater age diversity weakens Chinese bank performance.[11] In the present context, we widen the circle by considering inter-generational conflicts for US-listed Fintech firms. For such firms, the conflict may relate to older officers' resistance to fast-moving and disruptive new business models. Such resistance could delay or even threaten growth opportunities. Within this specific context, age diversity weakens Fintech performance, offering a channel for rejection for Hypothesis 2N, and thus support for H2A.

Issues surrounding executive compensation also offer an avenue of support for Hypothesis 2A. Talavera, Yin, and Zhang (2021) demonstrate that age similarity induces greater 'tournament' competition between officers for firm-level rewards. They argue that a more evenly balanced or less 'hierarchical' board structure incentivizes board commitment, culminating in stronger firm-level performance. Such an account suggests a board's more effective role in quelling both agency costs and in supporting the exercise of growth options through an advisory/strategic role (Kim, Mauldin, and Patro 2014).

Support for Hypothesis H2A may arise during more challenging and unpredictable conditions. For example, Goergen, Limbach, and Scholz (2015) report that greater Chair-CEO age gaps weakened firm performance during the Global Financial Crisis period. Moreover, they opine that an inverse relation between firm value and the Chair-CEO age differential arises in situations demanding greater 'managerial discretion [and] fast decision making' (154). Such a characterization resonates with recent Fintech developments, where success depends on the exploitation of ephemeral growth opportunities. Such a narrative offers a further layer of support for Hypothesis 2A. The deleterious effects of board age diversity may also emerge in other dimensions of corporate finance activity. For example, Hagendorff and Keasey (2012) report weaker M&A announcement returns in firms characterized by greater age diversity.

In keeping with the foregoing, Hypothesis 2A, as an alternative to Hypothesis 2N, asserts,

Hypothesis 2A: Greater board age diversity weakens Fintech firm performance.

3. Data & methodology

3.1. Data sample characteristics

The present inquiry focuses on the performance of US-headquartered publicly listed Fintech firms for the period 2010 to 2022. US-headquartered firms constitute the largest country sector for Fintech (Findexable 2021a). The place of a company's headquarters proxies for the company's principal market of revenue generation and location of business assets. As of 2020, the US was the largest national Alternative Finance Market, accounting for 65 percent of global online volume (Cambridge Centre for Alternative Finance 2021).

In achieving a representative sample of publicly listed entities, we select the constituents of leading Fintech Exchange Traded Funds (ETFs). These funds include the ARK Fintech Innovation ETF (ARKF), the Global X Fintech ETF (FINX), the ETFMG Prime Mobile Payments ETF (IPAY), the Amplify International Online Retail ETF (XBUY), the Ecofin Digital Payments Infrastructure Fund (TPAY), and the KBW Nasdaq Financial Technology Index (KFTX).

We chose 2010 as the opening year in the sample-period for two reasons. First, selection of this year sidesteps potential confounding effects arising from the Global Financial Crisis (GFC) and its immediate aftermath. Second, critical developments in Fintech, in relation to the emergence of online digitalization and payment systems, began within the initial post-GFC recovery period.

BoardEx serves as our principal source of data for demographic board information (on officer age, gender, and education). We utilize Compustat North America for Fintech firms' accounting and financial data. The denomination of all monetary variables is in US Dollars.

Based on RoleName within BoardEx, we restrict our definition of CEO to 'CEO' and 'Chief Executive'. This definition excludes acting CEOs and cases where leading officers occupy one or more other roles in the firm. Prior to the consideration of missing values and the lagging of explanatory variables, there are 473 firm-year cases. After removing cases with missing values on key accounting variables our final sample includes 384 firm-year observations based on 64 unique firms. Missing values largely arise due to missing data points on one or more lagged explanatory variables.

Finally, we recognize that Fintech entities' board demographics are at least in part jurisdictionally based. For example, female founder presence is often more commonplace in emerging than developed markets (Findexable 2021b). The cultural, institutional, and regulatory-legal context of a company's place of business thus exerts material influence on board composition and officer attributes. As shown in Puthusserry et al. (2021), the composition of developing market Fintech boards yields important effects on such firms' internationalization efforts.[12] In contrast, board members in the publicly listed Fintech firms considered in the present study context exhibit wide-ranging and deeply held international connections, networks, and experiences.

3.2. Methodology

We examine the impact of board age composition on Fintech performance by first considering the following Ordinary Least Squares (OLS) panel data regression model:

$$FintechPerformance_{i,t} = \alpha + \sum_{i=1}^{i=n} \beta_i \times Board\ Age\ Composition_{i,t-1} + \sum_{i=1}^{i=n} \gamma_i \times ControlVariables_{i,t-1} + Year\ FE + \varepsilon_{i,t} \quad (1)$$

where the dependent variable $FintechPerformance_{i,t}$ is one of the four measures of Fintech firm performance (i.e. adjusted ROA, SOA, cash flow intensity, and market-to-book value). $Board\ Age\ Composition_{i,t-1}$ refers to a board's age characteristics. $ControlVariables_{i,t-1}$ includes a set of governance, firm-level, and CEO-based controls. As in, for example, Schopohl, Urquhart, and Zhang (2021), we lag all explanatory variables by one period to mitigate reverse causality concerns. We also cluster standard errors at firm level.

Model (1) also controls for year fixed effects. As highlighted in Chen, Leung, and Evans (2016, Page 65), firm fixed effects potentially remove 'cross-sectional' variation. Ferris, Javakhadze, and Rajkovic (2017, 67) argue

Table 1. Fintech firms by sector (as based on a one-year lag in respect to explanatory variables considered in Table 3).

Sector	Freq.	Percent	Cum.
Banks	33	8.59	8.59
Business Services	75	19.53	28.13
Engineering & Machinery	3	0.78	28.91
General Retailers	6	1.56	30.47
Health	7	1.82	32.29
Insurance	2	0.52	32.81
Pharmaceuticals and Biotechnology	7	1.82	34.64
Real Estate	11	2.86	37.5
Software & Computer Services	107	27.86	65.36
Speciality & Other Finance	132	34.38	99.74
Utilities – Other	1	0.26	100
Total	384	100	

that firm fixed effects are inappropriate when considering time-invariant board characteristics over a relatively short timeframe. As in their analysis of CEO social capital, the board diversity measures we employ are largely time-invariant over the course of our study sample. As in Ferris, Javakhadze, and Rajkovic (2017), we find that virtually all the standard deviation in our variables of choice is cross-sectional. For our diversity measures relating to board age, and gender, the respective cross-sectional standard deviation figures are 0.2856 and 0.1035. In contrast, the respective standard deviation arising from time series variation is minimal for each of the two variables are at levels of only 0.0245 and 0.0077. In respect to board age diversity, more than 90 percent of the variation is therefore cross-sectionally based.

Accordingly, imposition of firm fixed effects (i.e. firm dummies) would mask the effects of time-invariant board demographics. Moreover, and in the spirit of upper echelons theory (Hambrick and Mason 1984), we opine that a significant share of a firm's performance derives from stable and enduring board properties.[13]

3.2.1. Dependent variables

We consider four measures of Fintech performance. The first measure is a Fintech entity's industry adjusted return-on-assets (ROA_Adj), defined as return-on-assets minus the average ROA of the industry to which the entity belongs (excluding the firm itself). While all firms in the study sample deliver Fintech products, systems, and capabilities, not all are specific to financial services. As shown in Table 1, sample firms traverse several industry subsectors.[14] These sectors include banking, insurance, real estate, business services, healthcare, software & computer services, pharmaceuticals, and biotech. As argued in Urquhart and Zhang (2022, Page 445), return-on-assets levels are 'industry specific'. For example, banks typically achieve lower ROA levels than companies from more growth-oriented sectors. We accordingly benchmark firm ROA levels against specific industry norms.[15]

The second and third dependent variables are sales on lagged total assets (SOA) and cash flow intensity (CashFlow). We define the latter as a Fintech firm's net operating cash flow divided by lagged total assets. The fourth dependent variable measure captures a Fintech firm's market value growth potential, as measured by its market-to-book value (MTBV).

3.2.2. Main explanatory variables relevant to hypotheses 1 & 2

This study's active explanatory variables capture different attributes of board age composition. We consider a range of specific variables. In respect to Hypothesis 1, which addresses the age of board members, we consider five measures. These are (1) the average age of all board officers, AvgAge; (2) the age of the leading officer, CEOAge; (3) the average age of executive directors, EDAge; (4) the average age of non-executive officers, NEDAge; and (5) the average age of independent non-executive board members, INEDAge.

As indicated earlier, for many firms, the NED section of a board houses mainly independent directors. In a minority of firms, one or more non-affiliated, i.e. 'connected' or non-independent, non-executive officers may be present. Such parties typically offer a consulting role to executive board members. As reported in the descriptive statistics (see Table 2), such 'connected' NEDs tend to be older than independent NED board members.

Table 2. Summary statistics (After Winsorizing continuous variables at 1st and 99th percentiles).

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent Variables					
ROA_Adj	384	0.01411	0.156023	−0.75443	0.324635
SOA	384	0.531284	0.359157	0.028434	1.833894
Cash Flow Intensity	384	0.101388	0.116612	−0.49378	0.42358
MTBV	384	5.092835	12.62924	−74.5359	48.34795
Main Explanatory (Age-related) Variables					
AverageAge	384	4.071711	0.084047	3.703768	4.317488
CEOAge	384	3.988804	0.141044	3.583519	4.317488
EDAge	384	3.977048	0.121654	3.650658	4.317488
NEDAge	384	4.101185	0.08479	3.7612	4.315263
INEDAge	384	4.103543	0.080752	3.806663	4.255613
CoVAge	384	0.132371	0.037512	0.05124	0.222517
STDEVAge	384	2.006978	0.284806	1.131402	2.533697
NED_EDAgeGap	384	0.124137	0.112223	−0.18805	0.426879
INED_EDAgeGap	384	0.126495	0.112261	−0.18805	0.426879
AgeGap	375	0.130023	0.16017	−0.41926	0.521297
Control Variables					
CEO_PhD	384	0.1875	0.390822	0	1
CEO_Chair	384	0.335938	0.472933	0	1
LnNetwork	384	7.321693	1.105082	4.204693	9.327501
% of INED	384	0.722731	0.120177	0.45	0.909091
LnFirmAge	384	2.157875	0.967788	0	3.713572
AssetTangibility	384	0.050277	0.04421	0.001468	0.218223
Leverage	384	0.229448	0.192914	0	0.78907
LnTotalAsset	384	8.277258	1.850474	3.437304	12.17304
R&D Intensity	384	0.058647	0.084738	0	0.406207
GenderRatio	384	0.175813	0.119687	0	0.5
Board Composition Statistics					
BoardSize	384	11.885	5.851	5	39
No_Female	384	2.063	1.686	0	7
No_INED	384	8.372	3.809	3	27
No_NED	384	8.836	4.243	3	30
No_ED	384	3.049	2.266	1	12
Average_Age (years)	384	58.86023	4.820396	40.6	75
AvgAge_ED (years)	384	53.75437	6.57427	38.5	75
AvgAge_NED (years)	384	60.62329	4.959467	43	74.83334
AvgAge_INED (years)	384	60.74657	4.724462	45	70.5

Notes: Table 3 contains a detailed definition of all the variables. All continuous variables are Winsorized at the 1st and 99th percentiles.

