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Financial literacy and fintech use in family business: Evidence from developing Asia

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**FINANCIAL LITERACY AND
FINTECH USE IN FAMILY BUSINESS:
EVIDENCE FROM DEVELOPING ASIA**

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Abstract

A growing literature examines the roles of financial literacy in an individual's income, saving behavior, and the use of financial products including financial technology (fintech). However, no study has examined the effects of the financial literacy of family business owners on fintech use and business outcomes in developing Asia, where family businesses play an important role in the economies. This study investigates these relationships in seven Association of Southeast Asian Nations (ASEAN) and ten Central Asia Regional Economic Cooperation (CAREC) countries. We measured the financial literacy of family business owners using the survey instrument for MSMEs developed by the Organisation for Economic Co-operation and Development and the International Network on Financial Education (OECD/INFE). The results show that self-employed and micro family business owners are less financially literate than owners of larger businesses. We find that a higher level of financial literacy has strong and positive effects on fintech use in family businesses and various business outcomes, including business continuity and changes in sales. These results hold when we use a set of instrumental variables.

Keywords: financial literacy, fintech, family business, Southeast Asia, Central Asia, Caucasus

JEL Classification: G50, G51, G53

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1. INTRODUCTION

Small family businesses make up the largest share of enterprises in the developing world. These enterprises include self-employed or micro, small, and medium-sized enterprises (MSMEs). Limited financial access is often considered to be one of the main barriers to small business development, in terms of both the availability of external sources of financing and the conditions for obtaining such finances. Recently, the use of financial technology, “fintech” hereinafter, has increased rapidly and is expected to enhance the financial access and inclusion of small business owners in developing countries including in Asia (Parvez et al. 2023). Fintech also played an essential role in mitigating the negative shocks on small businesses during the COVID-19 pandemic (Hossain and Chowdhury 2022). However, the mere availability of fintech products and services is not enough to ensure the financial inclusion of small business owners. Evidence indicates that literacy regarding financial options also creates challenges across enterprises at different stages (Atkinson 2017). As a result, the financial literacy of small business owners is gaining increasing importance as a policy objective (OECD 2020). Hence, it is important to understand the factors relating to the financial literacy of small business owners, and the effects of financial literacy on financial inclusion and other business outcomes.

Recent studies define and measure the financial literacy of households as a combination of multiple dimensions (Dewi 2022), including not only knowledge but also skills, attitudes, and behavior. Hung et al. (2009) define financial literacy as a mutual relationship between financial knowledge, skills, and behavior. Lusardi and Mitchell (2014) defined financial literacy as “people’s ability to process economic information and make informed decisions about financial planning, wealth accumulation, debt, and pensions.” The Organisation for Economic Co-operation and Development (OECD) and the International Network on Financial Education (INFE) defined financial literacy as “a combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions” and developed a survey instrument to measure the multidimensional financial literacy of households (OECD 2016). With an increasing recognition of the importance of financial literacy of MSMEs, OECD/INFE developed a standard survey instrument to measure the multidimensional financial literacy of MSME owners, including financial knowledge, attitude, and behavior (OECD 2020).

Despite the importance of financial literacy in family businesses, few studies have measured the multidimensional financial literacy of business owners and examined its linkage with fintech adoption and business outcomes. Using the survey instrument of the OECD/INFE (OECD 2020), the OECD (2021) measured the financial literacy of MSME owners in selected G20 countries. They found that microenterprise (i.e., fewer than 10 employees) owners have lower financial literacy scores than those of larger firms. In addition, they also found significant and positive correlations between financial literacy scores and the adoption of financial products and the achievement of better business conditions such as increased business turnover during the COVID-19 pandemic. To the best of our knowledge, however, no study has measured the multidimensional financial literacy of family business owners in developing Asia and investigated its effects on fintech use and family business outcomes.

In this study, we investigate the effects of the financial literacy of family business owners in developing Asian countries on their (i) adoption of fintech in the family business and (ii) family business outcomes such as business closure, change in business turnover, and the number of employees. Using data from a household survey covering seven Association of Southeast Asian Nations (ASEAN) and ten Central Asia

Regional Economic Cooperation (CAREC) countries, we measure the multidimensional financial literacy of small family business owners using the OECD/INFE's (2020) survey instrument. We find that financial literacy was particularly low for self-employed and micro family business owners, and in some countries like Afghanistan, Azerbaijan, and Turkmenistan. We also find that a higher level of financial literacy has strong and positive effects on fintech use and various family business outcomes. These results hold when we use a set of instrumental variables to control for endogeneity.

This study contributes to the literature in three ways. First, we contribute to the literature on the effects of financial literacy on financial inclusion and households' welfare. Many studies have reported the positive effects of higher financial literacy on financial inclusion (Grohmann et al. 2018; Morgan and Trinh 2019a, 2020) and household savings (Adetunji and David-West 2019; Morgan and Trinh 2019a, 2020). More specifically, Morgan and Trinh (2019b) measured the multidimensional financial literacy of Lao PDR households and found positive and significant effects on the households' awareness of fintech products. However, all these studies focus on the financial literacy of households in general, rather than focusing on family business owners. Yakob et al. (2021) studied the effects of financial literacy on various measures of the performance of SMEs in Malaysia and found positive effects, although they did not examine fintech use. Kumar, Mandal, and Yadav (2023) studied female-owned small businesses in India and found a positive relationship between financial literacy and the adoption of financial technology, but they did not analyze the effects of such adoption on business performance. Hasanudin and Panigfat (2024) studied MSMEs in North Maluku Province, Sula Islands Regency, Sanana District, Indonesia and found that financial literacy, financial inclusion, and fintech lending have a positive and significant effect on MSME performance, and the presence of business capital can serve as a mediating factor. Kulathunga et al. (2020) conducted a survey of 319 CFOs working in SMEs in Sri Lanka. They found that both technological literacy and financial literacy have a direct and positive impact on enterprise risk management (ERM) practices and SME performance, while ERM practices partially mediate the relationship between financial literacy and SME performance. Ours is one of the first studies to investigate the effects of financial literacy on fintech adoption in family businesses and important business outcomes that should affect households' welfare.

Second, we also contribute to the literature by providing one of the first estimates of the multidimensional financial literacy of family business owners in developing Asia. Our results are comparable to those from a previous study by the OECD (2021), which measured the financial literacy of MSMEs in selected G20 countries. For policymakers aiming to improve the level of financial literacy of small business owners, it is necessary to accumulate evidence on the level of financial literacy of MSMEs (OECD 2020). We provide evidence on the financial literacy level of family businesses in developing Asian countries.

