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## Working Paper

# Determinants of peer-to-peer lending expansion: The roles of financial development and financial literacy

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# DETERMINANTS OF PEER-TO-PEER LENDING EXPANSION

THE ROLES OF FINANCIAL DEVELOPMENT AND  
FINANCIAL LITERACY

*Eun Young Oh and Peter Rosenkranz*

**NO. 613**

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# Determinants of Peer-to-Peer Lending Expansion: The Roles of Financial Development and Financial Literacy

Eun Young Oh and Peter Rosenkranz

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## ABSTRACT

To explore the determinants of peer-to-peer (P2P) lending expansion, this study examines factors that impact P2P lending using a sample of 62 economies over the period 2015–2017. We investigate the effects of financial development and financial literacy on the expansion of P2P lending. The level of development of financial institutions is assessed by access, efficiency, and depth. We find that financial institutions' efficiency, financial literacy, and lower branch and ATM penetration are positively related with the expansion of P2P lending. This finding suggests that P2P lending can fill funding gaps in economies where traditional financial institutions may be less available, and thus promote financial inclusion. We also find that better information technology infrastructure and high new business density are positively associated with the expansion of P2P lending, suggesting that physical infrastructure is an essential prerequisite for it, while this is more likely to happen in dynamic business environments.

*Keywords:* financial development, financial literacy, fintech, peer-to-peer lending

*JEL codes:* E51, G23, G53, N20, O33

## I. INTRODUCTION

Online peer-to-peer (P2P) lending—a financial technology (fintech) service also known as crowdlending or debt-based crowdfunding—is a financial service in which lenders and borrowers transact directly without the intermediation of traditional financial institutions. P2P lending became a milestone in innovative financial solutions to individuals and firms in the aftermath of the global financial crisis, a period marked by a credit crunch, drying up of liquidity, deterioration of trade credit, and the inability and reluctance of banks to lend to individuals and small and medium-sized enterprises, with adverse social effects. P2P lending can secure financing for consumption and investment and improve liquidity provision and resource allocation.

The global crowdfunding market grew to a phenomenal \$290 billion in 2016 from \$0.5 billion in 2011 (Rau 2019), yet the growth has varied significantly across countries.<sup>1</sup> The P2P lending market has grown significantly in the People's Republic of China (PRC), the United States (US), and the United Kingdom (UK) (Claessens, Frost, and Zhu 2018). However, in other countries, such as Indonesia, it is only starting to emerge. Given that P2P lending also has the potential to promote financial inclusion by providing better access to credit to people most needing it—in order to bridge or narrow the P2P lending gap within and between countries—it is important to explore the factors explaining these differences in diffusion.

An important, underinvestigated aspect of the macrofinancial environment in the literature is the link between financial development, financial literacy, and P2P lending. While the effects of competition between P2P lenders and banks for loans are well documented (Tang 2019; Cornaggia, Wolfe, and Yoo 2018; Cole, Cumming, and Taylor 2019), far less attention has been paid to the role that existing financial environments might play in the expansion of P2P lending. And given that most studies have considered specific countries, it could be hard to draw general conclusions. This paper therefore investigates how existing financial environments, in particular financial institutional development, and financial literacy can account for observed cross-country differences in the expansion of P2P lending.

The role of financial development in promoting financial innovation has been widely studied in the last decade. Better financing environments lead to higher P2P lending growth because most P2P platforms consider accessibility, speed, and demand with the ability to access large amounts of collected data (Navaretti, Calzolari, and Pozzolo 2017). Most of the empirical literature uses a single indicator, such as the ratio of private credit to gross domestic product (GDP) or stock market capitalization, as a proxy for financial development. However, financial development is a multidimensional process so that considering only financial depth does not capture the complexity of financial development. A recent study by Čihák et al. (2012) explores financial development in terms of financial access, efficiency, and depth. Ayadi et al. (2013) investigate the relationship between financial development and economic growth. They use new financial sector measures for the quantity (depth) and the quality (efficiency) of the banking sector. They argue that the effects of quality and quantity of the financial system on economic growth in advanced economies differ from the effects in emerging economies. Hence, these three factors (financial access, efficiency, and depth) may have different impacts on all forms of credit, including P2P loans.

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<sup>1</sup> There are four types of crowdfunding: rewards-based crowdfunding, donation-based crowdfunding, debt-based crowdfunding (P2P lending), and equity-based crowdfunding.



Access to finance plays an important role in the development of alternative finance such as microcredit. The literature finds robust relationships between microfinance institutions and access to formal financial services. A number of empirical studies (e.g., Vanroose and D’Espallier 2013) show that microfinance institutions expand in countries where the percentage of formal financial institution account holders is lower. Low-income households in emerging economies face difficulty in obtaining credit from formal financial institutions. The demand for an alternative source of financing to existing formal financial institutions is expected to be higher. Not only microfinance institutions, but also digital finance can improve access to finance for unbanked people (World Bank 2014). According to UNDP (2015), many countries have been working to achieve the United Nations Sustainable Development Goals—in particular, Goal 9, which helps to improve digital inclusion.<sup>2</sup> As excluded people are more exposed to digital devices (e.g., mobile phones) than before, digital finance has great potential to increase financial inclusion.

Some comparative research looks at the relationship between P2P lending and access to formal financial services using the US market. Jagtiani and Lemieux (2018) document that Lending Club—a California-based P2P lending platform—provides credit in countries where credit card loans are more concentrated and areas that have fewer bank branches per capita. Havrylchuk et al. (2019) examine the expansion of P2P lending using data from Lending Club and Prosper Market Place, another P2P lender. They find that P2P lending is negatively related to market concentration and the number of bank branches. P2P lending platforms provide additional credit to customers that are underserved by traditional financial institutions.

Accordingly, we formulate our first research question as follows: *Does P2P lending expand in economies with the lack of access to formal financial institutions?*

On the depth of the financial sector, recent cross-country research on digital finance by Rau (2019) and Navaretti Calzolari, and Pozzolo (2017) shows a positive relationship between crowdfunding volumes and financial depth. The quality of the financial sector (profitability and cost efficiency of the financial institutions) also matters for the expansion of financial technology. Rau (2019) confirms a positive effect of bank profits and financial system inefficiency on crowdfunding expansion, which supports the view that financial system rents are important for crowdfunding. However, De-Ramon, Francis, and Straughan (2018) show that higher competition leads to better efficiency in the banking market. High competition within a financial industry can make it easier for new players to enter the market. Conditioning on the fact that higher efficiency represents high competition and lower barriers to entry, higher efficiency may have a positive impact on the adoption of P2P lending.