In respect to Hypothesis 2, which addresses board age dispersion, we also consider five measures. The respective variables are (1) the standard deviation of board member age, STDEVAge; (2) the coefficient of variation of board member age, CoVAge; (3) the average gap between non-executive and executive board directors, NED_EDAgeGap; (4) the average age gap between independent non-executive and executive board members, INED_EDAgeGap; and (5) the age gap between board chair and CEO, AgeGap. Among the proxy measures for age dispersion, prime attention focuses on the standard deviation (STDEVAge) and coefficient of variation (CoV) constructs. The relevant literature highlights the importance of the coefficient of variation construct (see, for example, Ali, Ng, and Kulik 2014; Talavera, Yin, and Zhang 2018).

As reported in Table 2, Fintech entities' non-executive board members are generally older than executive officers, with a mean study sample difference of 6.87 years (= 60.62–53.75 years). Interestingly, the Fintech entities we examine have a materially lower average age relative to S&P 500 firms. For example, Spencer Stuart (2020, 3) reports an average independent director age of 63.0 years across all S&P 500 constituents. The same source indicates independent officers make up 85 percent of all directors in Index constituent firms.

3.2.3. Control variables

This study's regression analysis controls for a range of board, corporate and market-based characteristics. The proportion of independent directors on a board (% of INED) and a dummy for board duality (CEO_Chair)

Table 3. Variable definitions.

Dependent Variables	Definition	Source
ROA_Adj	Industry adjusted Return on Asset, defined as ROA minus the average of ROAs in the industry.	Compustat
SOA	Sales on lagged Total Assets.	Compustat
CashFlow	Cash Flow on lagged Total Assets. Cash Flow represents the net change in cash from all items classified in the Operating Activities section on a Statement of Cash Flows.	Compustat
MTBV	Market to Book Value Ratio.	Compustat
Main Explanatory Variables		
AvgAge	Natural log of the average age of all directors. [Hypothesis 1].	BoardEx
CEOAge	Natural log of CEO age. [Hypothesis 1].	BoardEx
NEDAge	Natural log of the average age of non-executive directors. [Hypothesis 1].	BoardEx
INEDAge	Natural log of the average age of independent non-executive directors. [Hypothesis 1].	BoardEx
EDAge	Natural log of the average age of executive directors. [Hypothesis 1].	BoardEx
STDEVAge	Natural log of standard deviation of the age of all directors. [Hypothesis 2].	BoardEx
CoVAge	Coefficient of variation of director age = STDEVAge/AvgAge. [Hypothesis 2].	BoardEx
NED_EDAgeGap	Ln (average age of non-executive directors) – Ln (average age of executive officers). [Hypothesis 2].	BoardEx
INED_EDAgeGap	Ln (average age of a board's independent non-executive directors) – Ln (average age of executive officers). [Hypothesis 2].	BoardEx
AgeGap	Ln (chairperson age) – Ln (CEO age). [Hypothesis 2].	
Control Explanatory Variables		
CEO_PhD	Dummy variable equal to 1 if the CEO holds a PhD degree; and 0 otherwise.	BoardEx
GenderRatio	The proportion of female directors.	BoardEx
CEO_Female	Dummy variable equal to 1 if the CEO is Female; and 0 otherwise.	BoardEx
% of INED	Proportion of independent directors.	BoardEx
CEO_Chair	Dummy variable = 1 if the CEO also occupies the board Chair position, and 0 otherwise.	BoardEx
LnNetwork	Natural log of network size of the CEO (as captured in BoardEx by the number of 'overlaps' in regard to employment, education, and other networks).	BoardEx
$LnFirmAge_{t-1}$	Natural log of number of years since IPO	BoardEx
Leverage	Sum of debt in current liabilities and total long-term debt over total assets.	Compustat
LnTotalAsset	Natural log of book value of total assets.	Compustat
AssetTangibility	Ratio of book value of plant, property & equipment to book value of total assets	Compustat
R_D intensity	R&D on lagged Total Assets. Missing values on R&D were replaced with 0.	Compustat

control for a Fintech firm's internal governance characteristics. Duality arises where one individual holds Chair and CEO positions on a given board.[16] In respect to a firm's corporate characteristics, we control for firm size (LnTotalAsset), capital structure (Leverage), and level of seasoning (LnFirmAge). We also include a variable for a CEO's network size (LnNetworkSize). All regressions include year dummies.

We also recognize the educational background of an executive decision-maker as a construct of management quality and expertise (Cheng, Chan, and Leung 2010; Finkelstein 1992; Jalbert, Furumo, and Jalbert 2010; McGuinness, Vieito, and Wang 2020).[17] In line with recent evidence in Urquhart and Zhang (2022), of superior performance in firms with PhD-trained CEOs, we include control for such an effect, CEO_PhD.

The extant literature also recognizes a positive link between board gender diversity and corporate performance (see, for example, Giradone, Kokas, and Wood 2021). Accounts emphasizing female directors' more effective monitoring, oversight, and supervisory proficiencies (see, for example, Adams and Ferreira 2009; Cumming, Leung, and Rui 2015) suggest lower levels of agency cost in firms with greater female officer representation. A positive link may also arise for a myriad of other reasons. For example, Dezso and Ross (2012) highlights the mentoring role of high-level female decision-makers in cultivating innovative success. Greater female board representation also results in more informative stock prices (Gul, Srinidhi, and Ng 2011).[18] Such an outcome is consistent with the release of greater amounts of voluntary disclosure in gender-diverse firms. For the foregoing reasons our baseline regressions include a control variable for the proportion of female board officers, GenderRatio. It is not clear whether the evidence on a positive board gender diversity-firm performance link translates to Fintech. Fintech boards are, for the most part, homogeneous (Brett 2020; Findexable 2021b). Nonetheless, mounting evidence suggests women are gradually attaining a foothold in this sector (Forbes 2019). However, a critical Mass of female directors (Konrad, Kramer, and Erkut 2008) still eludes most Fintech entities.[19]

Table 4. Correlation matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. ROA_Adj	1								
2. SOA	−0.0216	1							
3. Cash Flow Intensity	0.6606	0.4228	1						
4. MTBV	−0.0130	0.1763	0.1112	1					
5. AvgAge	0.2557	−0.0896	0.0516	−0.0828	1				
6. CEOAge	0.2788	0.0159	0.2290	−0.0522	0.5754	1			
7. EDAge	0.2869	0.0718	0.2420	−0.0283	0.6549	0.8657	1		
8. NEDAge	0.2846	−0.1142	0.0570	−0.0762	0.9326	0.4338	0.4554	1	
9. INEDAge	0.2601	−0.1354	0.0290	−0.0798	0.9131	0.4273	0.4437	0.9763	1
10. CoVAge	−0.3514	0.0024	−0.2673	0.0205	−0.3458	−0.4691	−0.4566	−0.3008	−0.2686
11. STDEVAge	−0.2797	−0.0389	−0.2609	−0.0066	−0.0623	−0.3299	−0.3022	−0.028	−0.0034
12. NED_EDAgeGap	−0.0961	−0.1642	−0.2193	−0.0270	−0.0054	−0.6107	−0.7400	0.2619	0.2566
13.INED_EDAgeGap	−0.1238	−0.1752	−0.2414	−0.0267	−0.0529	−0.6308	−0.7645	0.2088	0.2385
14. CEO_PhD	−0.0642	−0.3204	−0.1570	−0.2027	−0.0244	−0.0612	−0.1502	0.0129	0.0499
15. CEO_Chair	0.1144	0.0406	0.1434	−0.1479	0.1529	0.4931	0.3375	0.1125	0.0972
16. LnNetwork	0.0392	−0.0686	0.0112	0.0358	−0.1603	−0.1472	−0.1714	−0.0895	−0.0773
17. % of INED	−0.0871	−0.0229	−0.1981	−0.0557	0.2628	−0.0733	−0.0462	0.1371	0.1072
18. GenderRatio	0.3025	0.0275	0.2063	0.0780	0.0379	0.2717	0.2324	0.0459	0.0200
19. LnFirmAge	0.4900	−0.3025	0.2003	−0.1122	0.4874	0.4493	0.4570	0.4641	0.4309
20. AssetTangibility	0.0409	0.3640	0.2629	0.1836	−0.0595	0.0944	0.1823	−0.0924	−0.1112
21. Leverage	0.0322	−0.1306	−0.0587	−0.1899	−0.0155	0.0146	−0.0486	0.0267	0.0733
22. LnTotalAsset	0.2689	−0.5791	−0.0639	−0.0265	0.0580	0.1760	0.0410	0.1552	0.1687
23. R&D Intensity	−0.4393	0.5499	−0.0040	0.2046	−0.1831	−0.2013	−0.0944	−0.2280	−0.2455

	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
10. CoVAge	1								
11. STDEVAge	0.9388	1							
12. NED_EDAgeGap	0.2677	0.3064	1						
13. INED_EDAgeGap	0.3016	0.3251	0.9865	1					
14. CEO_PhD	0.1221	0.1190	0.1725	0.1986	1				
15. CEO_Chair	−0.2431	−0.2330	−0.2808	−0.2958	0.0539	1			
16. LnNetwork	0.0005	−0.0348	0.1182	0.1301	−0.1135	−0.1593	1		
17. % of INED	0.0148	0.0979	0.1537	0.1272	0.0194	−0.0068	−0.1474	1	
18. GenderRatio	−0.2845	−0.2923	−0.2172	−0.2374	−0.1780	0.1349	0.1624	−0.2041	1
19. LnFirmAge	−0.3850	−0.2416	−0.1448	−0.1853	0.1646	0.1327	−0.0354	−0.0066	0.1940
20. AssetTangibility	−0.0593	−0.1069	−0.2674	−0.2775	−0.1957	−0.0499	−0.0761	−0.2358	0.2958
21. Leverage	−0.0974	−0.1033	0.0728	0.1054	0.1718	−0.0194	0.0832	−0.0674	0.0494
22. LnTotalAsset	−0.1350	−0.1057	0.0728	0.0769	0.2094	0.0790	0.2976	−0.2875	0.2916
23. R&D Intensity	0.1947	0.1239	−0.0699	−0.0743	−0.1583	−0.1961	0.0751	−0.0561	−0.0327

	(19)	(20)	(21)	(22)	(23)
19. LnFirmAge	1				
20. AssetTangibility	0.0500	1			
21. Leverage	−0.0485	−0.0810	1		
22. LnTotalAsset	0.3838	−0.2649	0.1888	1	
23. R&D Intensity	−0.3876	0.3441	−0.2270	−0.4620	1

Regressions do not specifically control for the nationality of board members. The present data sample contains firms that are strongly heterogeneous in terms of international outreach and the experiences and backgrounds of leading officers. This profile suggests greater access to global resources and stronger penetration of offshore markets, through the identification of customers, supply chains and external funding channels in a multiplicity of market settings.[20] Finally, regressions also include control for asset tangibility and the scale of R&D expenditures.

We are also acutely aware of the endogeneity issues surrounding the board age diversity-performance link. As argued in Erhardt, Werbel, and Shrader (2003), the invidious task for researchers is to judge whether '[a pertinent effect] is the cause or result of performance.' We dig deep on this issue in the ensuing analysis to (1) investigate whether a significant board age diversity-performance link exists within the domain of large-firm Fintech firms; and (2) whether any such link is subject to simultaneity.