Last, this study also relates to the literature on the determinants of financial literacy. Several studies investigate how demographic and socioeconomic factors affect the financial literacy of households (Dewi 2022). For example, many find that females are less financially literate than males (Klapper and Lusardi 2020; Kadoya and Khan 2020; Rink et al. 2021). With regard to firms, the OECD (2021) found that in some countries female MSME owners are less financially literate. Using the same multidimensional measure of financial literacy as the OECD (2021), we add comparable evidence on the financial literacy of family business owners in developing Asia.

The remainder of the paper is structured as follows. Section 2 describes the data, survey methodology, and descriptive results. Section 3 presents the econometric models, followed by the empirical results of the determinants of financial literacy and the effects of financial literacy on fintech use and family business outcomes in Section 4. Section 5 concludes.

2. LITERATURE REVIEW

Financial skills, which enable MSME owners and managers to manage their business's financial aspects effectively, are among the most important competencies that MSMEs need to have to operate their business successfully (OECD/INFE 2018). Previous studies usually used the concept of financial literacy to measure financial skills. However, the measure of financial literacy used in these studies is usually the one that is used for personal finance financial literacy (i.e., the managers' or owners' personal financial literacy rather than their business financial literacy) rather than for MSMEs (Graña-Alvarez et al. 2022; Molina-Garcia et al. 2023). Brown, Saunders, and Beresford (2006) argue that financial literacy for MSME owners or managers should include the ability to read and understand fundamental financial statements and the ability with numbers to make informed judgments and effective decisions regarding the use and management of money.

The OECD and INFE recently proposed a definition of financial literacy specifically designed for MSMEs. Accordingly, financial literacy is defined as "the combination of awareness, knowledge, skills, attitudes, and behavior that a potential entrepreneur or an owner or manager of a micro, small, or medium-sized enterprise should have in order to make effective financial decisions to start a business, run a business, and ultimately ensure its sustainability and growth" (OECD 2018). This definition covers four main areas of competence (namely, choice and use of financial services, financial and business management and planning, risk and insurance, and financial landscape). Similarly to personal financial literacy, the financial literacy for MSMEs can also be categorized into three components (knowledge, behavior, and attitudes).

A number of theories, such as the resource-based view theory, pecking order theory, and agency theory, have been used to explain the effects of financial literacy on firm performance, access to finance, and innovation. Among these theories, the resource-based view theory seems to be the most suitable one to explain the relationship between financial literacy and firm performance. According to this theory, valuable, rare, inimitable, and nonsubstitutable resources may be sources of business performance and competitive advantage (Barney 1991; Das and Teng 2000; Burks et al. 2009). Financial literacy could be viewed as an intangible resource allowing activities that generate higher performance levels (Resmi, Pahlevi, and Sayekti 2019; Molina-Garcia et al. 2023).

Most studies show that a firm whose owners and managers have a high level of financial literacy has a greater chance of boosting their performance by attracting new tangible and intangible resources, including accessing finance, adopting risk management practices, and capturing business opportunities faster (Anwar, Shuangjie, and Ullah 2020; Hussain, Salia, and Karim 2018; Kulathunga et al. 2020; Shah, Anwar, and Hussain 2021). In the context of the COVID-19 pandemic, the OECD (2021) shows that financial literacy is associated with positive business outcomes among MSMEs in many countries, such as Brazil, the People's Republic of China (PRC), Italy, Mexico, Portugal, and Spain. The results from the OECD's study further show that "financially literate MSME owners were less likely than those with low financial literacy to suffer

from a lack of cash during the COVID-19 crisis" (OECD 2021). They are also more likely to be aware of public support measures for MSMEs. Those with higher levels of financial literacy may also change their business strategies faster, such as adopting a digitalization strategy (OECD 2021).

In contrast to the above-mentioned studies, we focus on the financial literacy of family business owners in developing Asia. In these countries, family businesses are typically self-employed or micro or small enterprises if they hire any employees. Following the literature on MSMEs, we assess the effects of the multidimensional financial literacy of family business owners on their fintech adoption and business performances.

3. DATA AND METHODOLOGY

3.1 Household Survey

We conducted household surveys in seven ASEAN countries (Cambodia, Indonesia, Lao People's Democratic Republic (PDR), Malaysia, the Philippines, Thailand, and Viet Nam) and ten CAREC countries (Afghanistan, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan) in 2022 with a view to understanding the impacts of the COVID-19 pandemic on households. Computer-assisted telephone interviews (CATIs) were carried out on randomly selected representative samples of more than 1,000 households from each country, as face-to-face interviews were not practical under the pandemic conditions. The survey was intended to be representative in terms of household income level and regional distributions. The survey periods were from January to March 2022 and September to October 2022 for ASEAN and CAREC countries, respectively. Households were asked about their socioeconomic status, employment, family business (if any), financial conditions, household expenditure, and child education (see Morgan and Trinh (2021); Morgan, Trinh, and Kim (2022), and Azhgaliyeva et al. (2022a, 2022b) for further details).

For those who had operated a family business as an owner or manager in the previous two years at the time of the survey, we measured their financial literacy. We also asked for basic information about their family business such as the number of employees and the sector of the business. Business owners were also asked whether they use fintech in their business, and if so, how they use it. As regards business outcomes, we asked about the current business conditions (as of the survey), i.e., whether the business was still open, change in turnover, and change in the number of employees compared to December 2019, the pre-pandemic reference period. In this study, we restrict the samples to households whose head is running a family business or self-employed ("family business household"). This subsample included 3,007 households, around 17% of the original data set.

3.2 Measurement of Financial Literacy

In the household survey, we used the survey instrument in OECD/INFE (2020) to measure the financial literacy score of family business owners. The instrument contains questions aimed at measuring the three dimensions of financial literacy: financial knowledge, financial behavior, and attitudes toward longer-term financial planning.