This leads to our second question: *Does P2P lending expand in economies with more or less efficient financial institutions and high levels of financial depth?*

The link between financial literacy and variables related to financial behavior is widely studied. Hilgert and Hogarth (2003) find a positive relationship between financial knowledge and various financial outcomes. Higher financial literacy can improve cash flow management and lead to more saving and investment. Lusardi and Mitchell (2008), linking financial literacy to retirement and wealth accumulation, find positive relationships. Financial literacy also has an impact on investment behavior,

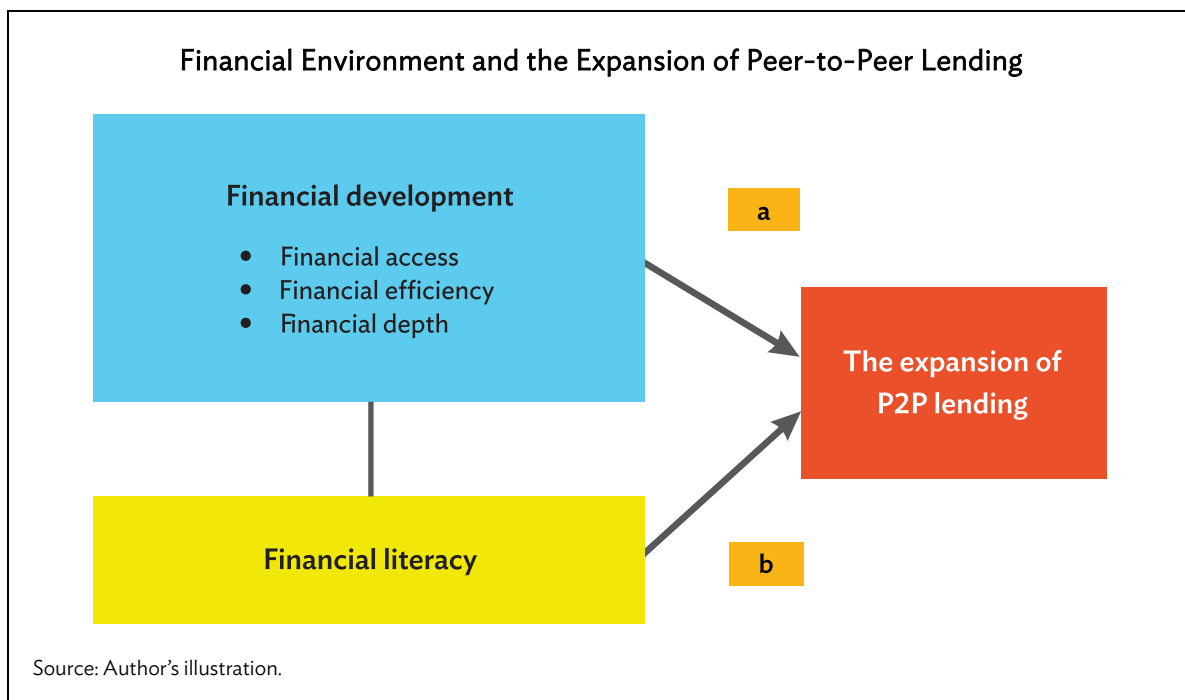
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<sup>2</sup> United Nations Sustainable Development Goal 9: Build resilient infrastructure, promote sustainable industrialization, and foster innovation.

including stock market participation and better equity diversification (Goetzmann and Kumar 2008). Rooij, Lusardi, and Alessie (2011) use the De Nederlandsche Bank Household Survey to see the relationship between financial literacy and stock market participation. They find that households with higher literacy are more likely to invest in stocks. Financial literacy is also an important resource for fintech users. Iyer et al. (2015) state that investors in P2P lending often lack financial industry knowledge and financial lending experiences. They confirm that P2P lenders use both soft and hard information to infer creditworthiness. According to Morgan and Trinh (2019), the positive relationship between financial literacy and awareness of fintech products is strong in the Lao People’s Democratic Republic. Yakoboski, Hasler, and Lusardi (2018), examining the financial literacy of millennials and their fintech activities, find fintech use depends on user knowledge, characteristics, and needs. Han, Xiao, and Su (2018) use two measures, financing familiarity and financing expertise, to test how financial knowledge affects P2P borrowing in the PRC. They conclude that financial literacy is predictive of P2P market participation.

Based on gaps in the literature, our third research question is: *Is the level of financial knowledge positively associated with the expansion of P2P lending across economies?*

We proceed by defining the financial environment and channels that can lead to expanding P2P lending markets. The figure illustrates the foundations of our analysis, and further investigations revolve around these two arrows (a and b).



We explore cross-country variations in P2P lending using a new cross-country panel dataset from 62 economies covering 2015–2017. This up-to-date data includes both advanced and emerging economies from the Cambridge Centre for Alternative Finance. To preview our empirical results, our findings show that financial access and efficiency are important determinants for the expansion of P2P lending. Our results also support the idea that financial literacy is positively associated with the

expansion of P2P lending, contributing to the literature on P2P lending, finance, and innovation diffusion. To the best of our knowledge, this paper is the first to analyze the impact of financial development and financial literacy on the expansion of P2P lending at a macro level. Since previous studies were conducted mainly at the individual country level, this paper examines the cross-sectional dimension.

The rest of the paper is organized as follows. Section II introduces our dataset and provides an overview of P2P lending activities by region and period. Section III presents evidence from the regressions that helps identify the major factors of the observed cross-country disparities in P2P lending expansions. Section IV concludes.