Table 3 provides detailed definition of all variables utilized.

4. Empirical results

4.1. Descriptive statistics

Table 2 reports descriptive statistics for all variables. In respect to dependent variables, we find that the average value of listed firms' industry adjusted ROA is 1.4%. The respective means for sales-on-assets (SOA), Cash Flow intensity, and MTBV are 53.1%, 10.1%, and 5.09. These figures suggest a level of financial maturity, relative of course to non-listed Fintech entities, where ROA levels are often negative, and sales turnover at modest levels.

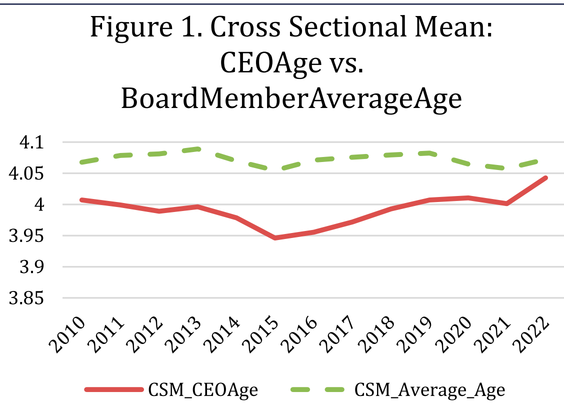
In relation to the active explanatory variables, average board member age is 58.86 years. Board member age diversity, represented by the mean of the standard deviation of director age, is 7.7 years. For the large, publicly listed Fintech firms considered in the present study sample, a significant number appoint retired former

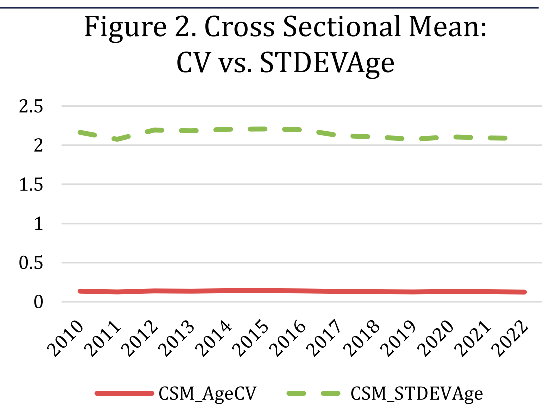
Table 5. Panel A: Sample statistics and univariate t-tests.

Distribution of observations by fiscal year

Year	Freq.	Percent	Cum.	Year	Freq.	Percent	Cum.
2010	20	5.21	5.21	2017	34	8.85	57.81
2011	24	6.25	11.46	2018	35	9.11	66.93
2012	23	5.99	17.45	2019	36	9.38	76.3
2013	28	7.29	24.74	2020	42	10.94	87.24
2014	30	7.81	32.55	2021	46	11.98	99.22
2015	31	8.07	40.62	2022	3	0.78	100
2016	32	8.33	48.96				
				Total	384	100	

Panel B: Cross-sectional mean (CSM) of key age and gender variables





FYear	CSM_CEOAge	CSM_Average_Age	CSM_AgeCV	CSM_STDEVAge
2010	4.007322	4.067851	0.134901	2.030097
2011	3.999122	4.078576	0.124377	1.951798
2012	3.989005	4.080971	0.137593	2.057566
2013	3.996178	4.088986	0.134506	2.050961
2014	3.978467	4.069696	0.140391	2.065556
2015	3.946089	4.054585	0.142327	2.065626
2016	3.955452	4.070979	0.139583	2.058148
2017	3.971706	4.075525	0.130204	1.995554
2018	3.99285	4.079269	0.126987	1.975685
2019	4.007263	4.082384	0.12431	1.95371
2020	4.010597	4.064619	0.129949	1.977868
2021	4.001213	4.057544	0.129419	1.963645
2022	4.042641	4.072309	0.122763	1.964073

(continued).

Table 5. Continued.

Panel C: Firm performance t-tests of difference

	CEOAge > = Median CEOAge	CEOAge < Median CEOAge	Diff	t−stat
ROA_Adj	0.0475	−0.02577	0.073268	4.7079***
SOA	0.530388	0.532354	−0.00197	−0.0533
Cash Flow Intensity	0.119679	0.079544	0.040135	3.4051***
MTBV	4.397507	5.923254	−1.52575	−1.1797
	AvgAge_ED > = Median AvgAge_ED	AvgAge_ED < Median AvgAge_ED	Diff	t−stat
ROA_Adj	0.053653	−0.02798	0.081637	5.3024***
SOA	0.534169	0.528213	0.005955	0.1622
Cash Flow Intensity	0.127895	0.073171	0.054724	4.7218***
MTBV	4.473998	5.751596	−1.2776	−0.9907
	STDEVAge > = Median STDEVAge	STDEVAge < Median STDEVAge	Diff	t−stat
ROA_Adj	−0.01681	0.047715	−0.06452	−4.1325***
SOA	0.528209	0.534626	−0.00642	−0.1747
Cash Flow Intensity	0.082337	0.122097	−0.03976	−3.3830***
MTBV	4.972818	5.223287	−0.25047	−0.1939
	CV > = Median CV	CV < Median CV	Diff	t−stat
ROA_Adj	−0.02743	0.056524	−0.08395	−5.4670***
SOA	0.543754	0.518552	0.025202	0.6870
Cash Flow Intensity	0.079469	0.123769	−0.0443	−3.7862***
MTBV	5.0884	5.097363	−0.00896	−0.0069

executives to non-executive board positions. This approach adds experience to boards housing young executive directors. Relative to private Fintech entities (see, for example, White 2017), publicly listed Fintech entities accommodate generally more experienced board officers. However, at the same time, publicly listed non-Fintech entities include officers that are materially older (see, for example, Spencer Stuart 2020) than those in the present study sample.

Descriptive statistics indicate executive director age (EDAge) is substantially lower than for non-executive directors (NEDAge). In relation to non-executive director and executive directors, the average ages of the respective subgroupings, NEDAge and EDAge, are 60.62 and 53.75 years. The standard deviations of the respective means are 4.96 and 6.57 years (see Table 2).

Table 2 also outlines the sample firms' board characteristics. Average board size is around 11.89 officers, with respective means for NED and ED categories of 8.84 and 3.05 members. In terms of descriptive statistics, CEO-Chair duality is at a relatively high level for sample firms. However, and as explained in Najaf, Chin, and Najaf (2021), duality is a common trait in the Fintech sector.

In terms of gender diversity, women account for 17.6% of board positions. As shown in Table 2, women account for only 2.06 board members on average. Many sample firms accommodate male-only boards. These results confirm the general lack of gender-based heterogeneity on Fintech firm boards (Findexable 2021b). While such homogeneity is more extreme in the case of private (non-listed) entities, notable gender-based board homogeneity remains for seasoned, publicly listed Fintech entities. In relation to other board demographics, 18.8% of CEOs hold a PhD.

Finally in this sub-section, Tables 4 and 5 report the respective correlations and differences in mean t-test results for Fintech firm performance variables against board age characteristics. Data in Table 5 (and shown in Figures 1 and 2) reveal very little cross-sectional variation exists in relation to board age across sample years. Board age characteristics therefore appear quite stable across the relevant timeframe.

4.2. Main results

Tables 6–8 report our baseline regression results. For each table, regression models include year fixed effects. We introduce our Fintech firms' board age characteristics sequentially in columns (1) – (5), in relation to Hypothesis 1, and in columns (6)-(10), for Hypothesis 2.

Table 6. Fintech board age composition and adjusted ROA: baseline results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge	0.270 (1.38)									
CEOAge		0.217** (2.28)								
EDAge			0.217* (1.92)							
NEDAge				0.237 (1.27)						
INEDAge					0.231 (1.16)					
CoVAge						−0.618*** (−2.93)				
STDEVAge							−0.0596** (−2.21)			
NED_EDAgeGap								−0.0736 (−0.77)		
INED_EDAgeGap									−0.0864 (−0.86)	
AgeGap										−0.0364 (−0.60)
CEO_PhD	−0.00259 (−0.11)	0.000820 (0.03)	0.00378 (0.15)	−0.00555 (−0.23)	−0.00759 (−0.33)	−0.000604 (−0.03)	−0.00542 (−0.25)	−0.00799 (−0.36)	−0.00670 (−0.30)	−0.0114 (−0.52)
CEO_Chair	−0.00116 (−0.04)	−0.0250 (−0.82)	−0.0136 (−0.47)	0.00187 (0.08)	0.00228 (0.09)	−0.00625 (−0.25)	−0.00443 (−0.18)	−0.00257 (−0.10)	−0.00363 (−0.14)	−0.00637 (−0.24)
LnNetwork	0.0163** (2.10)	0.0169** (2.35)	0.0168** (2.27)	0.0154** (2.06)	0.0151** (2.03)	0.0135* (1.95)	0.0130* (1.87)	0.0142** (2.03)	0.0144** (2.06)	0.0135* (1.89)
% of INED	−0.154* (−1.91)	−0.0945 (−0.90)	−0.0946 (−0.91)	−0.132 (−1.47)	−0.125 (−1.34)	−0.109 (−1.02)	−0.0992 (−0.92)	−0.0971 (−0.95)	−0.0976 (−0.95)	−0.105 (−0.96)
GenderRatio	0.229** (2.60)	0.214** (2.55)	0.221** (2.53)	0.223** (2.57)	0.227** (2.60)	0.197** (2.36)	0.206** (2.37)	0.230** (2.56)	0.228** (2.54)	0.227** (2.55)
LnFirmAge	0.0250* (1.72)	0.0245** (2.03)	0.0237* (1.94)	0.0279** (2.01)	0.0293** (2.20)	0.0283** (2.64)	0.0336*** (3.15)	0.0359*** (3.43)	0.0352*** (3.35)	0.0345*** (3.05)
AssetTangibility	0.272 (0.90)	0.220 (0.79)	0.204 (0.73)	0.275 (0.89)	0.271 (0.88)	0.248 (0.85)	0.220 (0.74)	0.199 (0.65)	0.196 (0.64)	0.234 (0.73)
Leverage	−0.0814 (−1.22)	−0.0832 (−1.26)	−0.0788 (−1.19)	−0.0813 (−1.20)	−0.0835 (−1.21)	−0.0899 (−1.33)	−0.0836 (−1.24)	−0.0711 (−1.05)	−0.0701 (−1.03)	−0.0802 (−1.18)
LnTotalAsset	−0.00590 (−0.57)	−0.00625 (−0.60)	−0.00471 (−0.43)	−0.00655 (−0.64)	−0.00646 (−0.63)	−0.00485 (−0.45)	−0.00521 (−0.48)	−0.00554 (−0.50)	−0.00547 (−0.50)	−0.00627 (−0.55)
R&D Intensity	−0.455*** (−2.75)	−0.446** (−2.53)	−0.458*** (−2.66)	−0.441*** (−2.66)	−0.435** (−2.59)	−0.426** (−2.60)	−0.428** (−2.61)	−0.441** (−2.56)	−0.444** (−2.55)	−0.462** (−2.65)
_cons	−1.120 (−1.25)	−0.914* (−1.87)	−0.922 (−1.64)	−1.007 (−1.15)	−0.990 (−1.06)	0.0440 (0.26)	0.0685 (0.35)	−0.0576 (−0.32)	−0.0550 (−0.31)	−0.0425 (−0.23)
N	384	384	384	384	384	384	384	384	384	375
adj. R-sq	0.3096	0.3207	0.3151	0.3071	0.3055	0.3130	0.3033	0.2921	0.2931	0.2854
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No

Notes:
The dependent variable in the regressions is the industry adjusted Return-on-Assets (ROA).
ROA is defined as a Fintech firm's ROA minus the average ROA of a Fintech firm's industry-specific subsector for each year.
The models include year fixed effects. Robust t-statistics (in parentheses) are based on standard errors clustered at firm level.
$*$, $**$, and $**$ indicate the significance at the 10%, 5%, and 1% levels, respectively.