- *Financial knowledge* is basic knowledge of financial concepts, and the ability to apply numeracy skills in a financial context. It helps business owners compare financial products and services and make appropriate, well-informed financial decisions. The score is calculated based on the respondent's answers to survey questions reflecting financial knowledge, such as calculations of simple and compound interest rates, risk and return evaluation, and understanding of inflation and financial diversification. This indicator ranges from 0 to 5 depending on the number of questions answered correctly.
- *Financial behavior* (or financial "savvy") means the financial actions taken or not taken by the respondents. Some types of behavior, such as not opening separate business bank accounts and failing to plan future investment, may have an adverse effect on a business's financial situation and/or outcomes. The financial behavior score is calculated from nine questions relating to basic payments, business finance, accounting, insurance, financial protection, and future financial planning. It ranges between 0 and 9.
- *Financial attitude* refers to the respondent's attitude towards longer-term financial planning such as their preference on financial decisions and willingness to set long-term financial goals. For example, one question asks about preferences for making financial decisions through instinct rather than a detailed financial plan. Such preferences are likely to hinder behaviors that could lead to improved financial resilience. The financial attitude score ranges from 0 to 3.

The overall score for financial literacy is the sum of three scores and hence takes values between 0 and 17. A higher score represents greater financial literacy (see OECD (2020) for the original questionnaires).

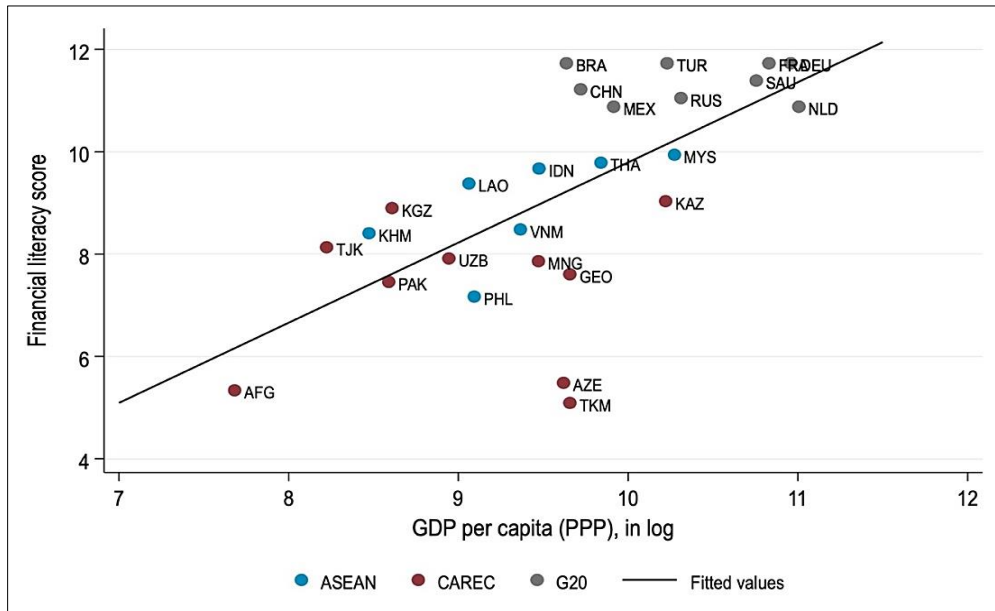
3.3 Descriptive Results

Overall, the average financial literacy score in the seven ASEAN countries is found to be 9.3 (55% of the maximum possible score of 17), which is greater than the average of 7.3 (43% of the maximum possible score of 17) in the ten CAREC countries. The three countries with the lowest financial literacy score are: Turkmenistan (5.1), Afghanistan (5.4), and Azerbaijan (5.5). For the rest of the countries the financial literacy score is above 7, but below 10, out of the maximum score of 17. These scores are lower than the average financial literacy score of microenterprises (up to 9 employees) in selected G20 countries of 11.6 (68% of the maximum possible score of 17) (OECD 2021). Nevertheless, these results are expected given the inclusion of self-employed owners in our sample and the different levels of economic development. Figure 1 shows there is a high correlation between the financial literacy score of family business/microenterprises and GDP per capita. Such a high correlation is consistent with the study on the financial literacy of households (Morgan and Trinh 2020). The scores of the seven ASEAN countries and most of the 10 CAREC economies lie close to the trend line. However, the scores of Azerbaijan and Turkmenistan lie well below the trend line.

Figure 2 presents the financial knowledge, attitude, and behavior score of family business owners in each country. On average, the financial knowledge score is slightly higher (2.3 out of 5 or 45.7% of the maximum score) than the financial behavior (3.9 out of 9 or 43.7% of the maximum score) and attitude (1.3 out of 3 or 41.8% of the maximum score) scores, except it is very low in Afghanistan (1.0 out of 5 or 19.9% of the maximum score). Financial behavior scores range among countries from 4.9 to 5.4

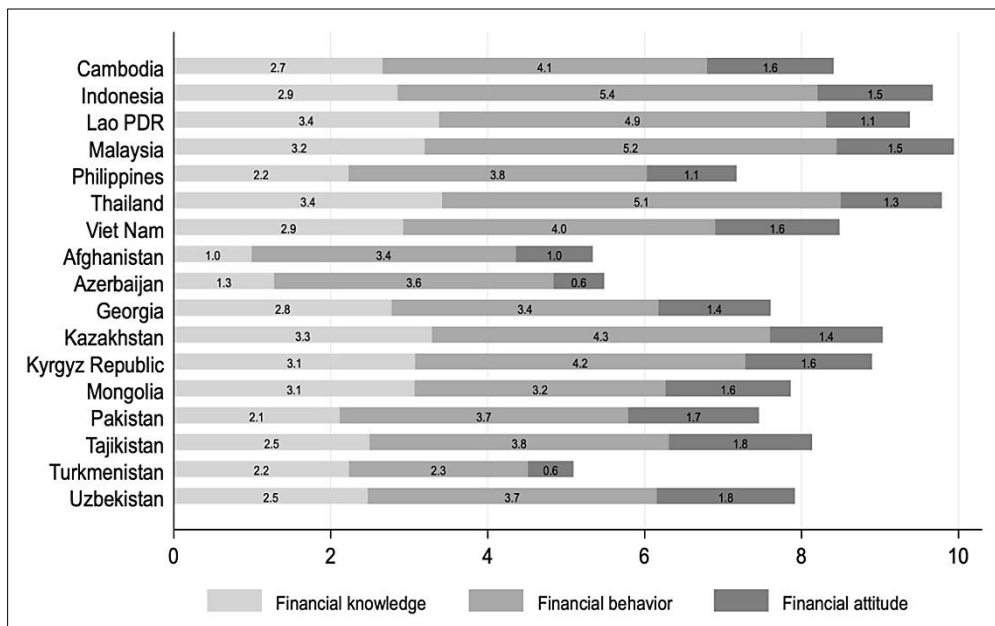
(out of 9) in some ASEAN countries (Indonesia, the Lao PDR, Malaysia, and Thailand) to as low as 2.3 in Turkmenistan. Financial attitude scores are similar across countries with a mean value of around 1.5, except for Azerbaijan and Turkmenistan (only 0.6 out of 3). A relatively lower financial attitude score is consistent with the findings from the MSMEs in selected G20 countries (OECD 2021).