## II. DATA

We use P2P loan data from the Cambridge Centre for Alternative Finance.<sup>3</sup> The sample contains yearly data from 2015 to 2017. The total P2P loan volumes are in US dollars based on the exchange rate at the end of 2015, 2016, and 2017. In total, 62 economies are part of the sample.<sup>4</sup> Table 1 presents total P2P loan volumes by region and year. During 2015–2017, the total Asian loan market share was about 82%, while Europe accounted for less than 5% of total global P2P loans volume. The size of the P2P loan markets has varied considerably over time. It first expanded considerably in 2016, then declined in 2017. A larger proportion of loans are more concentrated in the PRC, the UK, and the US. The size of the P2P loan market in the PRC is larger than the rest of the world, including the UK and the US.

For financial development, we obtain four measures from the International Monetary Fund Financial Development Index Database. We use a financial development index as the overall measure of financial development. To capture the complexity of financial development further, we also consider how financial institutions develop in terms of access, depth, and efficiency. Svirydzienka (2016) develops the methodologies using a set of key indicators.<sup>5</sup> Financial access consists of the number of bank branches and ATMs per 100,000 adults. Financial depth considers private sector credit, pension funds, mutual funds, and insurance premiums. Financial efficiency reflects both operational efficiency and the profitability of financial institutions. Financial access, depth, and efficiency are aggregated into the overall financial development index. In her analysis, countries such as India, Malaysia, and Viet Nam rank higher on depth but lower on access. This highlights that financial systems need to be extensively assessed. Countries with deep financial markets do not necessarily also have better financial market access or greater levels of financial efficiency. Appendix Table A.2 lists definitions of variables and data sources.

We use data from the Standard & Poor's Ratings Services Global Financial Literacy Survey to assess financial literacy, which was conducted in 2014 in more than 140 economies. Four basic concepts (interest compounding, inflation, risk diversification, and numeracy) were tested. Based on the dataset, Scandinavian countries score highest, followed by Canada, Israel, and the UK. Overall, the survey results reveal a great dispersion of financial literacy levels across economies.

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<sup>3</sup> Since 2014, the Cambridge Centre for Alternative Finance has collected data by surveying crowdfunding companies and public sources. Explanations of their data collection can be found at <https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/>.

<sup>4</sup> We group the 62 economies into three regions: Asia, America, and Europe. We limit our analysis to these three regions, mainly because of data availability. Appendix Table A.1 lists the economies.

<sup>5</sup> See Appendix Table A.2.

For the country-specific control variables, we include GDP per capita, trade openness, fixed broadband subscriptions, regulatory score, and new business density. Most of the data are taken from the World Development Indicators. These country-specific control variables have proven roles in the P2P lending and financial innovation studies of Rau (2019); BIS and FSB (2017); and Navaretti, Calzolari, and Pozzolo (2017). On the supply side, infrastructure—particularly internet access—and regulation play a role in financial innovations.

Among demand factors, the new market needs sufficient demand. Since the global financial crisis in 2008, new businesses struggle to secure debt financing in advanced economies, and lack of access to formal financial institutions and higher lending interest rates in emerging economies can be the biggest obstacles to start-up entrepreneurs (Bruton et al. 2015). When the supply of capital from formal financial institutions is limited, entrepreneurs will seek alternative forms of financing such as P2P loans.

We also add a dummy to control P2P lending market leaders (PRC, UK, and US), and indicators for developed economies.

**Table 1: Peer-to-Peer Loan Volumes**

	Year	Region	Volume (\$ million)	Proportion (%)		Year	Region	Volume (\$ million)	Proportion (%)
	<b>All</b>	2015	America	34,529		26	<b>Leaders</b>	2015	PRC
Asia			93,624	70	UK	4,288			3
Europe			5,101	4	US	34,368			26
Total			133,255	100	Total	131,351			100
2016		America	33,025	12	2016	PRC		240,905	86
		Asia	242,774	86		UK		6,068	2
		Europe	7,595	2		US		32,413	12
		Total	283,395	100		Total		279,387	100
2017		America	9,632	7	2017	PRC		109,965	89
		Asia	111,782	88		UK		4,894	4
		Europe	6,318	5		US		8,739	7
		Total	127,732	100		Total		123,599	100
2015– 2017		America	77,187	14	2015– 2017	PRC		443,566	83
		Asia	448,180	82		UK		15,250	3
		Europe	19,015	4		US		75,521	14
		Total	544,383	100		Total		534,338	100

Notes: United States (US) dollar values are based on the exchange rate at the end of 2015, 2016, and 2017. Leaders include the People's Republic of China (PRC), the United Kingdom (UK), and the US.

Source: Authors' calculations based on data from the Cambridge Centre for Alternative Finance.

### III. EMPIRICAL FINDINGS

The following discussion focuses on the estimation results based on the panel regression of Tables 2 and 3. We include fixed effects by adding indicators for P2P market leaders (PRC, UK, and US) and year dummy variables. For comparison and robustness checks, we conduct cross-sectional regressions separately for each of the years (2015–2017), with results in Tables 4 and 5.

Table 2 reports the panel regression outputs from the P2P loan model at the country level, where the dependent variable for each case is the log of P2P loan volume per capita. Table 2 includes the results for three regressions: one for the whole sample, one for the emerging economies, and one for the advanced economies. It shows estimation results obtained by including the financial development dynamics (financial access, financial efficiency, financial depth, and financial development indicators).

Table 2(a) shows the effect of financial development on P2P lending for all markets. The impact of access to formal financial institutions on the P2P lending expansion is negative and quite large. The result suggests that economies with a lower number of banking branches and ATM penetration promote the expansion of P2P lending. P2P lending has achieved success in economies lacking banking access. This accords with the Havrylchuk et al. (2019) finding that access is essential to P2P lending. Financial institution efficiency enters positively and significantly in column [2], implying that efficiency measures such as the quality of the financial institution are important for the expansion of P2P lending. Better efficiency can imply higher competition and lower barriers to entry in financial markets (De-Ramon, Francis, and Straughan 2018). A positive relationship between financial institution efficiency and P2P lending volumes could signal that P2P lending platforms can expand in economies where bank competition is high. This finding also relates to the literature on technology diffusion and finance development (Sassi and Goaid 2013, Comin and Nanda 2019). In contrast to the other two financial development factors, the variable measuring financial depth and financial development are not statistically significant in columns [3] and [4].