We begin by investigating the impact of board age composition on Fintech financial performance, as measured by a firm's industry adjusted return-on-assets (ROA). Findings in Table 6 reveal that age diversity, as viewed through the lens of either STDEVAge or CoVAge, is a strong determinant of industry adjusted ROA. The relevant estimated coefficients are negative and statistically significant at the 5% level [see Columns (6) & (7)]. Specifically, our findings suggest that a one standard deviation increase in age diversity (STDEVAge) is associated

Table 7. Fintech board age composition and sales on assets (SOA): Baseline results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	SOA	SOA	SOA	SOA	SOA	SOA	SOA	SOA	SOA	SOA
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge	0.429									
	(1.59)									
CEOAge		0.440***								
		(2.80)								
EDAge			0.346*							
			(1.86)							
NEDAge				0.444*						
				(1.78)						
INEDAge					0.427*					
					(1.71)					
CoVAge						−0.629				
						(−1.27)				
STDEVAge							−0.0427			
							(−0.77)			
NED_EDAgeGap								−0.0817		
								(−0.45)		
INED_EDAgeGap									−0.106	
									(−0.55)	
AgeGap										−0.0432
										(−0.33)
CEO_PhD	−0.101**	−0.0899**	−0.0905**	−0.104**	−0.108**	−0.104**	−0.110**	−0.111***	−0.109***	−0.116***
	(−2.41)	(−2.51)	(−2.34)	(−2.46)	(−2.60)	(−2.44)	(−2.55)	(−2.70)	(−2.68)	(−2.70)
CEO_Chair	0.0410	−0.00924	0.0211	0.0456	0.0464	0.0380	0.0420	0.0413	0.0394	0.0367
	(0.97)	(−0.20)	(0.46)	(1.09)	(1.11)	(0.81)	(0.89)	(0.89)	(0.84)	(0.68)
LnNetwork	0.0206*	0.0231*	0.0215*	0.0198	0.0190	0.0163	0.0160	0.0171	0.0174	0.0190
	(1.71)	(1.89)	(1.82)	(1.66)	(1.62)	(1.34)	(1.30)	(1.45)	(1.47)	(1.63)
% of INED	−0.386**	−0.285*	−0.292*	−0.358**	−0.344**	−0.315**	−0.308*	−0.302*	−0.301*	−0.322**
	(−2.41)	(−1.92)	(−2.00)	(−2.31)	(−2.23)	(−2.03)	(−1.96)	(−1.91)	(−1.93)	(−2.05)
GenderRatio	0.288	0.258	0.276	0.276	0.285	0.257	0.273	0.290	0.288	0.318*
	(1.59)	(1.47)	(1.49)	(1.57)	(1.61)	(1.42)	(1.50)	(1.57)	(1.54)	(1.75)
LnFirmAge	0.000580	−0.00615	−0.00165	0.00239	0.00531	0.0111	0.0177	0.0187	0.0176	0.0217
	(0.02)	(−0.19)	(−0.05)	(0.08)	(0.19)	(0.39)	(0.63)	(0.66)	(0.61)	(0.78)
AssetTangibility	1.832***	1.748***	1.724***	1.852***	1.843***	1.778***	1.751***	1.726***	1.720***	1.738***
	(3.45)	(3.35)	(3.19)	(3.51)	(3.48)	(3.13)	(3.01)	(2.98)	(2.98)	(2.94)
Leverage	−0.0446	−0.0527	−0.0406	−0.0472	−0.0511	−0.0478	−0.0378	−0.0286	−0.0273	−0.0261
	(−0.45)	(−0.55)	(−0.41)	(−0.49)	(−0.53)	(−0.47)	(−0.38)	(−0.29)	(−0.27)	(−0.26)
LnTotalAsset	−0.091***	−0.092***	−0.089***	−0.092***	−0.092***	−0.090***	−0.091***	−0.091***	−0.091***	−0.092***
	(−5.70)	(−5.96)	(−5.64)	(−5.68)	(−5.71)	(−5.59)	(−5.54)	(−5.44)	(−5.43)	(−5.64)
R&D Intensity	0.201	0.209	0.195	0.220	0.232	0.241	0.237	0.225	0.220	0.194
	(0.57)	(0.56)	(0.53)	(0.63)	(0.67)	(0.68)	(0.66)	(0.62)	(0.60)	(0.53)
_cons	−0.513	−0.567	−0.205	−0.600	−0.547	1.276***	1.262***	1.172***	1.176***	1.167***
	(−0.49)	(−0.89)	(−0.27)	(−0.61)	(−0.55)	(5.31)	(4.94)	(5.15)	(5.15)	(5.00)
N	384	384	384	384	384	384	384	384	384	375
adj. R-sq	0.5065	0.5204	0.5090	0.5085	0.5073	0.5017	0.4986	0.4980	0.4984	0.5150
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No

Notes:
The dependent variable in the regressions is the Sales on lagged Total Assets defined as a Fintech firm's Sales over lagged Total Assets. The models include year fixed effects. Robust t-statistics (in parentheses) reflect standard errors clustered at firm level.
∗, ∗∗, and ∗∗∗ indicate the significance at the 10%, 5%, and 1% levels, respectively.

with a 3.1% decrease in industry adjusted ROA[21], which is economically meaningful. Such an outcome indicates greater variation in board member age weakens Fintech firm performance. This result runs counter to Hypothesis 2N, offering support for the alternative hypothesis, H2A. As in Talavera, Yin, and Zhang (2018), pronounced age-gap differences may spawn conflict rather than constructive information-sharing. The pattern of results in Table 6 is also consistent with arguments in Talavera, Yin, and Zhang (2021) of weaker 'tournament' effects in entities with a more 'hierarchical' command structure. Talavera, Yin, and Zhang (2021) conclude that entities

Table 8. Fintech board age composition and cash flow intensity: Baseline results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	CashFlow	CashFlow	CashFlow	CashFlow	CashFlow	CashFlow	CashFlow	CashFlow	CashFlow	CashFlow
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge	0.180									
	(1.67)									
CEOAge		0.165**								
		(2.53)								
EDAge			0.196***							
			(2.70)							
NEDAge				0.143						
				(1.38)						
INEDAge					0.115					
					(1.05)					
CoVAge						−0.505***				
						(−2.67)				
STDEVAge							−0.0490**			
							(−2.03)			
NED_EDAgeGap								−0.106		
								(−1.46)		
INED_EDAgeGap									−0.129	
									(−1.66)	
AgeGap										−0.00699
										(−0.13)
CEO_PhD	−0.00969	−0.00629	−0.00184	−0.0120	−0.0137	−0.00676	−0.0106	−0.0107	−0.00859	−0.0156
	(−0.54)	(−0.38)	(−0.11)	(−0.66)	(−0.76)	(−0.39)	(−0.62)	(−0.65)	(−0.52)	(−0.92)
CEO_Chair	0.00855	−0.00994	−0.00364	0.0106	0.0109	0.00382	0.00525	0.00354	0.00164	0.00648
	(0.52)	(−0.52)	(−0.20)	(0.66)	(0.67)	(0.23)	(0.32)	(0.20)	(0.09)	(0.32)
LnNetwork	0.0145**	0.0152**	0.0156**	0.0138**	0.0134**	0.0126**	0.0122**	0.0135**	0.0139**	0.0119*
	(2.43)	(2.64)	(2.59)	(2.37)	(2.31)	(2.09)	(2.04)	(2.22)	(2.25)	(1.96)
% of INED	−0.240***	−0.199***	−0.197***	−0.224***	−0.218***	−0.210***	−0.202***	−0.193***	−0.193***	−0.210***
	(−3.92)	(−3.07)	(−3.03)	(−3.60)	(−3.42)	(−2.95)	(−2.83)	(−2.87)	(−2.90)	(−3.01)
GenderRatio	0.111	0.100	0.104	0.108	0.111	0.0851	0.0921	0.111	0.109	0.116
	(1.25)	(1.11)	(1.14)	(1.22)	(1.25)	(1.04)	(1.10)	(1.22)	(1.19)	(1.32)
LnFirmAge	0.0152	0.0136	0.0109	0.0177*	0.0194*	0.0160	0.0202**	0.0211**	0.0199**	0.0190**
	(1.40)	(1.26)	(0.99)	(1.70)	(1.94)	(1.60)	(2.09)	(2.25)	(2.07)	(2.05)
AssetTangibility	0.596***	0.561***	0.546***	0.594***	0.587***	0.583***	0.561**	0.529**	0.524**	0.595**
	(2.78)	(2.78)	(2.66)	(2.74)	(2.70)	(2.79)	(2.61)	(2.43)	(2.41)	(2.60)
Leverage	−0.0697	−0.0720	−0.0697	−0.0690	−0.0691	−0.0781	−0.0730	−0.0624	−0.0609	−0.0738
	(−1.39)	(−1.45)	(−1.38)	(−1.37)	(−1.36)	(−1.51)	(−1.39)	(−1.20)	(−1.17)	(−1.42)
LnTotalAsset	−0.0156**	−0.0158**	−0.0144**	−0.0160**	−0.0159**	−0.0147**	−0.0150**	−0.0149**	−0.0147**	−0.0156**
	(−2.36)	(−2.46)	(−2.15)	(−2.41)	(−2.38)	(−2.22)	(−2.22)	(−2.11)	(−2.09)	(−2.23)
R&D Intensity	−0.260	−0.255	−0.268*	−0.250	−0.246	−0.239	−0.241	−0.255	−0.261	−0.278*
	(−1.65)	(−1.58)	(−1.69)	(−1.58)	(−1.55)	(−1.51)	(−1.53)	(−1.61)	(−1.63)	(−1.71)
_cons	−0.489	−0.431	−0.563	−0.351	−0.245	0.303***	0.324***	0.221**	0.224**	0.238**
	(−1.03)	(−1.43)	(−1.63)	(−0.77)	(−0.51)	(3.17)	(2.94)	(2.27)	(2.31)	(2.44)
N	384	384	384	384	384	384	384	384	384	375
adj. R-sq	0.2299	0.2421	0.2463	0.2264	0.2231	0.2391	0.2307	0.2265	0.2303	0.2135
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No

Notes:
The dependent variable in the regressions is Cash Flow intensity defined as a Fintech firm's Net Operating Cash Flow on lagged Total Assets. The models include year fixed effects. Robust t-statistics (in parentheses) are based on standard errors clustered at firm level.
*, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively.

with directors of similar age are more likely to compete strongly in relation to firm-level compensation. Such competition yields positive firm-level performance effects, squeezing concomitant agency costs.