Figure 1: Financial Literacy Score of Family Business vs. GDP per Capita



Source: Average financial literacy scores of ASEAN and CAREC countries are based on our survey data, while the score for the G20 is the average score of owners of microenterprises (up to 9 employees) reported in OECD (2021). The GDP per capita for 2021 is retrieved from the World Bank’s World Development Indicators database (<http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>).

Figure 2: Financial Literacy Score of Family Business Owners by Country



Source: Survey results.

Finally, Table 1 summarizes descriptive statistics of the survey variables. In regard to the use of fintech, about 37%–39% of family businesses use fintech both in ASEAN and CAREC. Family business owners mainly use fintech for the following three reasons: (i) to raise capital/take out a loan; (ii) to make payments to suppliers; and (iii) to receive payment from customers. The first usage allows small family business owners to access the capital required to sustain/develop their businesses, and more generally, it improves their financial inclusion. The other two usages reduce the transaction costs related to payments but may also help adjust their business models as necessary. In both ASEAN and CAREC countries, for those firms who use fintech, the most common usage was “payment from customers,” with 83% and 51%, respectively.

Table 1: Descriptive Statistics

	ASEAN		CAREC	
	Mean	Std. Dev.	Mean	Std. Dev.
<i>Fintech use in family business</i>				
Use fintech	0.389	0.488	0.372	0.483
Usage: raise capital	0.135	0.342	0.133	0.340
Usage: payment to suppliers	0.174	0.379	0.188	0.390
Usage: payment from customers	0.321	0.467	0.191	0.393
<i>Family business outcomes</i>				
Family business closed	0.109	0.312	0.176	0.381
Change in family business turnover				
Increased	0.192	0.394	0.252	0.434
Same	0.392	0.488	0.441	0.497
Decreased	0.416	0.493	0.307	0.461
Change in number of employees				
Increased	0.114	0.318	0.141	0.348
Same	0.749	0.434	0.698	0.459
Decreased	0.137	0.344	0.162	0.368
<i>Family business and owner's characteristics</i>				
Pre-pandemic family business size:				
Self-employment	0.418	0.493	0.499	0.500
Microenterprise	0.497	0.500	0.475	0.499
Small enterprise	0.078	0.268	0.025	0.155
Medium or large enterprise	0.007	0.083	0.001	0.037
Family business owner:				
Female owner	0.468	0.499	0.171	0.377
High school graduate	0.384	0.487	0.319	0.466
College graduate	0.314	0.464	0.515	0.500
Age	43.995	11.698	42.223	11.944
Family business sector:				
Agriculture	0.153	0.360	0.292	0.455
Manufacturing	0.090	0.286	0.174	0.379
Retail	0.417	0.493	0.237	0.425
Service	0.202	0.402	0.245	0.430
Others	0.139	0.346	0.051	0.221
Observations	1,298		2,160	

Source: Survey results.

With regard to family business outcomes, about 10% (ASEAN) and 18% (CAREC) of households either temporarily or permanently closed their family business. Compared to December 2019 (pre-pandemic reference period), more than 40% (ASEAN) and 30% (CAREC) reported reduced family business turnover. These numbers are less than that in the 2021 survey (cf., Kodama et al. 2023), yet they indicate slow recovery and other related challenges (e.g., cost-push inflation). Meanwhile, 20%–25% of households experienced an increase in family business turnover. In terms of the number of employees, a large proportion of family businesses reported no change. This is reasonable because family business owners usually hire their family members.

For the family business characteristics, we refer to changes relative to the pre-pandemic (December 2019) business size. The sample consists primarily of self-employed and microenterprises (up to 9 employees) (92% of the total), with less than 10% of small (10–50 employees) and medium (51–250 employees) enterprises. Most of the family businesses engage in either the retail or service sectors, while some work in the agriculture or manufacturing sector. With regard to the owners' characteristics, only 17% of the owners are female in CAREC, while the number is much higher (47%) in ASEAN. More than half of the owners are college graduates in CAREC, but only around 30% in ASEAN. The average age of the owners is around 42–44.

4. ECONOMETRIC MODELS

To investigate the effects of financial literacy on fintech use in family business and other business outcomes during the pandemic, we estimate the following equation:

$$Fintech_i = \beta_0 + \beta_1 FL_i + X_i \beta_2 + \varepsilon_i, \quad (1)$$

where $Fintech_i$ is a dummy variable, taking the value of one if a respondent uses fintech in their family business and zero otherwise, FL_i is the standardized financial literacy score (mean zero and standard deviation one), X_i is a set of control variables, and ε_i is an error term. We employ the logit model to estimate the equation. As control variables, we include various business and owner's characteristics that may influence both fintech use and financial literacy. For the business characteristics, we include the size of the business based on the number of employees (self-employed, microenterprise, small enterprise) and the sector (agriculture, retail, service, manufacturing). Owner's characteristics include gender, education, and age.

Next, we examine the impacts of financial literacy on family business outcomes:

$$Outcome_i = \gamma_0 + \gamma_1 FL_i + \gamma_2 Fintech_i + X_i \gamma_3 + \varepsilon_i, \quad (2)$$

where $Outcome_i$ is a dummy variable that represents business outcomes. We consider the following outcome variables:

- closed family business (either temporarily or permanently): dummy variable taking the value of one if the business is currently closed (either temporarily or permanently);
- increased family business turnover: dummy variable taking the value of one if turnover from the family business has increased compared to December 2019; and
- increased number of employees: dummy variable taking the value of one if the number of employees has increased compared to December 2019.

As these variables are all dummies, we employ the logit model to estimate the equation.

There may exist unobservable factors that affect both fintech use and family business conditions, and a log-likelihood estimation of the logit model could yield biased and inconsistent effects of financial literacy. To address these potential endogeneity problems, we use a control function approach with two instrumental variables (IVs). For the first IV, we follow Fernandes, Lynch, and Netemeyer (2014) and Murendo and Mutsonziwa (2017) in using the district-level mean of the financial literacy score. One may argue that district-level financial literacy is also related to district-level accessibility of fintech and economic conditions. To address these concerns, following Morgan and Trinh (2020), we control for the level of development of the district by using the share of households that have an income higher than the median income of the country.