In Table 2(b), we split the data into two groups (emerging and advanced economies).<sup>6</sup> Columns 1–5 show the results for all emerging economies and columns [6]–[10] show the results for all advanced economies. For emerging markets, only access among the financial development variables is significant and the magnitude of financial access is larger than in Table 2(a). For advanced markets, only efficiency variables are significant, with the positive signs; in fact, the coefficient on the financial efficiency is larger than in Table 2(a). In other words, the effect of financial access is more pronounced in emerging economies, while that of financial efficiency is stronger in advanced economies. These findings seem intuitive given that access to formal financial institutions in emerging economies may be limited in comparison to advanced economies. P2P loans can be more in demand in developing economies, which in turn can be a means of expanding access to finance. Among advanced economies, countries with higher financial efficiency promote the expansion of P2P lending. This is in line with previous studies on technology adoption and efficiency (Comin and Hobijn 2004, Galang 2012), and confirm that, in advanced economies, the direct effect of financial efficiency on P2P lending is significantly positive. The effects of other financial development variables, such as financial depth and financial development indicators, do not appear to be significant.

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<sup>6</sup> The Asian Development Bank's classification of developing members and Rau's (2019) study were used to classify economies into emerging and advanced economies. A complete list of economies is presented in Appendix Table A.1.

Table 2: Financial Institutions Development and Peer-to-Peer Loans (Panel Regression)

## (a) Whole sample

Variables	[1]	[2]	[3]	[4]	[5]
Financial access	<b>-2.169**</b> (1.097)				<b>-1.998*</b> (1.080)
Financial efficiency		<b>3.279*</b> (1.880)			<b>3.124*</b> (1.852)
Financial depth			0.338 (1.488)		0.129 (1.491)
Financial development				-1.055 (2.261)	
<b>Control variables</b>					
Log of GDP per capita	0.639 (0.460)	0.642 (0.501)	0.677 (0.658)	0.917 (0.594)	0.463 (0.703)
Trade openness	-0.005 (0.004)	-0.004 (0.004)	-0.003 (0.004)	-0.003 (0.004)	-0.005 (0.004)
Log of broadband (per 100 people)	<b>1.215**</b> (0.534)	<b>0.922*</b> (0.546)	<b>0.947*</b> (0.547)	0.868 (0.549)	<b>1.248**</b> (0.555)
Regulatory score	0.169 (0.306)	-0.123 (0.287)	-0.001 (0.305)	0.081 (0.330)	0.014 (0.296)
New business density	0.099 (0.061)	<b>0.102*</b> (0.057)	0.099 (0.066)	0.102 (0.063)	<b>0.099*</b> (0.055)
Leader dummy	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.602	0.594	0.578	0.579	0.617
Observations	133	133	133	133	133

GDP = gross domestic product.

Notes: This table reports panel estimation results for a whole sample. Numbers in parentheses are robust standard errors, which are clustered at the country level. \*\*\*, \*\*, and \* represent 1%, 5%, and 10% significance, respectively. The dependent variable is log of peer-to-peer (P2P) loan volume per capita. Financial development is an aggregate of financial access, efficiency, and depth. Log of broadband is log of fixed broadband subscriptions per 100 people. The sample period is 2015–2017. All regressions include time fixed effects and dummies for P2P lending leading countries (People's Republic of China, United Kingdom, and United States). All variables are defined in Appendix Table A.2.

## (b) Emerging economies versus advanced economies

Variables	Emerging Economies					Advanced Economies				
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Financial access	<b>-5.475***</b> (1.668)				<b>-5.302***</b> (1.543)	-0.564 (1.466)				-0.071 (1.296)
Financial efficiency		2.936 (2.152)			3.057 (1.943)		<b>6.795***</b> (2.718)			<b>5.848**</b> (2.936)
Financial depth			0.026 (1.764)		0.150 (1.648)			0.567 (3.699)		0.282 (3.520)
Financial development				-3.365 (3.165)					0.551 (3.596)	

continued on next page

Table 2 *continued*

Variables	Emerging Economies					Advanced Economies				
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
<b>Control variables</b>										
Log of GDP per capita	-0.109 (0.770)	0.692 (0.821)	0.596 (0.911)	0.761 (0.843)	-0.038 (0.912)	0.421 (1.424)	0.221 (1.232)	0.285 (1.813)	0.474 (1.582)	0.079 (1.608)
Trade openness	-0.004 (0.006)	-0.006 (0.007)	-0.003 (0.007)	-0.001 (0.007)	-0.007 (0.006)	0.000 (0.005)	0.003 (0.004)	0.002 (0.006)	0.001 (0.006)	0.004 (0.006)
Log of broadband (per 100 people)	<b>1.896***</b> (0.665)	0.858 (0.682)	0.933 (0.685)	0.959 (0.667)	<b>1.814***</b> (0.682)	0.023 (1.215)	-0.656 (1.147)	0.085 (1.277)	0.161 (1.101)	-0.591 (1.320)
Regulatory score	0.379 (0.324)	-0.044 (0.333)	0.079 (0.348)	0.254 (0.362)	0.227 (0.310)	-0.297 (0.800)	-0.354 (0.622)	-0.351 (0.857)	-0.377 (0.885)	-0.341 (0.703)
New business density	0.097 (0.087)	0.124 (0.098)	0.103 (0.108)	0.098 (0.101)	0.119 (0.078)	0.101 (0.079)	0.082 (0.065)	0.103 (0.091)	0.103 (0.089)	0.086 (0.072)
Leader dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.562	0.459	0.444	0.469	0.573	0.407	0.565	0.429	0.417	0.562
Observations	78	78	78	78	78	55	55	55	55	55

GDP = gross domestic product.

Notes: This table reports panel estimation results for emerging and advanced economies separately. Numbers in parentheses are robust standard errors, which are clustered at the country level. \*\*\*, \*\*, and \* represent 1%, 5%, and 10% significance, respectively. The dependent variable is log of peer-to-peer (P2P) loan volume per capita. Financial development is an aggregate of financial access, efficiency, and depth. Log of broadband is log of fixed broadband subscriptions per 100 people. The sample period is 2015–2017. All regressions include time fixed effects and dummies for the P2P lending leading countries (People's Republic of China, United Kingdom, and United States). All variables are defined in Appendix Table A.2.

Source: Authors' calculations.

Among our country-specific control variables, fixed broadband subscriptions and new business density are statistically significant explanatory factors for the expansion of P2P lending. And we find little or no evidence to support the importance of other control variables. P2P lending involves internet-based loan transactions. Hence, the use of the internet is contingent on the adoption of technologies such as computers, and P2P lending users thus require internet access.

According to BIS and FSB (2017), technological advances in the internet are among the supply factors driving fintech adoption. Although Rau (2019) and Havrylchuk et al. (2019) found no robust impact of the internet on P2P lending, our results confirm that internet penetration is an important driver for the expansion of P2P lending. In addition, the findings show that the level of new business density is positively related to the volume of P2P lending. Interestingly, new business density appears to matter for P2P loan expansion. Borrowers (e.g., entrepreneurs) often apply for multiple sources of finance, even after they are turned down by other sources (Robb and Robinson 2014). P2P lending platforms can provide alternative sources of credit for many small businesses and start-ups, which may have difficulty accessing credit through traditional banks. This satisfies demand in general, and even also creates new demand. This could further indicate a dynamic and innovative business environment in general, leading to more demand for P2P lending. No significant variation in P2P lending is observed among economies according to GDP per capita, trade openness, and regulatory score.

Table 3 presents the estimates for the full sample, emerging, and advanced economies separately. The dependent variable is the log of P2P volume per capita during 2015–2017. To understand the effect of financial literacy on P2P lending, we first run our baseline regression in

column [1], [4], and [7], then include financial development index and an interaction term between financial literacy and financial development. We find that financial literacy matters for the expansion of P2P lending for both emerging and advanced economies. Economies with higher literacy are more likely to show active P2P lending activity. The results are consistent with Han, Xiao, and Su (2018), who show that financial literacy is positively associated with P2P lending activities. Since lenders in P2P lending markets lack financial investment knowledge and experience compared to the ones in traditional financial institutions, limited financial literacy can pose a significant challenge to expanding P2P lending markets. The fixed broadband subscription is an important predictor of the expansion of P2P lending, but other variables, including financial development, and new business density, are not statistically significant. Additional robustness checks not reported here reveal that the inclusion of the variables of financial access, efficiency, and depth do not alter the results reported in Table 3.

**Table 3: Financial Literacy (Panel Regression)**

Variables	Whole Sample			Emerging Economies			Advanced Economies		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Financial literacy	<b>0.056**</b> (0.024)	<b>0.054**</b> (0.025)	0.051 (0.101)	<b>0.096***</b> (0.044)	<b>0.086*</b> (0.045)	0.016 (0.236)	<b>0.064**</b> (0.029)	<b>0.080***</b> (0.032)	0.136 (0.186)
Financial development		-0.727 (2.558)	-0.899 (6.768)		-3.535 (4.056)	-7.856 (14.260)		3.234 (2.667)	7.523 (14.364)
Financial literacy x Financial development			0.003 (0.128)			0.126 (0.422)			-0.069 (0.229)
<b>Control variables</b>									
Log of GDP per capita	0.101 (0.546)	0.210 (0.730)	0.209 (0.725)	0.205 (0.872)	0.438 (0.966)	0.358 (0.962)	-0.627 (1.064)	-1.035 (1.269)	-1.103 (1.344)
Trade openness	-0.002 (0.003)	-0.002 (0.004)	-0.002 (0.004)	-0.005 (0.007)	-0.004 (0.007)	-0.005 (0.009)	0.002 (0.005)	0.005 (0.005)	0.006 (0.005)
Log of broadband (per 100 people)	<b>1.044*</b> (0.532)	<b>1.023*</b> (0.551)	<b>1.030*</b> (0.555)	0.799 (0.691)	0.817 (0.670)	0.935 (0.676)	-1.271 (1.287)	-1.727 (1.196)	-1.772 (1.170)
Regulatory score	-0.198 (0.297)	-0.159 (0.317)	-0.158 (0.321)	-0.126 (0.365)	0.025 (0.360)	0.050 (0.380)	-0.519 (0.585)	-0.717 (0.668)	-0.775 (0.647)
New business density	0.073 (0.056)	0.074 (0.057)	0.074 (0.057)	0.086 (0.078)	0.082 (0.077)	0.085 (0.080)	0.061 (0.068)	0.048 (0.078)	0.049 (0.079)
Leader dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.591	0.592	0.592	0.486	0.511	0.519	0.533	0.628	0.635
Observations	130	130	130	75	75	75	55	55	55

GDP = gross domestic product.

Notes: This table reports panel estimation results for a whole sample, emerging and advanced economies separately. Numbers in parentheses are robust standard errors, which are clustered at the country level. \*\*\*, \*\*, and \* represent 1%, 5%, and 10% significance, respectively. The dependent variable is log of peer-to-peer (P2P) loan volume per capita. Financial development is an aggregate of financial access, efficiency, and depth. Financial literacy x financial development is an interaction term. Log of broadband is log of fixed broadband subscriptions per 100 people. The sample period is 2015–2017. All regressions include time fixed effects and dummies for the P2P lending leading countries (People's Republic of China, United Kingdom, and United States). All variables are defined in Appendix Table A.2.

Source: Authors' calculations.



For robustness checks, we ran a series of additional regressions. Tables 4 and 5 report cross-sectional regression outputs separately for each of the years. They present the estimates using two different specifications: a basic specification and a second specification in which we add dummies for developed economies. The coefficient signs are mostly consistent with the ones from the panel regression models. The number of observations is lower than in the panel estimations of Tables 2 and 3, but the sample still includes a fair selection of economies at different stages of development and P2P lending adoption. The effects of financial development and financial literacy turn out to vary over time. It is interesting to see that some are not now statistically significant in explaining the expansion of P2P lending.

Table 4 reports the impact of financial access, efficiency, and depth on P2P lending for each year from 2015 to 2017. Formal financial institution access is more important in 2015 and 2016, while financial institution efficiency seems to do a better job capturing the expansion of P2P lending for 2017. In the early stage of the P2P lending adoption, broadband matters more, but the effect fades away over time. Higher demand levels associated with higher new business density link to an increase in P2P lending in 2015 and 2016. Table 5 shows financial literacy has a significant and positive causal link on P2P lending in 2015, but they are not significant for 2016 and 2017. Factors affecting P2P lending adoption can vary over time. Financial access, financial literacy, broadband, and new business density play important roles in the early stage of P2P lending markets, while financial efficiency is an important resource to expand those markets.

**Table 4: Financial Institutions Development and Peer-to-Peer Loans  
(Cross-Sectional Regression by Year)**

(a) Year: 2015

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
<b>Financial access</b>	<b>-3.879**</b> (1.513)				<b>-3.514**</b> (1.530)	<b>-4.069***</b> (1.545)				<b>-3.676**</b> (1.575)
<b>Financial efficiency</b>		<b>4.015**</b> (2.273)			3.203 (2.193)		<b>3.984*</b> (2.318)			3.050 (2.236)
<b>Financial depth</b>			0.396 (2.110)		0.407 (1.918)			0.302 (2.171)		0.221 (1.969)
<b>Financial development</b>				-3.274 (3.215)					-3.782 (3.365)	
<b>Control variables</b>										
Log of GDP per capita	0.587 (0.561)	0.469 (0.606)	0.599 (1.041)	1.273 (0.786)	0.211 (0.961)	0.134 (0.827)	0.378 (0.863)	0.463 (1.175)	0.972 (0.949)	-0.047 (1.079)
Trade openness	<b>-0.010**</b> (0.004)	-0.007 (0.004)	-0.006 (0.004)	<b>-0.008*</b> (0.005)	<b>-0.010**</b> (0.004)	-0.009 (0.005)	-0.006 (0.005)	-0.005 (0.005)	-0.007 (0.005)	-0.009 (0.005)
Log of broadband (per 100 people)	<b>2.025***</b> (0.657)	<b>1.614**</b> (0.661)	<b>1.630*</b> [0.816]	<b>1.432**</b> (0.690)	<b>2.116**</b> (0.764)	<b>2.222***</b> (0.711)	<b>1.650**</b> (0.713)	<b>1.678*</b> (0.848)	<b>1.563**</b> (0.733)	<b>2.227***</b> (0.798)
Regulatory score	0.021 (0.399)	-0.414 (0.402)	-0.318 (0.428)	-0.103 (0.452)	-0.120 (0.418)	0.002 (0.402)	-0.421 (0.411)	-0.327 (0.436)	-0.102 (0.457)	-0.120 (0.423)
New business density	<b>0.153**</b> (0.056)	<b>0.154**</b> (0.059)	<b>0.151**</b> (0.064)	<b>0.164**</b> (0.061)	<b>0.150**</b> (0.058)	<b>0.155**</b> (0.057)	<b>0.155**</b> (0.060)	<b>0.153**</b> (0.065)	<b>0.166**</b> (0.062)	<b>0.153**</b> (0.059)

continued on next page

Table 4 *continued*

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Leader dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Developed dummy	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
R-squared	0.738	0.712	0.684	0.694	0.755	0.742	0.712	0.685	0.697	0.758
Observations	40	40	40	40	40	40	40	40	40	40

GDP = gross domestic product.

Notes: This table reports cross-section estimation results for the year 2015. Numbers in parentheses are ordinary least squares standard errors. \*\*\*, \*\*, and \* represent 1%, 5%, and 10% significance, respectively. The dependent variable is log of P2P loan volume per capita. Financial development is an aggregate of financial access, efficiency, and depth. Log of broadband is log of fixed broadband subscriptions per 100 people. All regressions include dummies for the P2P lending leading countries (People's Republic of China, United Kingdom, and United States). In columns 6–10, the developed economy indicators are included. All variables are defined in Appendix Table A.2.

## (b) Year: 2016

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
<b>Financial access</b>	<b>-3.023**</b> (1.455)				<b>-2.898*</b> (1.500)	<b>-3.474**</b> (1.449)				<b>-3.391**</b> (1.509)
<b>Financial efficiency</b>		0.380 (3.142)			0.091 (3.076)		-0.114 (3.162)			-0.446 (3.043)
<b>Financial depth</b>			1.536 (1.755)		1.085 (1.751)			1.234 (1.781)		0.602 (1.750)
<b>Financial development</b>				-2.710 (2.951)					-4.039 (3.038)	
<b>Control variables</b>										
Log of GDP per capita	0.566 (0.543)	0.736 (0.568)	0.187 (0.846)	1.068 (0.663)	0.180 (0.828)	-0.382 (0.784)	0.071 (0.819)	-0.302 (0.977)	0.323 (0.821)	-0.560 (0.950)
Trade openness	0.000 (0.005)	0.003 (0.005)	0.005 (0.005)	0.002 (0.005)	0.001 (0.005)	0.005 (0.005)	0.007 (0.006)	0.007 (0.006)	0.006 (0.005)	0.005 (0.006)
Log of broadband (per 100 people)	0.656 (0.666)	0.234 (0.674)	0.543 (0.747)	0.205 (0.664)	0.848 (0.757)	1.060 (0.696)	0.495 (0.711)	0.706 (0.764)	0.522 (0.687)	1.166 (0.773)
Regulatory score	0.156 (0.327)	-0.085 (0.367)	-0.140 (0.334)	0.106 (0.373)	0.090 (0.380)	0.077 (0.324)	-0.141 (0.370)	-0.198 (0.339)	0.080 (0.368)	0.069 (0.374)
New business density	<b>0.179**</b> (0.067)	<b>0.182**</b> (0.072)	<b>0.177***</b> (0.071)	<b>0.189**</b> (0.070)	<b>0.175***</b> (0.070)	<b>0.177**</b> (0.066)	<b>0.183**</b> (0.072)	<b>0.178**</b> (0.071)	<b>0.190*</b> (0.069)	<b>0.176**</b> (0.068)
Leader dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Developed dummy	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
R-squared	0.518	0.463	0.474	0.475	0.523	0.551	0.481	0.4888	0.505	0.552
Observations	46	46	46	46	46	46	46	46	46	46

GDP = gross domestic product.

Notes: This table reports cross-section estimation results for the year 2016. Numbers in parentheses are ordinary least squares standard errors. \*\*\*, \*\*, and \* represent 1%, 5%, and 10% significance, respectively. The dependent variable is log of peer-to-peer (P2P) loan volume per capita. Financial development is an aggregate of financial access, efficiency, and depth. Log of broadband is log of fixed broadband subscriptions per 100 people. All regressions include dummies for the P2P lending leading countries (People's Republic of China, United Kingdom, and United States). In columns 6–10, the developed economy indicators are included. All variables are defined in Appendix Table A.2.

## (c) Year: 2017

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Financial access	-0.541 (1.695)				0.0348 (1.623)	-0.535 (1.743)				0.216 (1.672)
Financial efficiency		<b>7.091**</b> (2.799)			<b>7.409**</b> (2.929)		<b>7.478**</b> (2.887)			<b>7.770**</b> (3.030)
Financial depth			-0.332 (1.862)		-1.115 (1.793)			-0.317 (1.915)		-0.985 (1.826)
Financial development				1.089 (2.998)					1.259 (3.170)	
<b>Control variables</b>										
Log of GDP per capita	0.833 (0.684)	0.489 (0.646)	0.975 (0.926)	0.728 (0.773)	0.852 (0.885)	0.849 (1.024)	0.901 (0.922)	1.004 (1.128)	0.848 (1.013)	1.196 (1.091)
Trade openness	-0.004 (0.005)	-0.005 (0.004)	-0.004 (0.005)	-0.004 (0.005)	-0.005 (0.005)	-0.004 (0.006)	-0.007 (0.005)	-0.004 (0.006)	-0.004 (0.006)	-0.007 (0.005)
Log of broadband (per 100 people)	0.831 (0.772)	0.924 (0.681)	0.688 (0.809)	0.773 (0.732)	0.718 (0.807)	0.824 (0.856)	0.756 (0.736)	0.678 (0.854)	0.718 (0.797)	0.561 (0.863)
Regulatory score	0.463 (0.409)	0.089 (0.393)	0.455 (0.417)	0.365 (0.439)	0.147 (0.425)	0.464 (0.415)	0.100 (0.396)	0.457 (0.424)	0.364 (0.445)	0.138 (0.430)
New business density	0.053 (0.069)	0.060 (0.063)	0.057 (0.069)	0.055 (0.068)	0.066 (0.066)	0.053 (0.070)	0.058 (0.064)	0.056 (0.070)	0.054 (0.069)	0.064 (0.067)
Leader dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Developed dummy	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
R-squared	0.510	0.578	0.509	0.510	0.582	0.510	0.582	0.509	0.510	0.586
Observations	47	47	47	47	47	47	47	47	47	47

GDP = gross domestic product.

Notes: This table reports cross-section estimation results for the year 2017. Numbers in parentheses are ordinary least squares standard errors. \*\*\*, \*\*, and \* represent 1%, 5%, and 10% significance, respectively. The dependent variable is log of peer-to-peer (P2P) loan volume per capita. Financial development is an aggregate of financial access, efficiency, and depth. Log of broadband is log of fixed broadband subscriptions per 100 people. All regressions include dummies for the P2P lending leading countries (People's Republic of China, United Kingdom, and United States). In columns 6–10, the developed economy indicators are included. All variables are defined in Appendix Table A.2.

Source: Authors' calculations.

Table 5: Financial Literacy (Cross-Sectional Regression by Year)

Variables	2015	2016	2017	2015	2016	2017
<b>Financial literacy</b>	<b>0.069**</b>	0.033	0.046	<b>0.068*</b>	0.022	0.049
	(0.032)	(0.036)	(0.032)	(0.033)	(0.037)	(0.033)
<b>Financial development</b>	-2.213	-1.497	-0.548	-2.307	-2.855	-0.164
	(3.349)	(3.114)	(2.627)	(3.560)	(3.299)	(2.826)
<b>Control variables</b>						
Log of GDP per capita	0.250	0.443	0.547	0.215	-0.012	0.706
	(0.958)	(0.852)	(0.871)	(1.048)	(0.929)	(0.967)
Trade openness	-0.007	0.002	-0.002	-0.007	0.005	-0.003
	(0.004)	(0.005)	(0.004)	(0.005)	(0.006)	(0.005)
Log of broadband (per 100 people)	<b>1.659**</b>	0.440	0.648	<b>1.677**</b>	0.649	0.566
	(0.690)	(0.690)	(0.629)	(0.728)	(0.709)	(0.668)
Regulatory score	-0.239	0.036	-0.073	-0.238	0.042	-0.078
	(0.446)	(0.396)	(0.375)	(0.454)	(0.393)	(0.380)
New business density	<b>0.142**</b>	<b>0.163**</b>	0.023	<b>0.143**</b>	<b>0.172**</b>	0.021
	(0.060)	(0.077)	(0.057)	(0.061)	(0.077)	(0.058)
Leader dummy	Yes	Yes	Yes	Yes	Yes	Yes
Developed dummy	No	No	No	Yes	Yes	Yes
R-squared	0.725	0.499	0.549	0.725	0.518	0.551
Observations	39	45	46	39	45	46

GDP = gross domestic product.

Notes: This table reports cross-section estimation results for each year, 2015–2017. Numbers in parentheses are ordinary least squares standard errors. \*\*\*, \*\*, and \* represent 1%, 5%, and 10% significance, respectively. The dependent variable is log of peer-to-peer loan volume per capita. Financial development is an aggregate of financial access, efficiency, and depth. Log of broadband is log of fixed broadband subscriptions per 100 people. All regressions include dummies for the P2P lending leading countries (People's Republic of China, United Kingdom, and United States). In columns 4–6, the developed economy indicators are included. All variables are defined in Appendix Table A.2. Source: Authors' calculations.

#### IV. CONCLUSION

We investigated factors determining the expansion of P2P lending across economies using data on P2P loan volumes per capita for 2015–2017 for 62 economies. We use a set of financial development indicators—financial access, efficiency, depth, and financial literacy. The main finding is that formal financial institutions' access and efficiency, as well as financial literacy, best explain the observed expansion in P2P lending per capita. In particular, the effect of financial access is stronger in emerging economies, while the effect of financial efficiency is stronger in advanced economies. P2P lending expands in economies where barriers exist to access to formal financial services and in economies with higher financial literacy. Moreover, information technology infrastructure and new business density seem to drive expansion of P2P lending. In other words, P2P lending expands in economies with more businesses and start-ups and better infrastructure. In contrast to findings in the literature (BIS and FSB 2017, Rau 2019), GDP per capita and regulatory score have no statistically significant explanatory power in our model.

Our overview of the determinants of P2P loan expansion across economies provides important policy insights. It is important for policy makers to understand how the degree of financial institution development and levels of financial knowledge can explain differences across economies in P2P loan activities. To harness the possible benefits of P2P lending, enhanced financial literacy is needed, such as through targeted training. Moreover, essential infrastructure, broadband is required. Policy makers need to consider these two dimensions as otherwise, those most in need could be left behind. Our finding that P2P lending reaches regions otherwise underserved by traditional financial institutions underlined this great potential for promoting financial inclusion. Finally, high new business density is required for promoting the penetration of P2P lending services. Hence, policy makers should assure the creation of an enabling ecosystem for innovators and entrepreneurs, that will also help scale up the usage of new technologies, including P2P lending. However, policy makers need to pay careful attention to rapid and unregulated expansion of financial technologies, such as P2P platforms, as these could undermine financial stability. Policy makers must therefore adequately balance financial innovation (e.g., P2P loan expansion) with financial stability.

An important direction for future research would be to explore different drivers that influence the speed of P2P lending expansion at different stages of P2P lending development. As this study has no available data on international P2P loan transactions, future work could examine the patterns of P2P lending deal flows across economies where regulations on P2P lending are applied differently.

## APPENDIX

**Appendix Table A.1: List of Economies Included in the Data**

Asia		America		Europe	
Australia	A	Argentina	E/D	Austria	A
Cambodia	E/D	Bolivia	E/D	Belgium	A
China, People's Republic of	E/D	Brazil	E/D	Bulgaria	E/D
Georgia	E/D	Canada	A	Czech Republic	E/D
Hong Kong, China	E/D	Chile	E/D	Denmark	A
India	E/D	Colombia	E/D	Estonia	E/D
Indonesia	E/D	Costa Rica	E/D	Finland	A
Japan	A	Ecuador	E/D	France	A
Korea, Republic of	E/D	El Salvador	E/D	Germany	A
Malaysia	E/D	Guatemala	E/D	Ireland	A
Mongolia	E/D	Haiti	E/D	Italy	A
New Zealand	A	Mexico	E/D	Latvia	E/D
Pakistan	E/D	Nicaragua	E/D	Lithuania	E/D
Philippines	E/D	Panama	E/D	Netherlands	A
Singapore	E/D	Paraguay	E/D	Norway	A
Taipei, China	E/D	Peru	E/D	Poland	E/D
Thailand	E/D	Puerto Rico	E/D	Portugal	A
Viet Nam	E/D	United States	A	Russian Federation	E/D
		Uruguay	E/D	Slovak Republic	E/D
				Slovenia	E/D
				Spain	A
				Sweden	A
				Switzerland	A
				Turkey	E/D
				United Kingdom	A

A = advanced economy, E/D = emerging or developing economy.

Note: For Asia, developing members of the Asian Development Bank are defined as emerging or developing economies, whereas for economies outside of Asia, we follow Rau (2019).

Source: Authors' compilation.

Appendix Table A.2: Definitions of Variables and Data Sources

Variables	Description
Peer-to-peer (P2P) loans	Logarithm of P2P volume per capita by economy Source: Cambridge Centre for Alternative Finance.
Financial development index	An aggregate of the Financial Institutions Access Index, Financial Institutions Efficiency Index, and Financial Institutions Depth Index Source: International Monetary Fund (IMF) Data—Financial Development. data.imf.org (accessed July 2019).
Financial depth index	A composite measure of bank credit to the private sector in percent of gross domestic product (GDP), pension fund assets to GDP, mutual fund assets to GDP, and insurance premiums, life and nonlife to GDP Source: IMF Data—Financial Development. data.imf.org (accessed July 2019).
Financial access index	A composite measure of bank branches per 100,000 adults and ATMS per 100,000 adults Source: IMF Data—Financial Development. data.imf.org (accessed July 2019).
Financial efficiency index	A composite measure of banking sector net interest margin, lending–deposit spread, noninterest income to total income, overhead costs to total assets, return on assets and return on equity Source: IMF Data—Financial Development. data.imf.org (accessed July 2019).
Financial literacy	A composite measure of four basic financial concepts: risk diversification, inflation, numeracy, and interest compounding Source: Standard & Poor's Ratings Services Global Financial Literacy Survey. gflec.org (accessed July 2019).
GDP per capita	Logarithm of GDP at purchaser's prices divided by total population Source: World Bank Data. data.worldbank.org (accessed July 2019).
Trade openness	Trade openness is the sum of exports and imports of goods and services measured as a share of GDP Source: World Bank Data. data.worldbank.org (accessed July 2019).
Broadband	Logarithm of fixed broadband subscriptions (per 100 people) Source: World Bank Data. data.worldbank.org (accessed July 2019).
Regulatory score	A composite measure of transparency around proposed regulations, consultation on their content, the use of regulatory impact assessments, and the access to enacted laws Source: World Bank Data. data.worldbank.org (accessed July 2019).
New business density	New business registration per 1,000 people, ages 15–64 Source: World Bank Entrepreneurship Survey Data. <a href="https://www.doingbusiness.org/en/data/exploretopics/entrepreneurship">https://www.doingbusiness.org/en/data/exploretopics/entrepreneurship</a> (accessed July 2019).

Source: Authors' compilation.

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## **Determinants of Peer-to-Peer Lending Expansion**

### *The Roles of Financial Development and Financial Literacy*

To explore the determinants of peer-to-peer (P2P) lending expansion, this study examines factors that impact P2P lending using a sample of 62 economies over the period 2015–2017. The authors investigate the effect of financial development and financial literacy on the expansion of P2P lending. Assessing the level of development of financial institutions by access, efficiency, and depth, the study finds that financial institutions' efficiency, financial literacy, and lower branch and ATM penetration are positively related with the expansion of P2P lending. This finding highlights the possible role of P2P lending in promoting financial inclusion.

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