By way of contrast, we find no significant association between the average age of *all* board members and Fintech firms' industry adjusted ROA. However, findings in Columns (2) & (3) of Table 6 reveal that Fintech firm performance benefits from more experienced executive directors. This outcome runs counter to Hypothesis 1N, suggesting support instead for the alternative premise, H1A.

In terms of control effects, we find that CEO networks and gender diversity support firm performance. We also observe that Fintech firms with greater stock seasoning (i.e. a longer period of listing since IPO launch), fare better in performance terms. Consistent with expectations, Table 6 results show that greater R&D expenditure (R&D_Intensity) crimps short-run corporate profitability.

Fintech firms' preoccupation with growth possibilities and R&D suggests that historical accounting-based measures, like ROA, while informative, may not be a definitive guide to performance (see Urquhart and Zhang (2022, Page 445). Accordingly, Table 7 explores the impact of Fintech board diversity on a firm's sales to lagged total assets ratio (SOA). Results again offer evidence of a negative relation between board age diversity, STDEVAge, and performance [Column (7)].

Interestingly, CEO age [see Table 7, Column (2)] becomes even more significant in supporting financial performance. Regressions in Columns (4) & (5) of Table 7 suggest that rising NED age exerts significant, though weaker effects on SOA performance. This evidence runs counter to Masulis et al.'s (2022) cross-industry evidence, in which older independent directors impart weak board monitoring effects. Part of this difference may reflect the lower average age of independent directors in Fintech (of 60.75 years, as shown in Table 2). As reported in Spencer Stuart (2020, 3), the comparable figure for S&P500 firms, as of the mid-point of our sample period, 2015, is 63.1 years.

Results in Table 7 suggest weaker performance in Fintech entities accommodating PhD-trained CEOs. Results support Berger, Kick, and Schaeck's (2014) evidence on PhD-trained executives' more conservative corporate strategies. Our results on this frontier are consistent with Berger, Kick, and Schaeck's (2014) bank-related evidence on PhD-trained CEOs' more conservative disposition. However, such risk aversion does not necessarily result in greater cash holdings. In this sense, firms with PhD-trained CEOs do not invest less; rather, and as inferred from more stable sales growth, they select less risky growth options.

In contrast to Table 6, Table 7 findings offer little to no support for a gender diversity (GenderRatio) effect. This outcome may be reflective of Critical Mass prescriptions. Greater participation may be necessary before Critical Mass (Konrad, Kramer, and Erkut 2008) prescriptions achieve traction. Nonetheless, the mixed findings on ROA and SOA performance measures in the present context extend findings beyond the non-Fintech domain.

In respect to other control effects, network effects appear important in some regressions [see Columns (1)-(3) of Table 7], while asset tangibility strongly supports SOA performance. In contrast, SOE performance is significantly weaker in boards with greater independent director representation.

Results in Table 8 address our third performance measure, cash flow intensity. Results in Columns (2) & (3) indicate significantly greater cash flow intensity in Fintech firms with older executive directors. However, and consistent with earlier findings, effects emanating from NEDs appear notably weaker. In terms of Hypothesis 2, we find evidence of an inverse association between cashflow intensity and both CoVAge and STDEVAge [Columns (6) & (7)]. Again, such dispersion seemingly reflects movement in the age of executive directors, rather than in non-executive directors.

In relation to control effects, regressions in Table 8 reveal cash flow intensity rises with asset tangibility and with the scale of a CEO's networks. In respect to the latter, Tables 6–8 support a story in which the networks of the CEO attract valuable resources and business connections. Such results support a resource dependence theory (Pfeffer and Salancik 1978) narrative on performance. We note that board gender diversity imparts minimal effect on Fintech firms' cash flow intensity and market-to-book ratio performance measures.

For reasons of parsimony, we do not report findings for the fourth Fintech performance measure, market-to-book value (MTBV). All regressions in this area indicate that board demography exerts little to no material effect on Fintech firms' market-to-book (MTBV) values. None of the active age variables bears significant relation with the dependent variable.[22]

In relation to baseline regressions (Tables 6–8), we emphasize findings for the return-on-assets (ROA), sales-on-assets (SOA), and cash flow intensity results. These findings offer a consistent pattern of support for Hypothesis 1A in respect to both the age of a board's CEO and its executive directors. Likewise, a clear pattern of support emerges for Hypothesis 2A. Greater board age dispersion corresponds to weaker ROA, SOA, and cash flow intensity performance.

Baseline findings are consistent with more seasoned EDs (or less inexperienced CEOs) galvanizing Fintech firm performance. Such an outcome is congruent with CEOs and other executive directors combining

Table 9. OLS regression with year fixed effects for the ROA dependent variable with a lead time of one year (i.e. explanatory variables lagged by two years)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ROA_{t+1}	ROA_{t+1}	ROA_{t+1}	ROA_{t+1}	ROA_{t+1}	ROA_{t+1}	ROA_{t+1}	ROA_{t+1}	ROA_{t+1}	ROA_{t+1}
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge	0.388* (1.81)									
CEOAge		0.232** (2.37)								
EDAge			0.251** (2.11)							
NEDAge				0.323 (1.53)						
INEDAge					0.336 (1.53)					
CoVAge						−0.822*** (−3.10)				
STDEVAge							−0.0756** (−2.47)			
NED_EDAgeGap								−0.0618 (−0.66)		
INED_EDAgeGap									−0.0661 (−0.68)	
AgeGap										−0.0283 (−0.51)
_cons	−1.613 (−1.64)	−1.008* (−2.00)	−1.096* (−1.83)	−1.385 (−1.40)	−1.447 (−1.41)	0.0452 (0.25)	0.0634 (0.30)	−0.102 (−0.50)	−0.0992 (−0.49)	−0.0916 (−0.44)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	317	317	317	317	317	317	317	317	317	311
adj. R-sq	0.3396	0.3349	0.3335	0.3312	0.3324	0.3412	0.3206	0.2989	0.2991	0.2942
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No

dynamism, as reflective of their comparatively young age, with experience gained in assessing and calibrating the risk of growth options. Moreover, the presence of more experienced executive officers in Fintech entities narrows the age gap between EDs and generally older NEDs.

4.3. Robustness checks

4.3.1. Tests for reverse causality

In mitigating the possible effects of reverse causality, we first consider lagged regression effects. Such an approach serves as a longstanding remedy for possible endogeneity bias arising from simultaneity (see Ali, Liu, and Su 2022, for a recent application in respect to lagged fixed effects models).

Accordingly, regressions in Table 9 consider the return-on-assets dependent variable with a lead time of one year. As baseline regressions in Tables 6–8 already lag explanatory variables by one year (i.e. period t-1 variables) relative to dependent variables (of period t), Table 9 regressions effectively build-in two-year lags. By the same logic, Table 10 results build-in three-year lags. In particular, the significant inverse relation between age diversity (STDEVAge) and return-on-assets (ROA) remains strongly resilient. Moreover, more senior CEOs, and more experienced executive directors generally, support ROA performance. These results add a further layer of support for Hypothesis 1A and Hypothesis 2A.

Through a similar approach to the above, we also examine the impact of two- and three-year lags on explanatory variables in relation to SOA performance. Tables 11 and 12 report relevant results.

As with earlier findings, more experienced CEOs, and executive directors more generally, boost firm performance. Again, results reaffirm support for hypotheses 1A and 2A. Results in Tables 6–8 & 9–12 therefore

Table 10. OLS regression with year fixed effects for the ROA dependent variable with a lead time of two years (i.e. explanatory variables lagged by three years).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ROA_{t+2}	ROA_{t+2}	ROA_{t+2}	ROA_{t+2}	ROA_{t+2}	ROA_{t+2}	ROA_{t+2}	ROA_{t+2}	ROA_{t+2}	ROA_{t+2}
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge	0.263 (1.21)									
CEOAge		0.186** (2.10)								
EDAge			0.229* (1.87)							
NEDAge				0.180 (0.91)						
INEDAge					0.184 (0.95)					
CoVAge						−0.928*** (−3.07)				
STDEVAge							−0.0944** (−2.57)			
NED_EDAgeGap								−0.122 (−1.15)		
INED_EDAgeGap									−0.132 (−1.18)	
AgeGap										−0.0439 (−0.78)
_cons	−1.116 (−1.19)	−0.825* (−1.99)	−1.002* (−1.76)	−0.807 (−0.92)	−0.831 (−0.96)	0.0774 (0.58)	0.118 (0.71)	−0.0893 (−0.63)	−0.0850 (−0.60)	−0.0658 (−0.45)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	265	265	265	265	265	265	265	265	265	261
adj. R-sq	0.3200	0.3271	0.3327	0.3111	0.3111	0.3578	0.3390	0.3104	0.3114	0.3124
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No

Notes for Tables 8 & 10:
The dependent variable in the regressions is the Sales on lagged Total Assets defined as a Fintech firm's Sales over lagged Total Assets.
The models include year fixed effects. Robust t-statistics (in parentheses) are based on standard errors clustered at firm level.
*, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively.
Control variables, while not reported above, are included in all regressions. The control variables are CEO_PhD; CEO_Chair; LnNetwork; % of INED; GenderRatio; LnFirmAge; AssetTangibility; Leverage; LnTotalAsset; and R&D Intensity.

offer a considerable degree of robustness. The consistency of findings over 1-, 2-, and 3-period lags for explanatory variables suggest endogeneity, via reverse causality, does not underlie outcomes. The support we observe for hypotheses 1A and 2A is also consistent in economic terms. Given the pronounced age gap between non-executive and executive directors, an increase in executive director age contributes to lower board age dispersion by squeezing the NED-ED age gap.

As explained earlier, Fintech entities' financial performance is often seen through the lens of sales growth.[23] Even for publicly listed Fintech firms, and as stressed throughout, robust return-on-assets performance serves as a longer-run goal. Heavy R&D costs typically weigh on profitability in the initial years of listing. Consequently, strong sales growth attenuates short-run profitability concerns. Nonetheless, for more mature and established Fintech entities, we find that board age composition exerts explanatory power in relation to both ROA and SOA performance.