Another instrument involves whether respondents' siblings or parents experienced any financial difficulty before the pandemic. This type of variable was used in van Rooji, Lusardi, and Alessie (2011) and Morgan and Trinh (2020). While the financial condition of siblings and parents is not under the control of respondents, witnessing financial problems in the family may provide a strong motivation to acquire financial knowledge and make changes in financial behavior or financial attitude (Morgan and Trinh 2020).

5. ECONOMETRIC RESULTS

5.1 Determinants of Financial Literacy

Table 2 presents the determinants of financial literacy of family business owners. The table reports the OLS estimate results with the dependent variable being the standardized multidimensional financial literacy score. As determinants, we include owner's and business characteristics. In addition, two variables, the average literacy score in the region and the experience of financial difficulty of relatives, are included in the regression, and these serve as instrumental variables in the first-stage regression of our main analysis. We estimate equations for the whole sample and for ASEAN and CAREC regions separately.

The results show that the most important determinant is the size of the family business: Self-employed and micro business owners (< 10 employees) have lower financial literacy than small business owners (10–50 employees). Compared to small business owners, self-employed owners and micro business owners have lower scores by 0.53 (ASEAN) and 0.33 (CAREC) standard deviations and by 0.27 (ASEAN) and 0.26 (CAREC) standard deviations, respectively. These findings highlight the necessity of providing financial training and education to small-scale business owners (OECD 2020). In the CAREC countries, female owners have significantly lower financial literacy scores than male ones, but this is not the case for ASEAN countries. Education is also an important determinant: College graduates have higher scores than those with secondary or lower education backgrounds by 0.39 (ASEAN) and 0.12 (CAREC) standard deviations. Also, younger owners are more financially literate than older owners. Overall, these findings are consistent with the literature on the financial literacy of MSMEs (OECD 2021) and the financial literacy of households (Dewi 2022; Klapper and Lusardi 2020; Kadoya and Khan 2020; Morgan and Trinh 2020; Rink et al. 2021). Owners in the agricultural sector have significantly lower financial literacy than those in other sectors.

Table 2: Determinants of Financial Literacy Score, OLS

	(1) All	(2) ASEAN	(3) CAREC
Self-employment	-0.443*** (0.066)	-0.531*** (0.089)	-0.331*** (0.107)
Microenterprise	-0.267*** (0.066)	-0.260*** (0.087)	-0.227** (0.108)
Female owner	-0.044 (0.034)	-0.009 (0.047)	-0.088* (0.050)
High school graduate	0.068* (0.039)	0.141** (0.060)	-0.013 (0.051)
College graduate	0.240*** (0.040)	0.385*** (0.065)	0.121** (0.050)
Log age of owner	-0.218*** (0.050)	-0.280*** (0.083)	-0.158*** (0.061)
Agriculture	-0.265*** (0.068)	-0.279*** (0.106)	-0.207** (0.091)
Manufacturing	-0.142* (0.074)	-0.264** (0.122)	-0.044 (0.095)
Retail	-0.109 (0.068)	-0.181* (0.103)	-0.029 (0.091)
Service	-0.083 (0.070)	-0.157 (0.108)	-0.008 (0.092)
Average literacy in district	0.941*** (0.031)	0.924*** (0.052)	0.950*** (0.039)
Financial difficulty of siblings or parents	0.079** (0.031)	0.106** (0.049)	0.071* (0.041)
Constant	1.218*** (0.215)	1.486*** (0.344)	0.805*** (0.270)
Country fixed effects	Yes	Yes	Yes
First-stage F statistics (IV)	434.961***	133.875***	297.678***
R squared	0.462	0.337	0.467
Observations	2,935	1,264	1,671

Notes: Dependent variable (financial literacy score) is standardized. Asterisks (*, **, and ***) denote significance at 10%, 5%, and 1% levels, respectively. Heteroskedasticity-robust standard errors are reported in parentheses. Small enterprises (10–49 employees), middle school graduate or lower education attainment, being aged 60 or above, and other business sectors are used as reference groups.

Source: Authors' estimates.

5.2 Effect of Financial Literacy on Fintech Use in Family Business

Table 3 reports the estimation results on the effect of financial literacy on fintech use in family businesses in ASEAN and CAREC countries separately. The results of the combined sample are reported in the Appendix. The table reports estimated marginal effects of the logit model with the dependent variable being fintech use (dummy variable). The results are shown for the key variables of interest identified in Table 2. (The estimated coefficients for variables other than the variables of interest are not shown in the table.) Columns (1) and (3) report the results for standard estimation of the log-likelihood maximization, and columns (2) and (4) report the estimation results for the IV (control function approach).

The results show that financial literacy is positively associated with fintech use in both ASEAN and CAREC countries, and the relationship is statistically significant at the 1% and 5% levels, respectively. A one standard deviation increase in the financial literacy score is associated with an increased probability of fintech use by 7.4 (ASEAN) and 2.5 (CAREC) percentage points (p.p.). These positive effects remain significant for both ASEAN and CAREC in the IV estimates (cf., column (2) and (4)). When we distinguish usages of fintech, we find significant and positive effects on fintech use for “raising capital” for both ASEAN and CAREC, while the positive effects on fintech use for “payment to suppliers” and “payment from customers” are significant only for the ASEAN sample (results not shown).