As a second robustness check for possible simultaneity bias, we perform Two Stage Least Squares (2SLS) regression analysis. Table 13 presents relevant regressions. We consider three principal age measures, CEOAge, EDAge, and CoVAge. The exogenous instrumental variable is the market average of the relevant board age composition measure (excluding the firm case in question). Following Ali, Liu, and Su (2022), we use the average of the governance attribute of interest in relation to a sample of n firms but exclude the firm in question. Accordingly, the instrument on the attribute for a specific firm i, in a given fiscal year, reflects the average value of the attribute on the other n-1 firms. The intuition for using such a market average as an instrumental variable is

Table 11. OLS regression with year fixed effects for the SOA dependent variable with a lead time of one year (i.e. explanatory variables lagged by two years).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	SOA_{t+1}	SOA_{t+1}	SOA_{t+1}	SOA_{t+1}	SOA_{t+1}	SOA_{t+1}	SOA_{t+1}	SOA_{t+1}	SOA_{t+1}	SOA_{t+1}
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge	0.469**									
	(2.52)									
CEOAge		0.429***								
		(3.04)								
EDAge			0.376**							
			(2.60)							
NEDAge				0.447**						
				(2.30)						
INEDAge					0.469**					
					(2.48)					
CoVAge						−0.865*				
						(−1.76)				
STDEVAge							−0.0748			
							(−1.28)			
NED_EDAgeGap								−0.112		
								(−0.72)		
INED_EDAgeGap									−0.117	
									(−0.71)	
AgeGap										0.00148
										(0.01)
_cons	−0.782	−0.631	−0.442	−0.727	−0.832	1.202***	1.211***	1.048***	1.052***	1.016***
	(−1.07)	(−1.05)	(−0.78)	(−0.95)	(−1.10)	(5.64)	(5.32)	(4.67)	(4.66)	(4.62)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	317	317	317	317	317	317	317	317	317	311
adj. R-sq	0.5975	0.6105	0.6013	0.5981	0.5988	0.5949	0.5900	0.5871	0.5871	0.5974
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No

that the market-average is unlikely to directly impact on firm i's financial performance. We report the various 2SLS test results in Table 13. Results show that market-level or mean CEOAge is a valid instrument because of its statistical power in explaining firm-level CEOAge. Moreover, the instrument also passes the relevance test given an F-statistic well above 10. For the sake of prudence, we also tried the mean of EDAge and the mean of CoV as alternative instruments. Such findings are consistent with one another, as well as with baseline regressions. We perform fitted effects for each of the three age measures for our four dependent variables of interest, industry adjusted ROA, SOA, Cash Flow intensity, and MTBV.

Columns (2)-(5) of Table 13 present 2SLS regressions for CEOAge. Results reveal significant positive effects in relation to the ROA, SOA, and cash flow intensity measures. Columns (7)-(9) demonstrate that EDAge is positively and significantly related to the SOA and cash flow intensity measures. The 2SLS results for CoVage, in Columns (12)-(14) indicate an inverse association with all four measures, with two of these (ROA, and cash-flow intensity) strongly significant. Overall, the results in Table 13 suggest baseline results in Tables 6–8 are not unduly affected by simultaneity. Such findings therefore offer a further layer of assurance for hypothesis 1A and 2A.

4.3.2. Tests for selection bias

Model misspecification may arise if the characteristics of firms *with* board age diversity differ materially from those *without* such age variation. To mitigate misspecification or selection concerns, we apply an entropy balancing (EB) approach (for applications in the governance area, see Ali, Liu, and Su 2022). As explained in Ali, Liu, and Su (2022, 1660–1661), recent advances in the mitigation of selection bias suggest a preference for the EB design over the Propensity Score Matching (PSM) approach.[24] Accordingly, we pursue an EB design to match high board age diversity firms with entities that have similar characteristics but exhibit low levels of age diversity.

Table 12. OLS regression with year fixed effects for the SOA dependent variable with a lead time of two years (i.e. explanatory variables lagged by three years).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	SOA_{t+2}	SOA_{t+2}	SOA_{t+2}	SOA_{t+2}	SOA_{t+2}	SOA_{t+2}	SOA_{t+2}	SOA_{t+2}	SOA_{t+2}	SOA_{t+2}
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge	0.603** (2.65)									
CEOAge		0.513*** (3.39)								
EDAge			0.462*** (3.02)							
NEDAge				0.502** (2.05)						
INEDAge					0.483* (1.93)					
CoVAge						−1.249** (−2.51)				
STDEVAge							−0.0997 (−1.67)			
NED_EDAgeGap								−0.177 (−1.06)		
INED_EDAgeGap									−0.210 (−1.20)	
AgeGap										−0.0318 (−0.27)
_cons	−1.305 (−1.39)	−0.975 (−1.42)	−0.792 (−1.17)	−0.955 (−0.98)	−0.895 (−0.88)	1.272*** (4.97)	1.267*** (4.58)	1.048*** (3.88)	1.055*** (3.92)	1.011*** (3.83)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	265	265	265	265	265	265	265	265	265	261
adj. R-sq	0.5740	0.5921	0.5792	0.5704	0.5685	0.5741	0.5630	0.5590	0.5602	0.5690
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No

Notes to Tables 11 & 12:
The dependent variable in the regressions is the Sales on lagged Total Assets defined as a Fintech firm's Sales over lagged Total Assets.
The models include year fixed effects. Robust t-statistics (in parentheses) are based on standard errors clustered at firm level.
∗, ∗∗, and ∗∗∗ indicate the significance at the 10%, 5%, and 1% levels, respectively.
Control variables, while not reported above, are included in all regressions. The control variables are CEO_PhD; CEO_Chair; LnNetwork; % of INED; GenderRatio; LnFirmAge; AssetTangibility; Leverage; LnTotalAsset; and R&D Intensity.

Tables 14 and 15 report relevant EB results. The essential findings are largely congruent with baseline results in Tables 6–8, as well as with robustness test findings in Tables 9 and 12. In Table 14, we achieve an entropy balancing design by setting EDAgeHigh = 1 where EDAge > = Median of EDAge. In the resulting EB regressions, variable EDAge is highly significant in respect to the ROA, SOA, and cashflow intensity performance measures. As with prior results, no obvious relation is apparent with the market-to-book dependent variable. Results in Table 14 reaffirm support for Hypothesis 1A.[25]

Similarly, when considering CoVAge, the EB regression approach suggests a further layer of support for Hypothesis 2A. We determine the entropy balancing approach in relation to CoVAgeHigh = 1 where CoVAge > = Median of CoVAge. As reported in Table 15, a negative relation between CoVAge is evident in respect to all four dependent variable performance measures. The effects in relation to Fintech firms' ROA and cash flow intensity levels are highly significant. As an overarching theme, our Entropy Balancing analysis suggests baseline results are largely devoid of selection bias.

We also conduct a Heckman (1979) test to further deepen robustness tests for selection bias. Tables 16 and 17 report relevant results. In respect to Table 16, we consider the mean of EDAge in each year (excluding the firm case itself) as an exogenous variable for Fintech firms. In Table 17, we consider the mean of CoVAge in each year (excluding the firm itself) as the exogenous variable for a given firm. Both sets of regressions reveal a consistent pattern of outcomes.

Table 13. 2SLS: Market average of board age composition measures (excluding the firm itself) as exogenous variable.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	1st stage		2nd stage			1st stage		2nd stage			1st stage		2nd stage		
	CEOAge	ROA_Adj	SOA	CF_Int	MTBV	AvgAge_ED	ROA_Adj	SOA	CF_Int	MTBV	CoVAge	ROA_Adj	SOA	CF_Int	MTBV
CEOAge_mean	−28.74***														
	(−15.91)														
Fitted_LnCEOAge		0.169*	0.421**	0.120*	8.194										
Fitted_LnCEOAge		(1.70)	(2.50)	(1.82)	(1.19)										
AvgAge_ED_mean						−31.51***									
						(−25.53)									
Fitted_LnAvgAge_ED							0.176	0.365**	0.140*	3.280					
							(1.66)	(2.03)	(1.91)	(0.55)					
C0VAge_mean											−17.93***				
											(−3.24)				
Fitted_CoVAge												−1.009***	−1.244	−0.721**	−26.57
												(−2.88)	(−1.34)	(−2.31)	(−0.70)
CEO_PhD		−0.00122	−0.0894**	−0.00833	−6.255		0.00129	−0.0884**	−0.00551	−6.510		−0.000735	−0.102**	−0.00794	−6.466
		(−0.05)	(−2.47)	(−0.48)	(−1.38)		(0.05)	(−2.30)	(−0.30)	(−1.42)		(−0.03)	(−2.42)	(−0.45)	(−1.38)
CEO_Chair		−0.0166	−0.000910	−0.00258	−3.606		−0.0101	0.0206	0.000971	−2.910		−0.00451	0.0382	0.00597	−2.861
		(−0.54)	(−0.02)	(−0.13)	(−1.25)		(−0.35)	(0.46)	(0.05)	(−1.07)		(−0.18)	(0.82)	(0.36)	(−1.09)
_cons	118.9***	−0.723	−0.484	−0.254	−37.18	128.6***	−0.755	−0.274	−0.334	−17.94	2.505***	0.112	1.382***	0.341***	−0.472
	(16.46)	(−1.42)	(−0.71)	(−0.84)	(−1.24)	(26.33)	(−1.40)	(−0.38)	(−0.97)	(−0.69)	(3.47)	(0.65)	(5.04)	(3.32)	(−0.04)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	473	384	384	384	384	473	384	384	384	384	473	384	384	384	384
adj. R-sq	0.8774	0.3058	0.5158	0.2290	0.1223	0.9244	0.3060	0.5103	0.2320	0.1186	0.6195	0.3080	0.5024	0.2306	0.1194
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
F-Statistic	253.1281					651.7809					10.4976				

Note: ∗, ∗∗, and ∗∗∗ indicate the significance at the 10%, 5%, and 1% levels, respectively.
F-statistic > 10 means the instrumental variable is valid.

Table 14. Entropy balancing approach. Treatment is AvgAge_ED > = AvgAge_Ed Median.

Panel A: Post-entropy balancing covariate balance

	Treatment			Control				
	AvgAge_ED > = AvgAge_Ed Median			AvgAge_ED < AvgAge_Ed Median				
	mean	variance	skewness	mean	variance	skewness	Standard Mean Difference	Variance Ratio
CEO_PhD	0.1498	0.1279	1.963	0.1497	0.1279	1.963	0.000186	0.999989
CEO_Chair	0.4615	0.2495	0.1543	0.4615	0.2496	0.1544	0.000051	0.99963
LnNetwork	7.216	1.256	−0.5913	7.217	1.256	−0.5643	−0.00063	0.999858
% of INED	0.723	0.01382	−0.3109	0.7231	0.01382	0.00641	−0.00085	0.999805
GenderRatio	0.201	0.01331	0.05385	0.201	0.01331	−0.1095	−0.000046	0.999812
LnFirmAge	2.518	0.7244	−1.078	2.518	0.7246	−1.845	−0.00019	0.99971
AssetTangibility	0.0568	0.002338	1.424	0.0568	0.002337	1.261	−0.000012	1.000086
Leverage	0.2245	0.03702	0.6901	0.2245	0.03703	1.13	−0.00029	0.999689
LnTotalAsset	8.474	3.82	0.1972	8.475	3.821	−0.1411	−0.00025	0.999804
R&D Intensity	0.04917	0.006117	2.174	0.04918	0.006118	2.235	−0.00016	0.999869

Panel B: Entropy balancing regression outputs.

	ROA	SOA	Cashflow	MTBV
AvgAge_ED	0.450***	0.457**	0.313***	0.421
	(4.52)	(2.09)	(3.21)	(0.09)
_cons	−1.892***	−0.988	−1.121***	−12.605
	(−4.51)	(−1.12)	(−2.61)	(−0.62)
Control variables included	Yes	Yes	Yes	Yes
N	384	384	384	384
R-sq	0.5567	0.6041	0.3523	0.2191
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No

Note: *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively. Standard Mean Differences (SMD) calculated as the difference in means between treatment and control samples divided by the standard deviation of the treatment sample for each covariate (with values near zero when the distribution for a particular covariate is more similar between treatment and control samples), and Variance Ratios (VR) calculated as the ratio of the variance of each covariate in the treatment sample scaled by variance for the control sample.

First and foremost, and as an important pre-requisite, the Inverse Mills Ratio (IMR) is insignificantly different from zero in all regressions in Tables 16 and 17. Second, significant positive relations exist with the ROA performance measure in respect to the board age variables [Columns (1) – (5)]. This includes a strong positive effect in relation with the average age of all board members, AvgAge [Column (1)]. Such outcomes offer a further round of support for Hypothesis 1A.

For variable CoVAge, overall results in Tables 16 and 17 also reveal negative associations with the ROA performance variable. Such results offer a further strand of support for Hypothesis 2A.[26]

In a final round of analysis, we consider possible interaction effects. First, as reported in Appendix 1, we consider interactions of board age with GenderDum (= 1 for firm-years where there is at least one female board member on a board). Results show that the main effects are little affected by interactions with officer gender. The second interaction effect is about risk. We consider corporate leverage. High rates of firm leverage potentially constrain a board's ability to sanction risky investments. As shown in Appendix 2, interactions of LeverageDum (= 1 where leverage > sample median for leverage) with officer age variables have minimal impact on this study's main effects. Such outcomes underscore the distinct role of director age as a governance characteristic.

In summary, robustness test results based on 2SLS analysis, entropy balancing, and Heckman (1979) tests suggest that this paper's central findings are resilient to simultaneity and selection bias issues. We demonstrate two central findings. First, performance in publicly listed Fintech firms is increasing in respect to board member age, especially at the CEO, and more generally at executive director levels. Second, lower age dispersion on Fintech boards supports corporate performance.

Table 15. Entropy balancing approach. Treatment is CoVAge > = CoVAge Median.

Panel A: Post-entropy balancing covariate balance

	Treatment			Control				
	CoVAge > = CoVAge Median			CoVAge < CoVAge Median				
	mean	variance	skewness	mean	variance	skewness	Standard Mean Difference	Variance Ratio
CEO_PhD	0.1958	0.1581	1.533	0.1958	0.1581	1.533	0.000077	0.999993
CEO_Chair	0.2667	0.1964	1.055	0.2668	0.1965	1.054	−0.00036	0.999493
LnNetwork	7.325	1.279	−0.7497	7.325	1.279	−0.5627	0.000033	0.999752
% of INED	0.7244	0.01708	−0.3896	0.7244	0.01708	−0.07413	−0.00014	1.000117
GenderRatio	0.1683	0.01488	0.05763	0.1684	0.01488	0.7522	−0.0005	0.99959
LnFirmAge	1.936	1.023	−0.5816	1.937	1.023	−0.4071	−0.00048	0.999806
AssetTangibility	0.05033	0.002279	1.469	0.05034	0.002279	1.874	−0.00031	0.999737
Leverage	0.1977	0.02951	0.669	0.1977	0.02954	0.6316	−0.00025	0.998927
LnTotalAsset	8.073	3.435	0.072	8.073	3.434	0.2309	−0.0001	1.000233
R&D Intensity	0.0741	0.008814	1.531	0.07409	0.008811	1.375	0.000167	1.00034

Panel B: Entropy balancing regression outputs

	ROA	SOA	Cashflow	MTBV
CoVAge	−0.443***	−0.141	−0.296**	−4.461
	(−3.14)	(−0.38)	(−2.11)	(−0.45)
_cons	0.0187	1.327***	0.264***	−3.721
	(0.23)	(5.06)	(4.95)	(−0.89)
Control variables included	Yes	Yes	Yes	Yes
N	384	384	384	384
R-sq	0.3229	0.5759	0.3278	0.1858
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No

Notes:
∗, ∗∗, and ∗∗∗ indicate the significance at the 10%, 5%, and 1% levels, respectively. Standard Mean Differences (SMD) calculated as the difference in means between treatment and control samples divided by the standard deviation of the treatment sample for each covariate (with values near zero when the distribution for a particular covariate is more similar between treatment and control samples), and Variance Ratios (VR) calculated as the ratio of the variance of each covariate in the treatment sample scaled by variance for the control sample.
Control variables are included but not reported in the above table. The control variables include CEO_PhD; CEO_Chair; LnNetwork; % of INED; GenderRatio; LnFirmAge; AssetTangibility; Leverage; LnTotalAsset; and R&D Intensity.

5. Conclusions

The current inquiry examines the board age demography of large, US listed Fintech entities. We define our sample frame in terms of the constituents of six leading Fintech-focused Exchange Traded Funds (ETFs). In so doing, we address Fintech entities that are receptive to the regulatory and external protocols driven by market listing. We note that, even within this context, significant homogeneity exists in relation to gender. By way of contrast, notable heterogeneity exists in relation to board member age. This picture supports evidence in other settings and industries where age, as a management quality construct, stands in stark contrast to other more homogeneous board characteristics (Orlando and Shelor 2002). Specific to publicly listed Fintech entities, we report a marked age gap between non-executive and executive directors. Within this context, non-executive board officers are on average more than six years older than executive directors.

Within the present study context, we consider whether the age composition of board members impacts on publicly listed Fintech entities' performance metrics. We assess this issue in relation to four measures. Two of these, return-on-assets (ROA) and sales-on-assets (SOA), relate to financial performance. The third performance measure, cash flow intensity, is specific to the needs and demands of the Fintech world. Our fourth measure addresses the market-to-book value of the sample of publicly listed Fintech entities. Of the two financial performance metrics, we stress the SOA measure over the more backward-looking ROA measure (Urquhart and Zhang 2022). Growth in ROA therefore serves as a longer-run goal. We emphasize that strong sales performance is an imperative in convincing investors on the longer-run realization of earnings and dividends.

Table 16. Heckman two-stage test for selection bias. Dependent variable is the industry-adjusted ROA: Mean of EDAge in each year (excluding the firm itself) is the exogenous variable.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ROA	ROA	ROA	ROA	ROA	ROA	ROA	ROA	ROA	ROA
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge	0.269***									
	(3.36)									
CEOAge		0.216***								
		(4.18)								
EDAge			0.216***							
			(3.77)							
NEDAge				0.239***						
				(3.20)						
INEDAge					0.232***					
					(3.03)					
CoVAge						−0.617***				
						(−3.66)				
STDEVAge							−0.0597***			
							(−2.83)			
NED_EDAgeGap								−0.0695		
								(−1.23)		
INED_EDAgeGap									−0.0826	
									(−1.43)	
AgeGap										−0.0349
										(−0.80)
IMR	0.0549	0.0161	0.0191	0.0732	0.0664	0.0586	0.0668	0.0470	0.0461	0.0571
	(0.60)	(0.18)	(0.21)	(0.79)	(0.72)	(0.64)	(0.72)	(0.50)	(0.49)	(0.61)
_cons	−1.126***	−0.913***	−0.920***	−1.030***	−1.006***	0.0313	0.0546	−0.0677	−0.0649	−0.0545
	(−3.50)	(−4.27)	(−3.89)	(−3.34)	(−3.17)	(0.40)	(0.63)	(−0.91)	(−0.87)	(−0.72)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Select regression used	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	473	473	473	473	473	473	473	473	473	464

Note: *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively.
For presentational reasons, the results for the first-step of the Heckman 2-step model are now reported.
Control variables, while not reported above, are included in all regressions. The control variables are CEO_PhD; CEO_Chair; LnNetwork; % of INED; GenderRatio; LnFirmAge; AssetTangibility; Leverage; LnTotalAsset; and R&D Intensity.
Select regression includes AvgAge_ED_mean; CEO_PhD; CEO_Chair; LnNetwork; % of INED; GenderRatio; LnFirmAge; AssetTangibility; Leverage; LnTotalAsset; R&D Intensity; and constant.

As a key finding, study results reveal age diversity weakens firm performance. This finding is consistent across ROA, SOA, and cash intensity performance measures. It also holds in relation to a battery of board age dispersion measures. The results are also resilient to reverse causality and selection bias concerns. Accordingly, we surmise that the positive effect of a tighter age gap largely derives from the inclusion of more experienced executive officers on boards. Results in the present investigation show that increases in the average age of executive board directors yield positive performance effects. The presence of more seasoned executive directors narrows age gap differences between executive and non-executive subgroups. We contend that the inclusion of more experienced EDs on Fintech firm boards enables the benefits of both growth and much-needed Fintech experience. This issue is particularly important, given that more experienced Fintech EDs may still be young relative to EDs in large non-Fintech entities.

In summary, we extend the literature on the role of board officer age in empowering a firm's orientation toward growth opportunities (Berger, Kick, and Schaeck 2014; Farag and Mallin 2018; Krause and Semadeni 2014; McGuinness 2021; Serfling 2014; Yim 2013) to the specific context of (1) Fintech, and (2) the age composition of board directors in such entities. In terms of corporate recruitment, the implications are that Fintech firms gain from the inclusion of more seasoned executive directors, most likely where such experience is garnered from earlier waves of the digitalization process. Our findings are particularly instructive for shareholders, creditors, and other capital providers in the publicly listed Fintech domain. Present study findings suggest that investors gain from the fusion of more experienced (but still young) executive officers with older non-executive board officers.

Table 17. Heckman two-stage test for selection bias. Dependent variable is the industry-adjusted ROA: Mean of CoVAge in each year (excluding the firm itself) is the exogenous variable.

	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROA	(8) ROA	(9) ROA	(10) ROA
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge	0.267***									
	(3.35)									
CEOAge		0.212***								
		(4.09)								
EDAge			0.212***							
			(3.70)							
NEDAge				0.239***						
				(3.20)						
INEDAge					0.232***					
					(3.02)					
CoVAge						−0.601***				
						(−3.46)				
STDEVAge							−0.0571***			
							(−2.60)			
NED_EDAgeGap								−0.0658		
								(−1.17)		
INED_EDAgeGap									−0.0792	
									(−1.38)	
AgeGap										−0.0331
										(−0.75)
IMR	0.0987	0.0595	0.0663	0.115	0.109	0.0529	0.0737	0.0942	0.0930	0.0868
	(1.08)	(0.65)	(0.73)	(1.26)	(1.20)	(0.57)	(0.80)	(1.01)	(1.00)	(0.93)
_cons	−1.130***	−0.909***	−0.916***	−1.039***	−1.014***	0.0299	0.0475	−0.0779	−0.0753	−0.0611
	(−3.51)	(−4.23)	(−3.86)	(−3.37)	(−3.19)	(0.37)	(0.53)	(−1.01)	(−0.98)	(−0.79)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Select regression used	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	473	473	473	473	473	473	473	473	473	464

Note: *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively.
For presentational reasons, the results for the first-step of the Heckman 2-step model are now reported.
Control variables, while not reported above, are included in all regressions. The control variables are CEO_PhD; CEO_Chair; LnNetwork; % of INED; GenderRatio; LnFirmAge; AssetTangibility; Leverage; LnTotalAsset; and R&D Intensity.
Select regression includes AvgAge_ED_mean; CEO_PhD; CEO_Chair; LnNetwork; % of INED; GenderRatio; LnFirmAge; AssetTangibility; Leverage; LnTotalAsset; R&D Intensity; and constant.