Table 3: Effect of Financial Literacy on Fintech Use, Marginal Effects of Logit Model

	ASEAN		CAREC	
	(1)	(2)	(3)	(4)
Financial literacy	0.074*** (0.014)	0.092*** (0.031)	0.025** (0.012)	0.096*** (0.023)
Self-employment	-0.199*** (0.051)	-0.197*** (0.054)	0.063 (0.065)	-0.022 (0.067)
Microenterprise	-0.164*** (0.049)	-0.160*** (0.051)	0.011 (0.065)	-0.029 (0.066)
Female owner	0.068** (0.028)	0.064** (0.028)	0.076** (0.031)	0.071** (0.032)
High school graduate	0.013 (0.036)	0.008 (0.037)	-0.012 (0.029)	-0.008 (0.029)
College graduate	0.167*** (0.037)	0.162*** (0.039)	0.032 (0.028)	0.056* (0.029)
Log age	-0.123** (0.049)	-0.127** (0.050)	-0.043 (0.036)	-0.079** (0.037)
Agriculture	-0.045 (0.073)	-0.048 (0.074)	-0.042 (0.054)	-0.118** (0.060)
Manufacturing	0.057 (0.075)	0.052 (0.077)	-0.036 (0.056)	-0.094 (0.061)
Retail	-0.016 (0.065)	-0.021 (0.066)	-0.020 (0.054)	-0.066 (0.060)
Service	0.014 (0.068)	0.011 (0.069)	-0.028 (0.054)	-0.060 (0.060)
Country fixed effect	Yes	Yes	Yes	Yes
Control function (IV)	No	Yes	No	Yes
LR chi-square	174.99***	170.58***	371.97***	363.64***
Pseudo R squared	0.115	0.115	0.163	0.170
Observations	1,146	1,113	1,766	1,670

Notes: Financial literacy score is standardized. Asterisks (*, **, and ***) denote significance at the 10%, 5%, and 1% levels, respectively. Heteroskedasticity-robust standard errors are reported in parentheses. Other controls include the age of family business owners and the sector of family business (not shown). Small enterprises (10–49 employees) and middle school graduate or lower education attainment are used as reference groups.

Source: Authors' estimates.

The results further suggest that in ASEAN countries, self-employed or micro business owners have a significantly lower likelihood of using fintech in their business (about 15–20 p.p. less) than small and medium-sized business owners. Such results suggest uneven opportunities for small family business owners to take advantage of new financial technologies. Interestingly, female business owners are more likely to use fintech by 6.9 p.p. (ASEAN) and 7.8 p.p. (CAREC) than male business owners. Even though Morgan and Trinh (2019b) find no significant differences in the awareness of fintech between male and female household heads, we find that females are more likely to use fintech in the family business in both ASEAN and CAREC countries. As expected, younger and more educated owners are more likely to use fintech in their business. The sectoral variables are generally not significant.

5.3 Effect of Financial Literacy on Family Business Outcomes

Table 4 shows the estimation results for the effects of financial literacy on the various family business outcomes. The table reports estimated marginal effects of the logit model with the dependent variables (all dummies) being “closed family business” (panel A), “increased family business turnover” (panel B), and “increased number of employees” (panel C). (The estimated coefficients for the variables other than the variables of interest are not shown in the table.) Columns (1) and (4) report the results for the standard estimation, columns (2) and (5) report the results with an interaction term between financial literacy and fintech use, and columns (3) and (6) report the estimation results with IVs (control function approach). We use the same control variables as in Table 2 (results not shown).

In panel A, we find that financial literacy is negatively associated with family business closure in both ASEAN and CAREC. A one standard deviation increase in the financial literacy score is associated with a 1.7 p.p. (ASEAN) and 3.9 p.p. (CAREC) reduced probability of family business closure. The interaction term between financial literacy and fintech use is negative and significant (columns (2a) and (4a)), suggesting that fintech use is beneficial for those with a higher level of financial literacy. The negative effects of financial literacy on the probability of business closure remain significant in the IV estimates (columns (3a) and (6a)).

In panel B, the results show that financial literacy has a positive and significant effect on the probability of increased turnover only for CAREC countries. On average, a one standard deviation increase in the financial literacy score is correlated with a 5.5 p.p. increased probability of higher turnover in the family business (column (4b)). This positive and significant effect holds in the IV estimate (column (6b)). Moreover, fintech use is positively and significantly associated with a higher probability of increased family business turnover.

Finally, in panel C, financial literacy and fintech use are positively associated with a higher probability of an increased number of employees in both ASEAN and CAREC countries. A one standard deviation increase in the financial literacy score is related to a 4.3 p.p. (ASEAN) and 5.5 p.p. (CAREC) higher probability of an increased number of employees. Although the significance does not hold for the IV estimate for ASEAN (column (3c)), it remains significant for CAREC (column (6c)). Overall, we find positive linkages between the financial literacy of family business owners and their business outcomes. These results generally hold when we apply the control function approach with a set of instrumental variables.

Table 4: Effect of Financial Literacy on Family Business Outcomes, Marginal Effects of Logit Model*A. Outcome: Closed family business*

	ASEAN			CAREC		
	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)
Financial literacy	-0.017** (0.008)	-0.003 (0.011)	-0.056*** (0.019)	-0.039*** (0.011)	-0.013 (0.013)	-0.193*** (0.033)
Fintech use	-0.023 (0.020)	-0.011 (0.019)	-0.020 (0.020)	0.005 (0.023)	0.005 (0.022)	-0.012 (0.023)
Literacy x fintech		-0.043** (0.018)			-0.090*** (0.021)	
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Control function (IV)	No	No	Yes	No	No	Yes
LR chi-square	42.83***	47.56***	48.46***	192.98***	199.60***	161.95***
Pseudo R squared	0.0586	0.0665	0.0715	0.131	0.140	0.152
Observations	1,168	1,168	1,135	1,766	1,766	1,670

B. Outcome: Increased family business turnover

	ASEAN			CAREC		
	(1b)	(2b)	(3b)	(4b)	(5b)	(6b)
Financial literacy	0.017 (0.013)	0.019 (0.016)	-0.001 (0.028)	0.055*** (0.010)	0.062*** (0.012)	0.076*** (0.020)
Fintech use	0.035 (0.026)	0.037 (0.028)	0.036 (0.026)	0.062*** (0.019)	0.064*** (0.019)	0.065*** (0.020)
Literacy x fintech		-0.004 (0.025)			-0.020 (0.019)	
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Control function (IV)	No	No	Yes	No	No	Yes
LR test	36.60***	36.62***	36.57***	224.42***	225.53***	162.78***
Pseudo R squared	0.0312	0.0312	0.0320	0.138	0.138	0.134
Observations	1,168	1,168	1,135	1,766	1,766	1,670

C. Outcome: Increased family business turnover

	ASEAN			CAREC		
	(1c)	(2c)	(3c)	(4c)	(5c)	(6c)
Financial literacy	0.043*** (0.011)	0.032** (0.015)	0.032 (0.024)	0.055*** (0.011)	0.067*** (0.013)	0.075*** (0.021)
Fintech use	0.073*** (0.020)	0.057** (0.024)	0.069*** (0.020)	0.083*** (0.019)	0.083*** (0.019)	0.089*** (0.020)
Literacy x fintech		0.023 (0.021)			-0.031 (0.020)	
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Control function (IV)	No	No	Yes	No	No	Yes
LR test	88.03***	89.25***	83.10***	187.02***	189.41***	181.46***
Pseudo R squared	0.107	0.108	0.103	0.120	0.122	0.121
Observations	1,168	1,168	1,135	1,766	1,766	1,670

Notes: Financial literacy score is standardized. Asterisks (*, **, and ***) denote significance at the 10%, 5%, and 1% levels, respectively. Other controls include all the other variables reported in Table 2: size and sector of family business and age, gender, and education background of family business owners.

Source: Authors' estimates.

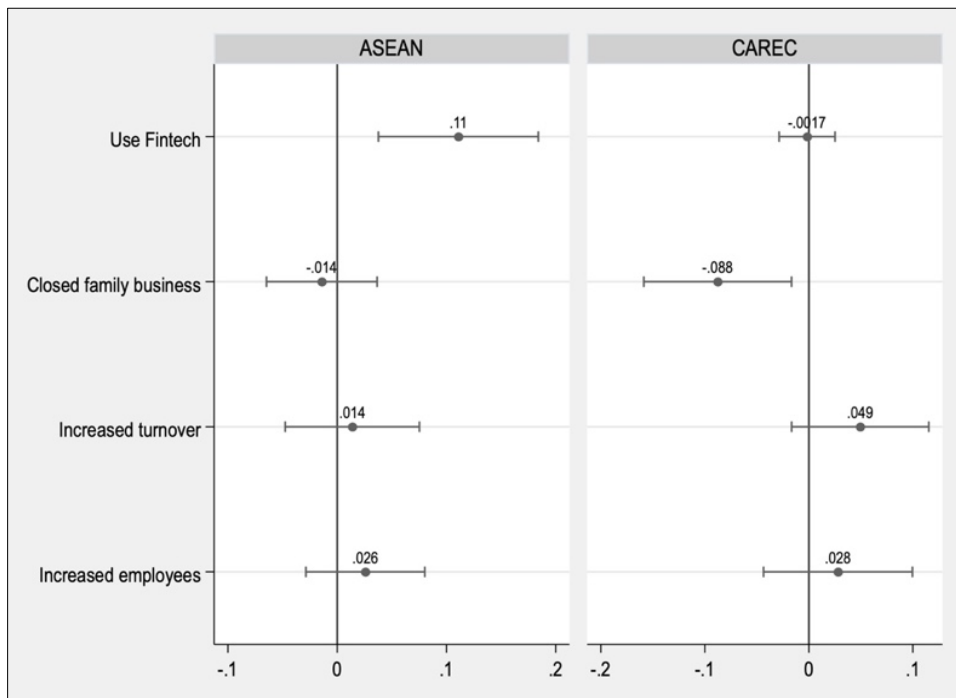
5.4 Heterogeneous Effects of Financial Literacy

We further investigate the heterogeneous effects of the subscores of overall financial literacy, i.e., financial knowledge, behavior, and attitude score, on fintech use and various family business outcomes. We estimate the logit model with a control function approach, where in the first stage we regress a set of instrumental variables and other controls on the subscores.

Figure 3 summarizes the estimated marginal effects of the financial literacy subscores. All subscores, except for the financial knowledge effect in CAREC, have positive and significant effects on fintech use in family businesses. In regard to the effect on the probability of business closure, financial knowledge and attitude have significant effects, but financial behavior does not. Perhaps this is because only financial knowledge and attitude enable business owners to make thoughtful decisions, including on risk diversification, that may help their business to continue. As for the effect on the probability of an increased business turnover and number of employees, financial attitude and behavior have significant and positive effects on the outcomes for CAREC countries, as does financial attitude for ASEAN countries. This highlights the importance of taking the multidimensional financial literacy of business owners as a policy objective rather than just financial knowledge.

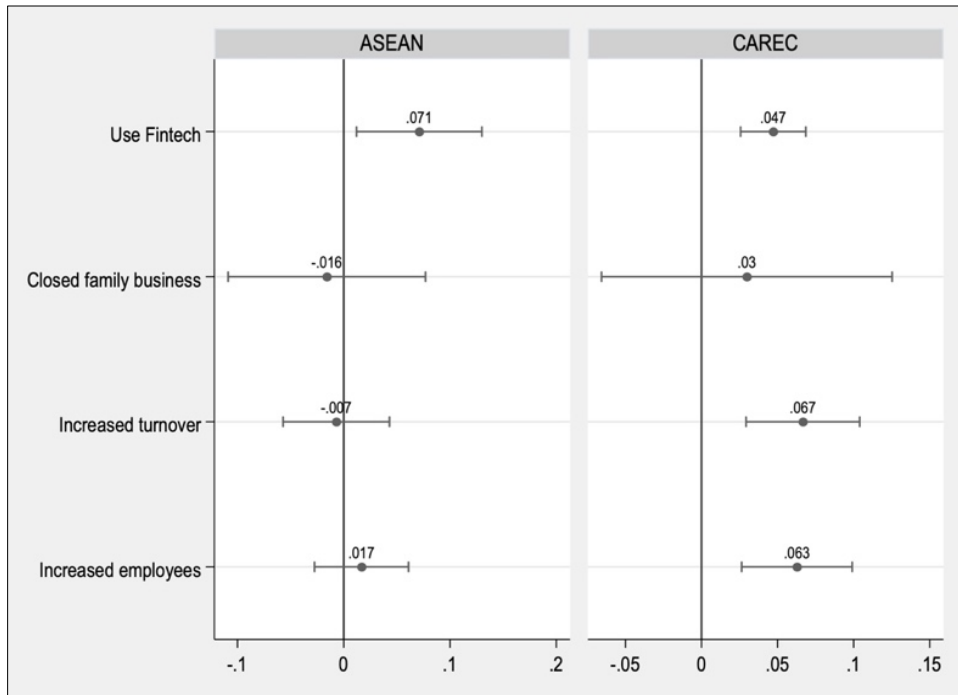
Figure 3: Effects of Financial Knowledge, Behavior, and Attitude, Marginal Effects of Logit Model with Control Function Approach

A. Effect of financial knowledge

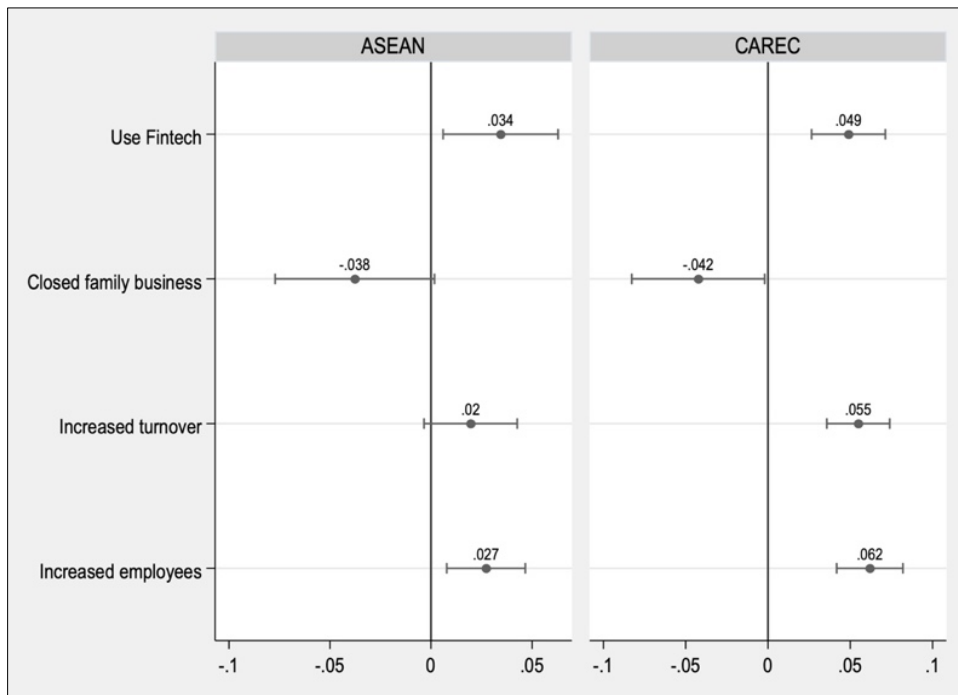


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Figure 3 continued
B. Effect of financial behavior



C. Effect of financial attitude



Source: Authors' estimates.

6. CONCLUSIONS AND POLICY RECOMMENDATIONS

This study examines the effects of the financial literacy of family business owners on the adoption of financial technology (fintech) in their business and various business outcomes in developing Asia. We measured the multidimensional financial literacy scores of family business owners in seven Association of Southeast Asian Nations (ASEAN) and ten Central Asia Regional Economic Cooperation (CAREC) countries, using the survey instrument for financial literacy of MSME owners designed by the OECD/INFE.

The average financial literacy scores of family business owners are highly correlated with the level of economic development, while we find particularly lower scores in Azerbaijan and Turkmenistan relative to GDP per capita. We also find that self-employed and micro family business owners tend to have lower financial literacy scores, while younger and more educated owners have higher scores.

Our results also suggest that higher financial literacy is positively and significantly associated with fintech use in family business and better business outcomes. These results hold in almost all cases when we apply the control function approach with a set of instrumental variables. When analyzing the subcomponents of the financial literacy index, we find that financial attitude and behavior are particularly important and associated with fintech use and better business outcomes. The results are largely consistent with those of previous studies but provide new information on the effects of financial literacy and fintech on self-employed micro-size family businesses.

Overall, our results suggest that improved financial literacy of family business owners could lead to better utilization of fintech in their businesses and business performance. Therefore, it is recommended to provide financial education programs to family business owners with lower financial literacy (e.g., self-employed and micro family business owners) with a view to improving not only their financial knowledge but also their financial behavior and attitude.

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APPENDIX

Table A1: Effect of Financial Literacy on Fintech Use and Family Business Outcomes, Marginal Effects of Logit Model: Combined Sample

<i>A. Outcome: Use fintech in business</i>						
	(1a)		(2a)			
Financial literacy	-0.017**	(0.008)	-0.003	(0.011)	-0.003	(0.011)
Country fixed effect	Yes		Yes		Yes	
Control function (IV)	No		Yes		Yes	
LR chi-square	42.83***		47.56***		47.56***	
Pseudo R squared	0.0586		0.0665		0.0665	
Observations	1,168		1,168		1,168	
<i>B. Outcome: Closed family business</i>						
	(1b)		(2b)		(3b)	
Financial literacy	-0.017**	(0.008)	-0.003	(0.011)	-0.056***	(0.019)
Fintech use	-0.023	(0.020)	-0.011	(0.019)	-0.020	(0.020)
Literacy x fintech			-0.043**	(0.018)		
Country fixed effect	Yes		Yes		Yes	
Other controls	Yes		Yes		Yes	
Control function (IV)	No		No		Yes	
LR chi-square	42.83***		47.56***		48.46***	
Pseudo R squared	0.0586		0.0665		0.0715	
Observations	1,168		1,168		1,135	
<i>C. Outcome: Increased family business turnover</i>						
	(1c)		(2c)		(3c)	
Financial literacy	-0.017**	(0.008)	-0.003	(0.011)	-0.056***	(0.019)
Fintech use	-0.023	(0.020)	-0.011	(0.019)	-0.020	(0.020)
Literacy x fintech			-0.043**	(0.018)		
Country fixed effect	Yes		Yes		Yes	
Other controls	Yes		Yes		Yes	
Control function (IV)	No		No		Yes	
LR chi-square	42.83***		47.56***		48.46***	
Pseudo R squared	0.0586		0.0665		0.0715	
Observations	1,168		1,168		1,135	
<i>D. Outcome: Increased family business turnover</i>						
	(1d)		(2d)		(3d)	
Financial literacy	-0.017**	(0.008)	-0.003	(0.011)	-0.056***	(0.019)
Fintech use	-0.023	(0.020)	-0.011	(0.019)	-0.020	(0.020)
Literacy x fintech			-0.043**	(0.018)		
Country fixed effect	Yes		Yes		Yes	
Other controls	Yes		Yes		Yes	
Control function (IV)	No		No		Yes	
LR chi-square	42.83***		47.56***		48.46***	
Pseudo R squared	0.0586		0.0665		0.0715	
Observations	1,168		1,168		1,135	

Notes: Financial literacy score is standardized. Asterisks (*, **, and ***) denote significance at the 10%, 5%, and 1% levels, respectively. Other controls include all the other variables reported in Table 2: size and sector of family business and age, gender, and education background of family business owners.

Source: Authors' estimates.