Notes

1. Only a small minority of NEDs are non-independent or potentially 'connected' to EDs. Such persons typically provide a corporate consulting role. We offer further discussion in Section 2.1 and Footnote 9 of this paper.
2. Several cross-market analyses reveal a positive link. Major international business contributions on this frontier include CSRI (2012), García-Meca, García-Sánchez, and Martínez-Ferrero (2015), Post and Byron (2015), Terjesen, Couto, and Francisco (2016), and Christiansen et al. (2016).
3. The existence and magnitude of such costs vary according to alternative financing form (Farag and Johan 2021). 'Free rider' incentives in crowdfunding potentially open-up moral hazard concerns (Strausz 2017; Farag and Johan 2021).
4. Notable exceptions exist. See, for example, Yermack's (2017) analysis of the governance impact of blockchains.
5. Haddad and Hornuf (2019, 89–91) report a marked increase in FinTech start-ups in the post GFC period.
6. For incisive discussion of the role of age in decision-making processes, see Graham, Harvey, and Puri (2013, 107).
7. As a countervailing argument, and predicated on career concern issues, Andreou, Louca, and Petrou (2017) demonstrate that younger executive officers are less likely to divulge unfavurable news. Consequently, older board officers, with fewer career concerns, may serve a stronger role in attenuating information asymmetry.
8. However, and as Bo, Li, and Sun (2016, 446) attest, firms with younger, less seasoned officers may, on account of career concerns, be less willing to deviate from industry norms in relation to fixed investment decisions.
9. As shown in Table 1C, NED officers account for around 8.84 board members on average in sample firms. Within this NED subgroup, around 8.37 officers are independent directors.
10. A non-linear relation between board age diversity and performance is also permissible. Ali, Ng, and Kulik's (2014) analysis of Australian firms reports a curvilinear relation between board age diversity and return-on-assets. They show that a positive

relation inverts at comparatively high age diversity levels. An initial positive relation peaks at a coefficient of variation value of 0.1 (see Page 504). Thereafter, additional board age diversity results in weaker performance.

11. Based on listed firms in China, Cheng, Chan, and Leung (2010) show that older board chairs boost performance. They contend that the esteem afforded more seasoned chairpersons opens-up access to the chair's extensive networks and resources. In relation to domestic and foreign firms in China's insurance industry, Li et al. (2011) reveal age diversity across *employees* bears a significant positive association with performance for Western firms. However, insignificant effects emerge for Asian entities.
12. Loko and Yang (2022) also reveal the positive effect of Fintech on gender employment diversity in financial services.
13. Chen, Leung, and Evans (2016, Page 65, Note 12) also cite Zhou (2001), with the latter arguing that firm fixed effect models are inappropriate when cross-sectional variation accounts for a substantial part of a dependent variable's movement. Both papers, Chen, Leung, and Evans (2016) and Zhou (2001), suggest the inclusion of firm fixed effects obscures active firm-specific factors. In the present context, the extremely high R^2 figures that result from the inclusion of firm fixed effects supports such an account. Firm specific dummies thus remove much of the cross-sectional variation in firm-level characteristics (as at least partly explained by board demographics) from view.
14. We determine such sectors using the variable 'Sector Code (Sector)' in BoardEx.
15. For banks, King, Srivastav, and Williams's (2016) study defines adjusted return-on-assets as the difference between a bank's raw ROA figure and that of all other banks. Additionally, Katsiampa et al. (2022) provide in-depth analytical comparison of Chinese Fintech and traditional bank entities in relation to a range of prudential and financial performance outcomes.
16. Due to multicollinearity, we exclude from regressions a variable for the number of board officers (BoardSize). BoardSize exhibits strong and significant positive association with firm size, LnTotalAsset.
17. As a side note, evidence on graduate entrepreneurship (Breznitz and Zhang 2020) suggests business competencies undergird corporate success. Evidence in relation to MBA-training is however quite mixed. For example, King, Srivastav, and Williams's (2016) study of US banks reveals that MBA-trained CEOs boost firm-level innovation. In contrast, Urquhart and Zhang (2022) report, for FTSE350 firm CEOs, that MBA training does not necessarily boost net profit margins or ROA performance. As a further related data point, Chevalier and Ellison (1999) report that MBA-trained fund managers often fail to deliver above-the-norm risk-adjusted returns. MBA-trained CEOs may also pursue short-term strategies. Such an approach may be inimical to longer-run corporate performance goals (Miller and Xu 2019).
18. Gul, Srinidhi, and Ng (2011) find US listed firms with gender-diverse boards have more informative stock prices, i.e., prices embed more specific risk as reflected in lower R^2 figures in Sharpe (1963) Market Model regressions. Within this context, Gul, Srinidhi, and Ng (2011) reveal gender-diverse boards are more effective in disseminating firm-specific information.
19. Institutional factors, and issues of gender-based homophily, likely characterize the Fintech world. Gu (2020) identifies gender-based recruitment biases within financial services more generally. As shown in Zhang (2020), institutional theory explains industry and jurisdictionally based differences in norms on gender-inclusion. External (regulatory- and market-based) forces should nonetheless act on publicly listed Fintech in coaxing greater gender-based diversity.
20. In other contexts, a greater spread in board member nationality cultivates stronger firm-level performance (Ruigrok, Peck, and Tacheva 2007; Masulis, Wang, and Xie 2012). Board internationalization acts as a palliative against the 'liability of foreignness' (Zaheer 1995). Greater diversity in board nationality also accentuates 'cognitive' strengths (Maitland and Sammartino 2015), enabling greater receptivity to offshore market norms. In contrast to the foregoing positive effects, Arnaboldi et al. (2020) report that greater variation in the board nationality of EU banks culminates in weaker performance.
21. The sample average value industry-adjusted ROA is 0.014, the coefficient for STDEVAge is equal to −0.618 and its standard deviation is equal to 0.285.
22. Regression findings are of course available on request. Of the control variables in such regressions, asset tangibility exhibits the strongest relation with MTBV. Interestingly, MTBV values decline with time since listing, suggesting that Fintech entities' growth option valuations decline with stock seasoning. This outcome is indicative of market-to-book values stabilizing as returns crystallize on key investment projects.
23. Lead-Lag regression results for the other three dependent variables considered are available on request.
24. Nonetheless, PSM approaches feature widely in the governance literature (see, for example, Galariotis et al. 2023).
25. In respect to Tables 14 and 15, we check on the issue of covariate balance (see, for example, McMullin and Schonberger 2020; Berger and Lee 2022). We find similar covariate properties in relation to both control and treatment subsamples. We acknowledge the guidance of an anonymous reviewer in relation to the EB approach.
26. We also run Heckman (1979) two-stage regressions for SOA for the respective exogenous variables considered in Tables 9–16 and 17. Significant inverse effects are also evident for CoVAge in relation to SOA performance, albeit at lower thresholds than is the case for the ROA dependent variable. AvgAge is strongly significant in relation to such SOA results. While tables do not include such SOA results, our detailed findings are available on request.

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Appendices

Appendix 1. Analysis of interaction effects director age variables with GenderDum (= 1 for firm-years with at least one female board officer; and = 0 otherwise)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge x LeverageDum	−0.00420									
	(−0.63)									
CEOAge x GenderDum		−0.00381								
		(−0.51)								
EDAge x GenderDum			−0.00398							
			(−0.53)							
NEDAge x GenderDum				−0.00353						
				(−0.54)						
INEDAge x GenderDum					−0.00363					
					(−0.56)					
CoVAge x GenderDum						−0.0527				
						(−0.28)				
STDEVAge # GenderDum							−0.00214			
							(−0.16)			
NED_EDAgeGap x GenderDum								−0.242**		
								(−2.00)		
INED_EDAgeGap # GenderDum									−0.245**	
									(−2.04)	
AgeGap x GenderDummy										−0.122
										(−1.33)
AvgAge	0.289									
	(1.49)									
CEOAge		0.227**								
		(2.54)								
EDAge			0.230**							
			(2.11)							
NEDAge				0.250						
				(1.36)						
INEDAge					0.246					
					(1.24)					
CoVAge						−0.577**				
						(−2.03)				
STDEVAge							−0.0575*			
							(−1.91)			
INED_EDAgeGap								0.110		
								(1.02)		
NED_EDAgeGap									0.0983	
									(0.91)	
AgeGap										0.0572
										(0.62)
Control variables included	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
GenderRatio	0.264***	0.245***	0.253***	0.252***	0.258***	0.212**	0.215**	0.301***	0.302***	0.265***
	(2.76)	(2.67)	(2.66)	(2.72)	(2.73)	(2.40)	(2.43)	(3.55)	(3.58)	(2.98)
_cons	−1.189	−0.951**	−0.969*	−1.055	−1.044	0.0391	0.0651	−0.0591	−0.0565	−0.0404
	(−1.33)	(−2.05)	(−1.79)	(−1.22)	(−1.12)	(0.24)	(0.35)	(−0.33)	(−0.31)	(−0.22)
N	384	384	384	384	384	384	384	384	384	375
adj. R−sq	0.3090	0.3198	0.3143	0.3061	0.3045	0.3114	0.3015	0.3037	0.3055	0.2888
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No

Note: *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively.

Appendix 2. Analysis of interaction effects director age variables with LeveragerDum (= 1 where corporate leverage > sample median for leverage; = 0 where corporate leverage < sample median value for leverage)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj	ROA_Adj
	Regressions relevant to Hypothesis 1					Regressions relevant to Hypothesis 2				
AvgAge x LeverageDum	−0.00755 (−1.27)									
CEOAge x LeverageDum		−0.00769 (−1.28)								
EDAge x LeverageDum			−0.00755 (−1.25)							
NEDAge x LeverageDum				−0.00780 (−1.33)						
INEDAge x LeverageDum					−0.00796 (−1.36)					
CoVAge x LeverageDum						−0.0737 (−0.52)				
STDEVAge x LeverageDum							−0.00911 (−0.82)			
NED_EDAgeGap x LeverageDum								0.0195 (0.16)		
INED_EDAgeGap x LeverageDum									0.0293 (0.22)	
AgeGap x LeverageDum										0.000445 (0.01)
AvgAge	0.274 (1.41)									
CEOAge		0.219** (2.33)								
EDAge			0.219* (1.95)							
NEDAge				0.244 (1.33)						
INEDAge					0.240 (1.22)					
CoVAge						−0.574** (−2.40)				
STDEVAge							−0.0537* (−1.94)			
INED_EDAge								−0.0838 (−0.69)		
NED_EDAge									−0.102 (−0.81)	
AgeGap										−0.0366 (−0.44)
Control variables included	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Leverage	−0.0141 (−0.14)	−0.0159 (−0.16)	−0.0131 (−0.13)	−0.0115 (−0.11)	−0.0123 (−0.12)	−0.0691 (−0.75)	−0.0440 (−0.44)	−0.0765 (−0.85)	−0.0783 (−0.85)	−0.0804 (−1.03)
_cons	−1.136 (−1.27)	−0.925* (−1.91)	−0.930 (−1.66)	−1.035 (−1.20)	−1.026 (−1.11)	0.0386 (0.23)	0.0557 (0.29)	−0.0559 (−0.32)	−0.0527 (−0.30)	−0.0425 (−0.23)
N	384	384	384	384	384	384	384	384	384	375
adj. R-sq	0.3125	0.3235	0.3177	0.3103	0.3089	0.3117	0.3032	0.2902	0.2913	0.2834
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No

Note: *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively.