Credit Risk Premium Dynamics of P2P Lending: Do Small Business Owners Pay More?

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Abstract

We attempt to assess and explain the credit risk premium of peer-to-peer (P2P) loans for small business purposes. Our evidence shows that P2P borrowers pay significantly higher interest rates for small business financing purposes than for other purposes, controlling for loan amount and borrowers' characteristics. The higher interest rates can be justified by the higher default risks carried by small business borrowers. The robustness check further supports that the credit risk premium, as well as the default risk, are sensitive to macroeconomic shocks. The loans with higher interest rates and poor credit records are more likely to default across all economic states, especially during economic recessions. The observation is more evident in the loans for small business purposes. Small business borrowers do pay more and are more likely to default during economic downturns. The finding is consistent with our expectation that economic conditions have greater impacts on small business growth during economic downturns than during economic booms due to declining market demand and profitability.

Keywords: P2P lending, crowdfunding, Financial Technology, Credit Risk

I. Introduction

Peer-to-peer (P2P) lending has gained growing popularity in recent years as an alternative financing source in the digital financial market to challenge the traditional bank loan markets. The global peer-to-peer (P2P) lending market size was valued at US$83.79 billion in 2021 and is expected to hit over US$705.81 billion by 2030 with a registered CAGR of 26.7% from 2022 to 2030. (Precedence Research, 2022) The P2P lending platforms, such as Prosper, LendingTree, and LendingClub, facilitate credit services by connecting individual borrowers and lenders without the interference of traditional banks as intermediaries. The P2P loan providers do not lend the funds directly but oversee the loan application process, underwriting, and repayment. Individual investors can lend small sums of money in several loans to mitigate their risk, instead of lending the full amount of loans, and can diversify their asset allocation with access to consumer loans without going through the asset-backed security market.

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Although some P2P lenders offer small business loans directly to businesses, borrowers can still borrow money in the form of personal loans and then use the funds to finance their business needs. Loans are often limited to about $40,000, with a closing fee average of 5% of the loan usually deducted from the loan upfront, therefore reducing the net amount of loans funded. The final interest rate for each loan depends on credit risk and market conditions and is the sum of LendingClub's base rate and an adjustment for risk & volatility. The adjustment for risk & volatility is designed to cover expected losses and provide higher risk-adjusted returns for each loan grade increment from A1 to G5.[2] The loan grade is determined by a formula that includes a combination of credit score and several indicators of credit risk from the credit report and loan application. Therefore, P2P lending may not work for borrowers with poor credit scores.

The advantages of P2P loans compared to conventional small business loans are their fast speed to fund, easy application process, and affordable interest rates without collateral. Most loans are funded within 7 to 14 days, partially or fully, depending on the investors. P2P platform providers usually have a credit evaluation system that checks beyond FICO scores to determine a borrower's creditworthiness, enabling more borrowers to get funding. P2P loan offers a viable alternative for entrepreneurs who do not qualify for conventional bank financing and is particularly suitable for businesses to fill a temporary cash flow shortage in working capital. Another advantage is that many P2P loans offer affordable interest rates and flexible terms, especially when compared to other alternatives, such as some merchant cash advances, where prices are high and lending terms are opaque. The broad coverage of clients on P2P platforms leads to economies of scale, which ensures the provision of more favorable and affordable interest rates (Wang, Yu, Yang, and Zhang, 2021). Lastly, most P2P loans are unsecured and do not tie up any collateral directly. This benefit is important for small business owners who may need financing in the later stages of their businesses.

Lending to small businesses is considered to be risky and costly due to the high small business failure rate and cash flow vulnerability during economic downturns. Information opacity about the business itself could also add complications to small business loans. In the case of traditional commercial loans, commercial banks gather business information via relationship banking and are thus in a better position to assess the creditworthiness of small businesses. However, most borrowers seeking P2P personal financing for small business purposes do not provide detailed financial statements of their businesses. Obtaining reliable information on the business creditworthiness is difficult. P2P lenders suffer severe information asymmetry due to the lack of borrowers' business financial information in an online environment, and therefore should diversify their risks by spreading investment dollars across multiple borrowers.

According to the pricing regime established by the LendingClub platform, the interest rate for personal loans is determined solely by the loan amount, term, and credit ratings, with the loan purpose expected not to impact the interest rate. However, the empirical evidence indicates otherwise. Mach et al. (2014) conducted a preliminary study examining peer-to-peer borrowing by small businesses from LendingClub for the period from 2007 to 2012. The study looks into the characteristics of small business loan applications that were funded and not funded, concluding that small business loans are more likely to perform poorly, and small business loans through P2P platforms tend to have higher interest rates, nearly one percentage point more than non-business loans.

In this paper, we extended the sample period of Mach et al. (2014) by seven years, spanning from 2007 to 2019, to reassess how borrower-specific information and loan purposes influence credit risk premiums in P2P lending. Additionally, we investigated whether small

[2] https://www.lendingclub.com/foliofn/rateDetail.action

business owners are subjected to higher charges in the P2P market. Analyzing P2P short-term lending transactions designated for small business purposes on LendingClub.com, we observe that small business loans incur significantly higher credit risk premiums, even when controlling for loan characteristics such as terms and amounts. Small business loans face a disadvantage with elevated interest rates compared to loans of similar terms intended for other purposes, especially when personal credit scores serve as the primary indicator of credit risk. The determination of lending rates based solely on credit risk assessments overlooks considerations such as anticipated cash flow and future business potential. The rationale behind these higher interest rates may be justified by the increased risk of default associated with small business borrowers.

Another important finding in our research, not explored by Mach et al. (2014), is the sensitivity of P2P loan credit risk premiums to monetary shocks under varying macroeconomic conditions affecting all borrowers. Loans characterized by higher interest rates and poorer credit histories exhibit a higher likelihood of default across all economic phases, particularly during recessions. This effect is particularly pronounced in loans intended for small business purposes, where tightening monetary policies during economic downturns constrain traditional lending channels and introduce greater uncertainty for businesses, thereby resulting in elevated lending rates.

While the positive correlation between default rates and credit risk premiums, alongside its variation under different macroeconomic conditions, is well-documented in the finance literature, P2P loans utilizing alternative credit assessment approaches may yield different outcomes, impacting both P2P borrowers and investors. P2P loan grades, ranging from A to G with five subgrades each, are determined based on borrower attributes such as income, employment history, FICO score, credit limit, revolving credit line utilization, and loan payment history as stipulated by the P2P platform. The regulation and determination of lending rates in P2P lending lack clarity and transparency. Considering the significant demand for non-conventional P2P loans, we believe it is worthwhile conducting a comprehensive investigation into the algorithms and potential risks faced by investors. This approach allows investors to minimize losses and make informed decisions, mitigating the tendency to herd blindly, while enabling borrowers to obtain fast financing at reasonable rates.

Overall, our study fills the gap in the existing literature by providing new evidence that the interest rate and credit risk premium are significantly higher among personal loans for small business purposes as compared to the loans for other purposes on the P2P platform, controlling for the loan characteristics. The disproportional interest charges on small business owners on P2P platforms carry significant implications for lending practices and regulatory policies. Lenders can justify higher interest rates as compensation for the risk associated with small business loans, adjusting premiums based on borrowers' creditworthiness assessments. Borrowers who are deemed higher risk incur higher costs, while enhancing creditworthiness could potentially reduce these premiums.

II. Literature Review

P2P platforms provide simple procedures that facilitate rapid lending decisions without costly intermediation. Many individuals and businesses who fail to qualify for conventional bank loans can receive funding via P2P lending. The downside is that lenders bear the direct risk of loss from a P2P loan default due to the information asymmetry in the microcredit market. Yum, Lee, and Chae (2012), Pokorná and Sponer (2016), and Basha, Elgammal, and Abuzayed (2021) state that the information asymmetry problem exists largely in the online P2P market as private lenders lack information on the borrowers. The private lenders are not professional investors and may be inexperienced in assessing the credit risk of borrowers. Caglayan,

Talavera, and Zhang (2021) report that P2P investors skip due diligence of borrowers' financial information and exhibit herding behavior by imitating the lending behavior of other lenders in the hope of achieving higher returns. Shao and Bo (2021) state that Chinese P2P lenders tend to seek short-term capital gains and use the P2P platform as a speculative investment tool. They tend to pursue higher interest rates without fully accounting for credit ratings in their decisions (Liao, Wang, Xiang, Yan, and Yang, 2021; Wang and Tong, 2020). In case of default, private lenders are unable to monitor and go after the borrowers for effective loan enforcement. The severe information asymmetry, lack of collateral, and effective loan enforcement cause adverse selection problems and moral hazard risk. Thus, the information provided by borrowers online as risk indicators is extremely important, as obtaining additional information is costly and difficult.

The borrowers' specific information serves as the only information source for the lenders to assess borrowers' credit risks. Borrower-specific factors include aspects that affect a borrower's credit rating - length of credit history and financial status of the borrower, such as annual income, home ownership, debt-to-income ratio, and revolving credit balance. Serrano-Cinca et al. (2015) include loan characteristics together with borrower indebtedness as determinants of default risk. The loan characteristics include loan amount, loan term, interest rates, and a description of the loan purpose. Screening and signaling devices, such as collateral and personal guarantees, distinguish the ex-ante riskiness of the borrower in the P2P consumer market. Emekter, Tu, Jirasakuldech, and Lu (2015) studied the factors affecting default rates and funding success and reported that the borrower's credit grade, debt-to-income ratio, FICO score, and revolving line utilization impacted loan default rate. Jenq, Pan, and Theseira (2015) focus on the impact of the borrowers' appearance on the funding behavior of lenders and find loan amounts and loan terms to be significant credit drivers. Guo et al. (2016) and Lin et al. (2017) include additional loan information - the amount of the loan, the borrower's debt-to-income ratio, and home ownership status in their credit risk assessment model and conclude that default risk is determined by both the demographic characteristics of borrowers and corresponding loan information. Gine, Jakiela, Karlan, and Morduch (2010), Godquin (2004), Field, Pande, Papp, and Rigol (2013), D'Espallier, Guerin, and Mersland (2011) study the influence of group lending, loan conditions, and gender on loan repayment and find the same evidence.

Inspired by Keeton and Morris (1988) and Sinkey and Greenawalt (1991), we assume that loan default risk is highly correlated with overall economic conditions. Changes in monetary policy and business cycle stages affect credit risk premiums. While an increase in the risk-free rate could directly increase the cost of loans, including P2P consumer loans, Bernanke and Kuttner (2005) document that monetary policy surprises are induced primarily by changes in risk premiums, with very little of the effect coming directly from changes in the risk-free rate. In response to the financial crisis, lending standards for small businesses tightened substantially in 2008 and 2009 and then eased after 2010. The decrease in loan offerings is a result of both diminished demand from small businesses and tightened control on small business lending. When traditional channels of lending become difficult, small business borrowers can switch to alternative financing options such as P2P lending. Such loans may allow the firm to remain in business in the short term, but the business may not sustain itself in the long run due to high financing costs. Additionally, changes in business cycles, as measured by GDP growth rate and unemployment rates, affect lending rates as the borrowers' creditworthiness changes over the business cycle. The labor markets directly impact the earned income and, therefore, the ability to pay consumer credits.

III. Data Description and Research Questions

Like traditional financial intermediaries, LendingClub utilizes a credit score-based model to evaluate borrowers' credit risk. The borrowers are classified into different letter grade groups and assigned specific loan interest rates, based on their FICO scores, credit history, income, *etc*. Investors can choose how much risk they wish to take when funding a loan based on the letter grades. Our sample from LendingClub.com covers the funded loans issued between June 2007 and March 2019. We focus on loans with a 36-month duration and with complete information on loan status since the majority of loans offered by LendingClub are 36-month loans. The loans on LendingClub carry seven different statuses: fully paid, charged off, current, default, late for 31-120 days, late for 16-30 days, and in Grade Period. We exclude the loans with the status of "Current" in our sample since those loans are waiting to be paid back. The loans with "Full Paid" status are non-defaulted and fully paid off by the borrowers, while the loans are default loans if the status is "Charged Off", "Default", "Late (31-120 days)", "Late (16-30 days)", or "In Grade Period". After excluding any observations with missing data, we ended up with a total of 649,733 loans, of which 509,348 were non-defaulted loans and 140,385 were defaulted loans. In terms of loans for small business purposes, there are 8,728 in total, among which 5,883 are non-defaulted small business loans and 2,845 defaults.

We first investigate whether the loan purpose affects the borrowing costs of borrowers with similar default risk. In particular, we are interested in finding out whether borrowers seeking small business financing borrow more and are charged higher interest rates than borrowers for other purposes, possibly due to the investors' perception of higher default risk associated with small business loans and the information symmetry between lenders and borrowers on business conditions.

We regress the risk premium of small business loans on a small business dummy (SB), controlling for other loan characteristics and borrowers' characteristics. LendingClub assesses loan credit risks by assigning seven letter grades to funded loans, ranging from A to G, with A being the lowest and G being the highest credit risk. The risk premium is defined as the loan rate adjusted by the 3-month Treasury Bill rate[3]. In the model, we assign numerical values to each grade, giving 1 to an A grade and 7 to a G grade. We also add an interaction term between loan grade and small business dummy to examine whether the incremental risk premium added for each credit risk category is the same for small business loans and loans for other purposes.

The next question of interest is whether the default risk of loans for business purposes granted on the LendingClub platform can justify the high interest rate charged to these borrowers. Can the discrepancy in credit risk premium be explained by the default risk levels of borrowers for small business purposes as compared to those for other purposes? We use the credit risk premium as the dependent variable and small business dummy and loan grade as independent variables, controlling for loan amount, borrowers' characteristics, and borrowers' credit history in the regression. Borrowers' characteristics include annual income, FICO score, employment length, annual installment to income, and debt-to-income ratio. Borrowers' credit history includes the length of credit history, any delinquency within the most recent two years, number of credit inquiries within the most recent six months, number of public records, use of revolving credits, bank open accounts, number of months since last delinquency, and mortgage to own or rent a home. In addition, an interaction term between the small business dummy and

[3] The 3-month Treasury Bill rates are imported from Federal Reserve Bank-St. Louis.
Source: Board of Governors of the Federal Reserve System (US), 3-Month Treasury Bill: Secondary Market Rate [TB3MS], retrieved from FRED, Federal Reserve Bank of St. Louis https://fred.stlouisfed.org/series/TB3MS.

loan grade is included to examine the incremental effects of small business financing on default risk. The model specification is as follows:

$$\text{(1) Credit Risk Premium} = \beta_0 + \beta_1 \times \text{SB} + \beta_2 \times \text{Loan Grade} + \beta_3 \times (\text{Loan Grade} \times \text{SB}) + \beta_i \times \text{Control Variables} + e$$

Since default risk is a primary determinant of the interest rate charged to borrowers, can we predict default risk on a P2P platform? Statistical models like discriminant analyses and logistic regressions have been the standard methods for default forecasting (Crook et al. 2007). Emekter et al. (2014) and Serrano-Cinca et al. (2015) use a logistic regression model to predict potential defaults well with credit features such as the FICO score - a scoring system that evaluates borrowers' credit levels. We adopt the logistic model using the default dummy as the dependent variable, while the small business dummy, loan grade, and loan interest rate serve as independent variables. The interaction terms between loan grade and small business dummy, and between loan interest rate and small business dummy, and the same control variables in Eq. (1) are included in the logistic model specified below.

$$\text{(2)} \quad \text{Default Dummy} = \beta_0 + \beta_1 \times \text{SB} + \beta_2 \times \text{Loan Grade} + \beta_3 \times (\text{Loan Grade} \times \text{SB}) + \beta_4 \times \text{Loan Interest Rate} + \beta_5 \times (\text{Loan Interest Rate} \times \text{SB}) + \beta_i \times \text{Control Variables} + e$$

We test the robustness of results under different macroeconomic conditions by splitting the sample into high and low groups based on the median of 3-month Treasury bill rates and unemployment rates separately, and construct t-tests for the difference in means between the two groups (loans for small business vs loans for non-small business) under different states of the economy. We use the seasonally adjusted unemployment rates to control for business cycle effects. Unemployment rates affect the average borrower's ability to pay and the creditworthiness of borrowers as captured by the default premium of interest rates. We expect the unemployment rates to be positively correlated with loan default risk and interest rates. The government short-term interest rate, serving as another proxy for macroeconomic conditions, is expected to show a positive sign as well.

IV. Empirical Results

Descriptive Analysis

Table 1 summarizes the number, amount, and interest rates of funded loans for fourteen loan purposes. There are 8,728 small business loans, about 1.34% out of all funded loans, compared to 641,005 loans for other purposes. Loans seeking debt consolidation and credit card payments dominate the loan market on LendingClub. Concerning default risk, 2,845 out of 8,728 small business loans are in default, equivalent to a 32.60% default rate, ranked the highest among all loans. The average loan amount of fully paid and defaulted small business loans is $13,623.9 and $15,193.8, respectively. The average interest rate of defaulted small business loans is 16.31%, significantly higher than 13.78% for fully paid loans at the 1% level.

We further compare the loan amount and interest rates of small business and non-small business loans in Table 2. The borrowers tend to borrow significantly higher amounts for small business purposes than for other purposes. The average loan amounts of small business and non-small business loan borrowers are $14,135.6 and $12,298.5, respectively, significantly different at the 1% level. In addition, lenders charge higher interest rates to small business borrowers than to non-small business borrowers. The average interest rate for small business

loans is 14.60% compared to 12.60% for non-small business loans in the full sample. The 2% interest rate difference is statistically significant at the 1% level. Similar results are found in fully paid and default loan sub-samples. In summary, loans borrowed for small business purposes carry the largest loan amount, the greatest interest rate, and the highest default rate among all funded loans.

Table 1 Summary Statistics of Funded Loans Characteristics on LengingClub.com for the Period of 2007-2019

	N			**Loan Amount ($)**			**Loan Interest Rate**		
	Fully Paid	Default	Default Rate	Fully Paid	Default	Diff.	Fully Paid	Default	Diff.
Small Business	**5883**	**2845**	**32.60%**	**13623.9**	**15193.8**	**-1569.9*** (-7.11)**	**0.1378**	**0.1631**	**-0.0253*** (-21.55)**
Moving	4510	1642	26.69%	6653.5	7452	-798.5*** (-4.85)	0.1363	0.1613	-0.0250*** (-15.40)
Medical	7094	2436	25.56%	7451.1	8119.2	-668.1*** (-4.43)	0.1288	0.1511	-0.0223*** (-20.22)
Renewable Energy	442	148	25.08%	8736.3	9753.9	-1017.6 (-1.37)	0.1359	0.1583	-0.0224*** (-4.80)
Other	36481	11300	23.65%	8113.8	9421.3	-1307.5*** (-15.81)	0.1336	0.1587	-0.0251*** (-47.43)
Debt Consolidation	280082	80501	22.33%	13125.6	13618.7	-493.1*** (-14.53)	0.1234	0.1465	-0.0231*** (-34.33)
Vacation	4881	1391	22.18%	5184.2	6911.1	-1726.9*** (-9.94)	0.1296	0.1496	-0.0200*** (-14.20)
House	3488	986	22.04%	13406	14387.8	-981.8*** (-2.79)	0.1309	0.1627	-0.0318*** (-15.98)
Credit Card	107558	25704	19.29%	12708.4	13130.4	-422*** (-7.52)	0.1118	0.1314	-0.0196*** (-71.16)
Major Purchase	13592	3238	19.24%	9262.6	12006.2	-2743.6*** (-15.20)	0.1147	0.1456	-0.0309*** (-33.31)
Home Improvement	36134	8519	19.08%	11774.3	13131	-1356.7*** (-11.99)	0.1136	0.1407	-0.0271*** (-49.46)
Car loan	7347	1413	16.13%	7420.7	8537.5	-1116.8*** (-6.11)	0.1127	0.1396	-0.0269*** (-20.27)
Educational	261	49	15.81%	6587	7975.5	-1388.5* (-1.72)	0.1136	0.1245	-0.0109*** (-2.99)
Wedding	1595	213	11.78%	9408.9	9960.3	-551.4 (-1.27)	0.1298	0.1511	-0.0213*** (-6.58)

The sample consists of funded loans with 36-month duration and with complete information on loan status on LendingClub.com for the period of 2007-2019. The funded loans have been grouped into fourteen categories by loan purposes. Paired *t*-tests have been performed to examine the characteristic difference between "Fully Paid" loans and "Default" loans. *t*-statistics are in parentheses and robust to heteroskedasticity. Statistical significance at the 1%, 5%, and 10% levels is denoted by "***," "**," and "*," respectively.

Figure 1 illustrates the comparison of loan characteristics between small business and non-small loans across different loan grades. Not surprisingly, small business loans show higher loan amounts, default rates, and interest rates than non-small business loans across all loan grades. The default rate and interest rate of both small business and non-small loans increase as the loan grade goes down from A to G, rendering support for using loan grade as a measure of borrowers' default risk to justify higher interest rates charged on loans of poor grade due to a higher default risk premium. However, the last plot shows that small business borrowers carry a lower debt-to-income ratio than non-small business borrowers across all loan grades. Debt-to-income ratio may include only the borrower's personal debt rather than business debt, while lenders are conservative in using this ratio as a default risk measure.

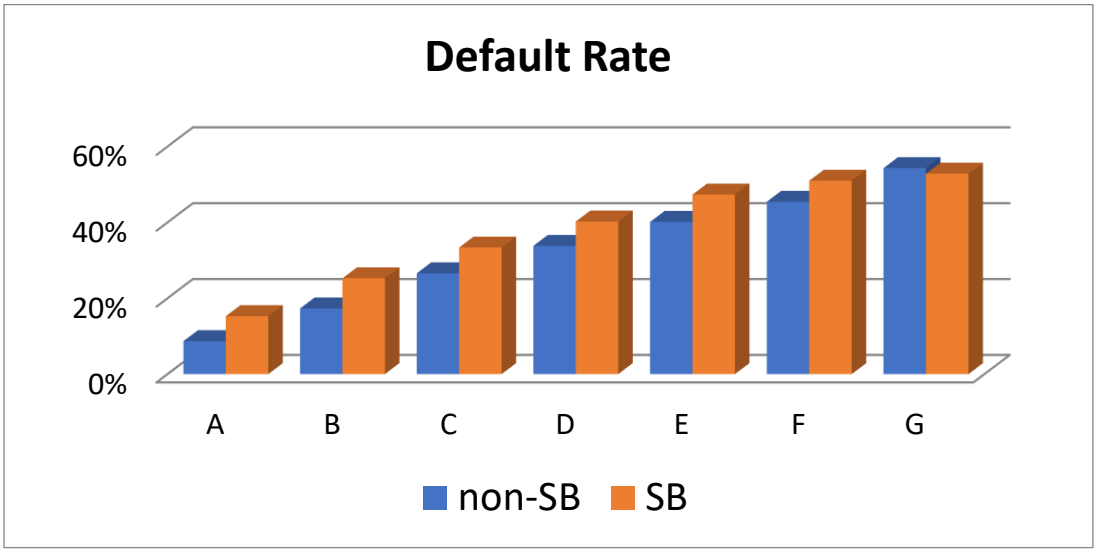
Table 2 Loan Amount and Interest Rate Comparison between Small-Business and Non-Small Business Loans

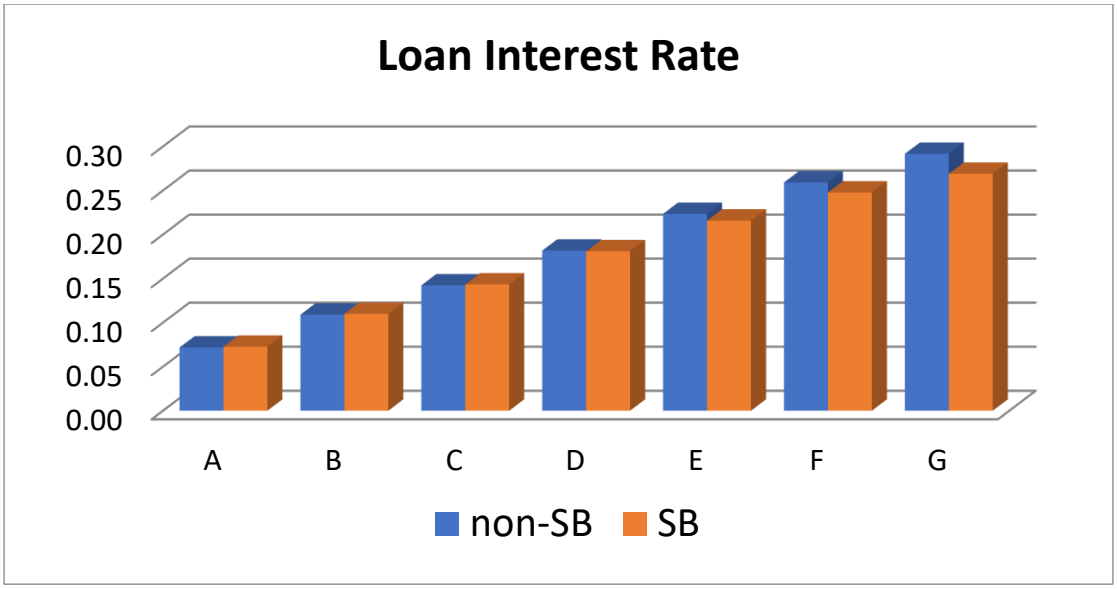
	N			Loan Amount ($)			Loan Interest Rate		
	SB	Non-SB	SB%	SB	Non-SB	Diff.	SB	Non-SB	Diff.
Fully Paid	5883	503465	1.16%	13623.9	12156.8	1467.1*** (11.60)	0.1378	0.1209	0.0169*** (25.78)
Default	2845	137540	2.03%	15193.8	12817.1	2376.7*** (12.83)	0.1631	0.1447	0.0184*** (18.75)
Full Sample	8728	641005	1.34%	14135.6	12298.5	1837.1*** (17.62)	0.1460	0.1260	0.0200*** (35.78)

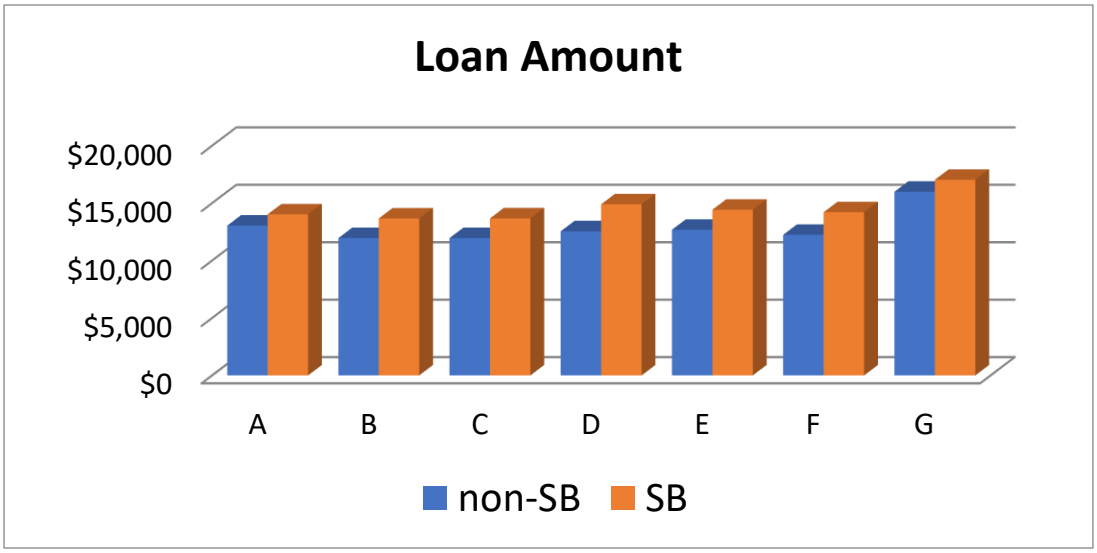
The sample consists of funded loans with 36-month duration and with complete information on loan status on LendingClub.com for the period of 2007-2019. SB and Non-SB represent funded loans for "Small Business" and for all other purposes, respectively. Paired *t*-tests have been performed to examine the characteristic difference between "SB" loans and "Non-SB" loans. *t*-statistics are in parentheses and robust to heteroskedasticity. Statistical significance at the 1%, 5%, and 10% levels is denoted by "***," "**," and "*," respectively.

Figure 1 SB and Non-SB Loan Comparison

The sample consists of funded loans with 36-month duration and with complete information on loan status on LendingClub.com for the period of 2007-2019. SB and Non-SB represent funded loans for "Small Business" and for all other purposes, respectively. Letters A to G are loan grades that represent rankings of loan credit risks with A being the lowest and G being the highest credit risk.




Loan Interest Rate
0.30
0.25
0.20
0.15
0.10
0.05
0.00
A
B
C
D
E
F
G
non-SB
SB


Loan Amount
$20,000
$15,000
$10,000
$5,000
$0
A
B
C
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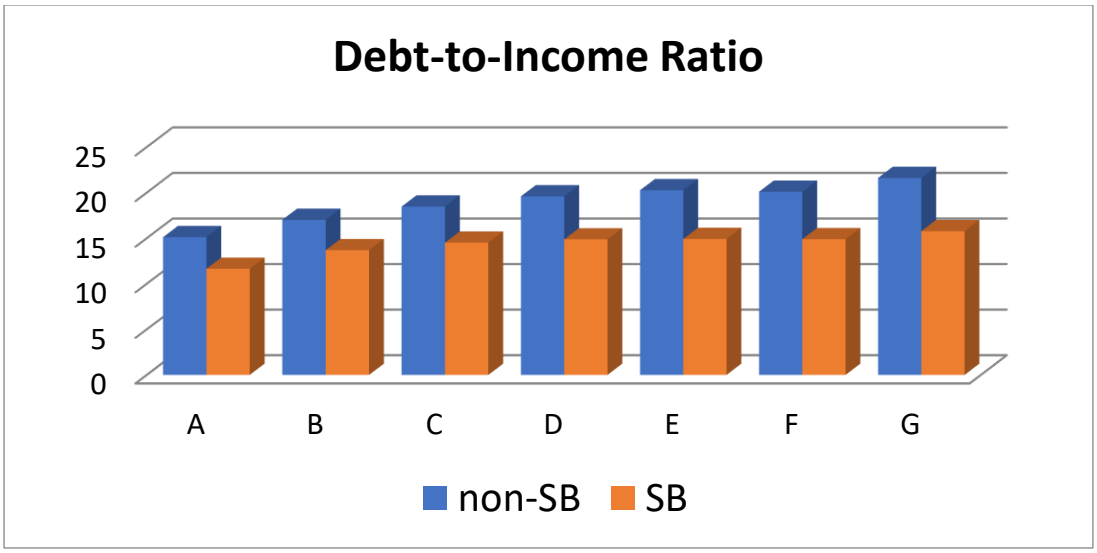
F
G
non-SB
SB


Debt-to-Income Ratio
25
20
15
10
5
0
A
B
C
D
E
F
G
non-SB
SB

While the evidence shows that the default rate and interest rate of borrowers for small business purposes are significantly higher than those for other purposes, we investigate whether the difference is a result of higher default risk carried by small business borrowers than their counterparts. We compare common measures of credit risk, including income, FICO scores, employment length, installment to income, and debt to income ratio, as illustrated in Figure 1. Except for shorter employment length, small business borrowers are financially strong with significantly higher income, higher FICO scores, lower installment to income, and lower debt-to-income ratio than those of non-small business borrowers at the 1% level. Particularly, the average annual income of small business borrowers is significantly higher than that of their counterparts by $13,648.9. The debt-to-income ratio of small business borrowers is 14.03% compared to 17.53% for borrowers with non-business purposes. The proportion of annual installments to income is 0.08 for small business borrowers, whereas 0.19 for the counterpart.

Table 3 Characteristics Comparison between Small Business and Non-Small Business Loans

	Full Sample	**SB**	**Non-SB**	**Diff.**
Loan Characteristics				
N	649,733	8,728	641,005	-632,277
Loan Amount	12323.1	14135.6	12298.5	1837.1*** (17.62)
Loan Interest Rate	0.13	0.15	0.13	0.02*** (35.78)
Interest Rate Premium	0.12	0.14	0.12	0.02*** (36.31)
Borrower Characteristics				
Annual Income	74306.0	87771.6	74122.7	13648.9*** (17.37)
FICO Score	699.8	708.3	699.7	8.6*** (21.12)
Employment Length	5.86	5.34	5.87	-0.53*** (-13.94)
Annual Installment to Income	0.19	0.08	0.19	-0.11*** (-2.64)
Debt to Income	0.1748	0.1403	0.1753	-0.035*** (-38.28)
Borrowers' Credit History				
Credit History Length	188.3	179.1	188.4	-9.3*** (-9.59)
Delinquency 2 Years	0.3	0.32	0.30	0.02 (1.43)
Inquiries Last 6 Months	0.67	0.85	0.68	0.17*** (15.72)
Public Records	0.21	0.23	0.21	0.02*** (2.94)
Revolving Utilization	0.49	0.42	0.49	-0.07*** (-23.23)
Open Accounts	11.24	9.93	11.26	-1.33*** (-24.31)
Months Since Last Delinquency	34.58	33.33	34.60	-1.27*** (-3.84)

The sample consists of funded loans with 36-month duration and with complete information on loan status on LendingClub.com for the period of 2007-2019. SB and Non-SB represent funded loans for "Small Business" and for all other purposes, respectively. Paired *t*-tests have been performed to examine the characteristic difference between "SB" loans and "Non-SB" loans. *t*-statistics are in parentheses and robust to heteroskedasticity. Statistical significance at the 1%, 5%, and 10% levels is denoted by "***,", "**," and "*," respectively.

Table 4 Multiple Regressions of Determinants of Credit Risk Premiums

	Dependent Variable: Risk Premium			
	Model 1	**Model 2**	**Model 3**	**Model 4**
Small Business (SB)	0.027***			0.002***
	(46.72)			(12.77)
Loan Grade (A=1, G=7)		0.035***	0.035***	0.035***
		(12.58)	(12.58)	(12.42)
Loan Grade * SB			0.0002***	0.0006***
			(3.68)	(3.67)
Loan Amount	0.00005***	0.00005***	0.00005***	0.00005***
	(52.88)	(13.34)	(13.26)	(13.29)
Annual Income	-0.000002***	-0.000007***	-0.000007***	-0.000007***
	(-23.91)	(-19.22)	(-19.26)	(-19.26)
FICO Score	-0.0006***	-0.00003***	-0.00003***	-0.00003***
	(-14.85)	(-23.45)	(-23.60)	(-23.54)
Employment Length	-0.00002**	-0.00005***	-0.00005***	-0.00005***
	(-2.04)	(-6.54)	(-6.59)	(-6.57)
Annual Installment to Income	0.000007**	0.000002**	0.000002**	0.000002**
	(2.45)	(2.07)	(2.07)	(2.07)
Debt to Income	0.0008***	0.00004***	0.00005***	0.00004***
	(31.63)	(12.46)	(12.59)	(12.52)
Credit History Length	-0.00004***	-0.000005***	-0.000005***	-0.000005***
	(-51.64)	(-15.62)	(-15.60)	(-15.59)
Delinquency 2 Years	0.00002	0.00001	0.00001	0.00001
	(0.27)	(0.50)	(0.50)	(0.49)
Inquiries Last 6 Months	0.011***	0.002***	0.002***	0.002***
	(41.21)	(54.37)	(54.36)	(54.36)
Public Records	0.0005***	0.0003***	0.0003***	0.0003***
	(4.50)	(6.18)	(6.22)	(6.22)
Revolving Utilization	0.0096***	0.006***	0.006***	0.006***
	(29.09)	(47.21)	(47.27)	(47.25)
Open Accounts	0.00004***	0.00004***	0.00004***	0.00004***
	(3.34)	(6.98)	(6.84)	(6.85)
Months Since Last	-0.00005***	-0.000002	-0.000002	-0.000002
Delinquency	(-13.01)	(-1.18)	(-1.16)	(-1.16)
Mortgage	0.008	0.001	0.001	0.001
	(1.17)	(1.11)	(1.13)	(1.13)
Own	0.003	0.001	0.001	0.001
	(1.18)	(1.00)	(1.02)	(1.02)
Rent	0.002	0.002*	0.002*	0.002*
	(0.87)	(1.73)	(1.75)	(1.75)
Obs.	649,733	649,733	649,733	649,733
Adjusted R^2	0.275	0.885	0.885	0.885

The sample consists of funded loans with 36-month duration and with complete information on loan status on LendingClub.com for the period of 2007-2019. SB and Non-SB represent funded loans for "Small Business" and for all other purposes, respectively. Letters A to G are loan grades that represent rankings of loan credit risks with A being the lowest and G being the highest credit risk. "Loan Grade * SB" is an interaction term between small business dummy and loan grade. The model specification is below.

$$\text{Loan Risk Premium} = \beta_0 + \beta_1 \times \text{SB} + \beta_2 \times \text{Loan Grade} + \beta_3 \times (\text{Loan Grade} \times \text{SB}) + \beta_i \times \text{Control Variables} + e \quad (1)$$

t-statistics are in parentheses and robust to heteroskedasticity. Statistical significance at the 1%, 5%, and 10% levels is denoted by "***,", "**," and "*," respectively.

We further examine another indicator of a borrower's creditworthiness - credit history. The credit records of small business borrowers indicate high potential default risks with shorter credit history, higher frequency of inquiries, higher number of delinquencies, and higher notations on public records than non-business borrowers. For example, the average length of credit history is 179.1 days for small business borrowers, while it is 188.4 days for non-small business borrowers. The borrowers for small business purposes appear to have more frequent attempts to seek financing, as indicated by an average of 0.85 credit inquiries within the last six months for small business borrowers compared to 0.68 inquiries for those with other purposes. Although small business borrowers own fewer bank open accounts and use revolving credits less often than their counterparts, the relatively high number of public records further indicates that borrowers to obtain small business financing possess higher default risk. In summary, the borrower's credit history tends to serve as an important measure of default risk and weighs vitally in P2P lending decisions.

Credit Risk Premium Determination

We perform four regression models to analyze the relationship between interest rate risk premium and credit risk levels on the P2P lending platform. These results are in Table 4. In particular, we focus on whether borrowers seeking small business financing pay significantly higher interest rates than borrowers at the same credit risk level for other purposes. In Model 1, the risk premium is regressed on a small business dummy and control variables, including loan amount, borrower's characteristics, and borrower's credit history. The coefficient of the small business dummy is 0.027 and statistically significant at the 1% level, meaning that the risk premium of a small business loan is 2.7% higher than that of a non-small business loan, controlling for loan and borrower-specific characteristics. Model 2 uses loan grade as the explanatory variable. The positive coefficient of 0.035 is consistent with our expectation that a higher interest risk premium is associated with higher credit risk, as indicated by loan grade. Model 3 adds the interaction term between loan grade and small business dummy to examine the joint effects of credit risk and small business financing on risk premium. The coefficient of the interaction term of loan grade and small business dummy is 0.0002 and significant at the 1% level, indicating that small business borrowers are imposed additional risk premiums and pay higher interest rates compared to borrowers financing for other purposes for the loans with the same grade. Model 4 with a small business dummy included shows consistent results with Model 3. The signs of coefficients of control variables are consistent with our expectations that borrowers with higher income and FICO scores, and lower debt-to-income ratios, pay lower risk premiums for their potential credit risks.

Loan Default Risk Prediction

While borrowers pursuing small business financing are found to pay more via P2P lending, we investigate whether loan grade and other characteristics can fully predict default risk, which justifies the higher interest rates of loans for small business purposes. Table 5 contains the results of this investigation. Model 1 includes only the small business dummy as the explanatory variable, and the result suggests that small business borrowers are more likely to default, 76.8% higher than that of non-small business borrowers, controlling for loan characteristics, borrowers' characteristics, and borrowers' credit history, etc. Models 2, 3, and 4 provide further support that the loan grade assigned by LendingClub accurately captures the borrower's default risks. The coefficients of loan grade are 0.313 in Model 2 and 0.309 in Models 3 and 4, all statistically significant at the 1% level. The borrowers with poor loan grades assigned are more likely to default. This is especially true for small business loans, where loan

grade is a strong indicator of borrower's default risk, where the coefficient of the interaction term of loan grade and small business dummy is 0.089 and significant at the 1% level, as shown in Model 4. We also add year-fixed effects and macroeconomic conditions in the regressions as a robustness check and report in Appendix C. The coefficients of the interaction terms between the small business dummy and macroeconomic conditions (either based on 3-month TB rates or unemployment rates) are significantly negative, which is consistent with our prior results.

Model 5 adds the loan interest rate and the interaction term between the loan interest rate and the small business dummy in the equation to further explain the default risk. The positive coefficients of the loan interest rate and the interaction term with the small business dummy are 2.367 and 0.668, significant at the 1% level, respectively. The results meet our expectations that borrowers charged with higher interest rates are more likely to default. More importantly, small business borrowers are even more sensitive to high interest rates and inclined to default than non-small business borrowers. Finally, the control variables, as expected, indicate that the borrowers with higher annual income, longer employment history, higher FICO score, and lower debt-to-income ratio are less likely to default. The finding implies that financing for small business purposes is indeed more risky and therefore carries higher default risk, controlled for borrower and loan characteristics.

Table 5 Multiple Regressions of Default Risk Prediction

	Dependent Variable: Default Dummy = 1				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Small Business (SB)	0.768*** (50.98)			0.134*** (11.16)	0.367*** (10.35)
Loan Grade (A=1, G=7)		0.313*** (45.67)	0.309*** (44.49)	0.309*** (43.03)	0.223*** (32.37)
Loan Grade * SB			0.117*** (26.48)	0.089*** (11.80)	0.062*** (10.75)
Loan Interest Rate					2.367*** (56.24)
Loan Interest Rate * SB					0.668*** (10.12)
Loan Amount	0.00002*** (23.47)	0.00002*** (16.69)	0.00003*** (16.52)	0.00003*** (16.51)	0.00002*** (16.30)
Annual Income	-0.000002*** (17.47)	-0.000001*** (81.67)	-0.000001*** (89.23)	-0.000001*** (89.34)	-0.000001*** (86.66)
FICO Score	-0.0134*** (28.29)	-0.008*** (88.09)	-0.008*** (92.25)	-0.008*** (92.32)	-0.008*** (91.37)
Employment Length	-0.012*** (85.92)	-0.013*** (91.20)	-0.012*** (86.82)	-0.012*** (86.63)	-0.012*** (87.41)
Annual Installment to Income	0.0008 (0.42)	0.0007 (0.26)	0.0007 (0.26)	0.0007 (0.26)	0.0007 (0.26)
Debt to Income	0.029*** (22.36)	0.023*** (13.41)	0.023*** (13.77)	0.023*** (13.78)	0.023*** (13.56)
Credit History Length	-0.0007*** (13.78)	-0.0004*** (38.09)	-0.0004*** (36.79)	-0.0004*** (36.81)	-0.0004*** (35.10)
Delinquency 2 Years	0.023*** (26.28)	0.024*** (27.71)	0.024*** (27.49)	0.024*** (27.45)	0.024*** (27.95)

Inquiries Last 6 Months	0.126*** (73.86)	0.053*** (11.93)	0.053*** (11.92)	0.053*** (11.92)	0.051*** (11.07)
Public Records	0.054*** (56.72)	0.049*** (47.29)	0.048*** (45.52)	0.048*** (45.56)	0.05*** (48.09)
Revolving Utilization	0.054** (5.97)	0.097*** (18.69)	0.089*** (15.96)	0.09*** (15.92)	0.09*** (16.91)
Open Accounts	0.002* (3.68)	0.0006 (0.42)	0.001 (1.19)	0.001 (1.20)	0.001 (1.48)
Months Since Last Delinquency	-0.0023*** (11.24)	-0.0023*** (85.37)	-0.0023*** (84.30)	-0.0023*** (84.31)	-0.0023*** (84.67)
Mortgage	0.217 (1.64)	0.15 (0.77)	0.14 (0.65)	0.14 (0.65)	0.14 (0.68)
Own	0.04 (0.80)	0.07 (0.17)	0.08 (0.23)	0.08 (0.23)	0.08 (0.22)
Rent	0.136 (0.42)	0.158 (0.97)	0.179 (1.10)	0.179 (1.10)	0.176 (1.07)
Obs.	649,733	649,733	649,733	649,733	649,733
Pseudo R^2	0.066	0.086	0.088	0.088	0.088

The sample consists of funded loans with 36-month duration and with complete information on loan status on LendingClub.com for the period of 2007-2019. SB and Non-SB represent funded loans for "Small Business" and for all other purposes, respectively. Letters A to G are loan grades that represent rankings of loan credit risks with A being the lowest and G being the highest credit risk. "Loan Grade * SB" and "Loan Interest Rate * SB" are interaction terms between small business dummy and loan grade and between loan interest rate and small business dummy, respectively. The model specification is below.

$$\text{Default Dummy} = \beta_0 + \beta_1 \times \text{SB} + \beta_2 \times \text{Loan Grade} + \beta_3 \times (\text{Loan Grade} \times \text{SB}) + \beta_4 \times \text{Loan Interest Rate} + \beta_5 \times (\text{Loan Interest Rate} \times \text{SB}) + \beta_i \times \text{Control Variables} + e \quad (2)$$

t-statistics are in parentheses and robust to heteroskedasticity. Statistical significance at the 1%, 5%, and 10% levels is denoted by "***,", "**," and "*," respectively.

Robustness Check

With a proven significantly positive relationship between default risk measure and credit risk premium on the P2P platform, we also study whether the relationship is sensitive to macroeconomic shocks. These robustness tests are conducted under different macroeconomic conditions as indicated by risk-free rates and unemployment rates. The 3-month Treasury bill rates serve as a measure of risk-free interest rates to control for monetary policy changes, and seasonally adjusted unemployment rates are used to control for business cycle effects.

Appendix B shows plots of the 3-month Treasury bill rates and the seasonally adjusted unemployment rates from January 2007 to March 2019. We split the sample into three periods: 2007 to 2008, 2009 to 2015, and 2016 to 2019, respectively, based on 3-month treasury rates as shown in Figure 1. The financial crisis emerged from 2007 to 2008 when the interest rates dropped sharply. The interest rates approached zero from 2009 to 2015 and have increased afterward. We also attempt an alternative grouping into 2007 to 2009 and 2010 to 2019 sub-periods using unemployment rates as the macroeconomic indicator as shown in Figure 2. The market was in recession from 2007 to 2009, with increasing unemployment rates, and then recovered with declining unemployment rates afterward.

Table 6 Determinants of Credit Risk Premium Under Different Macroeconomic Conditions

The sample consists of funded loans with 36-month duration and with complete information on loan status on LendingClub.com for the period of 2007-2019. SB and Non-SB represent funded loans for "Small Business" and for all other purposes, respectively. Letters A to G are loan grades that represent rankings of loan credit risks with A being the lowest and G being the highest credit risk. "Loan Grade * SB" is an interaction term between small business dummy and loan grade. The model specification is below

$$\text{Loan Risk Premium} = \beta_0 + \beta_1 \times \text{SB} + \beta_2 \times \text{Loan Grade} + \beta_3 \times (\text{Loan Grade} \times \text{SB}) + \beta_i \times \text{Control Variables} + e \quad (1)$$

Panel A shows the results of three sub-sample periods: 2007-2008, 2009-2015, and 2016-2019 using the 3-month Treasury Bill rates to control for monetary policy changes. Panel B shows the results of two sub-periods: 2007-2009 and 2010-2019 using seasonal adjusted unemployment rates to control for business cycle effects. *t*-statistics are in parentheses and robust to heteroskedasticity. Statistical significance at the 1%, 5%, and 10% levels is denoted by "***," "**," and "*," respectively.

Panel A Multiple Regressions Under Different Economic Conditions Proxied by 3-Month Treasury-Bill Rates

	Dependent Variable: Risk Premium		
	2007-2008	**2009-2015**	**2016-2019**
Small business (SB)	0.009*** (3.37)	0.013*** (4.34)	0.005*** (12.10)
Loan Grade (A=1, G=7)	0.039*** (12.92)	0.029*** (6.50)	0.010*** (12.33)
Loan Grade * SB	0.002*** (12.22)	0.001*** (6.10)	0.002*** (10.52)
Loan Amount	0.00007*** (6.28)	0.00005*** (13.39)	0.00005*** (12.05)
Annual Income	-0.000003*** (-4.80)	-0.000003*** (-4.94)	-0.000002*** (-6.15)
FICO Score	-0.00002*** (-9.30)	-0.00001*** (-23.63)	-0.00001*** (-7.12)
Employment Length	-0.00004*** (-3.10)	-0.00001*** (-12.57)	-0.00006*** (-3.07)
Annual Installment to Income	0.000015 (1.06)	0.000046*** (8.31)	0.000002* (1.84)
Debt to Income	0.00003*** (3.46)	0.00003*** (4.72)	0.00007*** (17.32)
Credit History Length	-0.000001 (-0.17)	-0.000009* (-2.65)	-0.000003*** (-9.18)
Delinquency 2 Years	0.00003*** (4.55)	0.00002*** (3.53)	0.00001*** (4.41)
Inquiries Last 6 Months	0.004 (0.11)	0.002*** (44.48)	0.008*** (23.41)
Public Records	0.0002 (1.14)	0.0008*** (9.74)	0.0002*** (5.47)
Revolving Utilization	0.009 (0.47)	0.006*** (31.94)	0.002*** (11.97)
Open Accounts	0.00005 (0.53)	0.00001 (1.29)	0.00002*** (3.58)
Months Since Last Delinquency	-0.00002*** (-11.76)	-0.00001*** (-5.92)	-0.00001*** (-6.24)

Mortgage	0.008 (1.56)	0.003** (2.20)	0.001 (1.06)
Own	0.008 (1.47)	0.003** (2.08)	0.001 (0.59)
Rent	0.009* (1.66)	0.004** (2.41)	0.001 (0.59)
Obs.	91,813	271,053	286,867
Adjusted R^2	0.690	0.867	0.920

Panel B Multiple Regressions Under Different Macroeconomic Conditions Proxied by Unemployment Rates

	Dependent Variable: Risk Premium	
	2007-2009	**2010-2019**
Small Business (SB)	0.011*** (3.49)	0.007*** (4.20)
Loan Grade (A=1, G=7)	0.036*** (22.37)	0.012*** (12.78)
Loan Grade * SB	0.003*** (2.99)	0.004*** (3.18)
Loan Amount	0.00006*** (6.17)	0.00005*** (12.13)
Annual Income	-0.000001*** (-4.20)	-0.000007*** (-20.55)
FICO Score	-0.00002*** (-11.48)	-0.00003*** (-20.17)
Employment Length	-0.00001 (-1.10)	-0.00003*** (-3.96)
Annual Installment to Income	0.000002** (2.39)	0.000002** (2.10)
Debt to Income	0.00002*** (2.97)	0.00003*** (7.47)
Credit History Length	-0.000002*** (-2.90)	-0.000006*** (-18.43)
Delinquency 2 Years	0.00006*** (11.22)	0.00001*** (4.54)
Inquiries Last 6 Months	0.002*** (30.24)	0.002*** (56.79)
Public Records	0.0004*** (3.07)	0.0003*** (7.57)
Revolving Utilization	0.006** (2.22)	0.007*** (51.94)
Open Accounts	0.00002*** (2.61)	0.00004*** (6.96)
Months Since Last Delinquency	-0.000003*** (-22.83)	-0.000001*** (-6.67)
Mortgage	0.007** (2.27)	0.002** (2.23)
Own	0.005 (1.33)	0.003** (2.37)
Rent	0.007** (2.12)	0.002 (1.62)
Obs.	136,529	513,204
Adjusted R^2	0.644	0.891

Table 6 presents the regression results of interest rate premiums on small business dummies under different macroeconomic conditions. Using 3-month Treasury-bill rates to classify economic conditions, we find that the coefficients of loan grade and small business dummy are significantly positive across all three sub-periods. The borrowers' risk premiums are most sensitive to loan grade with a coefficient of 0.039 during the financial crisis of the 2007 to 2008 sub-period, compared to 0.290 and 0.010 during the 2009 to 2015 period and afterward. It indicates that borrowers with poor credit suffered the most, possibly due to higher potential default risk under poor macroeconomic conditions. The significantly positive relationship between risk premium and loan grade at the 1% level gets weaker as the economy recovered during the period from 2009 to 2015, until fully recovered after 2016. The coefficients of the Small Business dummy are 0.009 and 0.013 from 2007 to 2008 and 2009 to 2015, both of which are greater than 0.005, the coefficient during the period of 2016-2019. The coefficients of the interaction term of loan grade and small business dummy are all significantly positive at the 1% level. The evidence supports our expectation that small business borrowers consistently pay extra risk premiums and have to endure even more costly financing rates than their counterparts during economic downturns. The coefficients of all control variables are consistent with our hypotheses and significant at the 1% level, except for installment-to-income ratios, credit history length, the number of inquiries over the last six months, and home ownership.

Panel B presents the macroeconomic impacts on the credit risk premium dynamics via P2P financing using unemployment rates as an alternative economic condition measure. The results are consistent with the findings in Panel A, where the coefficients of the Small Business dummy are 0.011 and 0.007 during the financial crisis period of 2007 to 2009 and post-2009 period, respectively. This confirms that borrowers to finance small businesses do pay more regardless of economic conditions, and the situation is even worse during poor economic conditions. The coefficient of loan grade is 0.036 during tough economic times, higher than 0.012 under sound economic conditions after 2009. In addition, the coefficients of the loan grade and small business dummy interaction term are both significantly positive at the 1% level. Overall, the evidence is consistent with our expectation that small business borrowers do pay more, controlling for loan and borrower characteristics, and those with poor credit records suffered the most during economic downturns. The robustness tests of coefficient differences across different economic conditions are reported in Appendix D.

Table 7 examines the robustness of the default risk model of P2P loans under different macroeconomic conditions. Panel A presents the results using 3-month Treasury bill rates to classify macroeconomic conditions, while Panel B shows the results based on the unemployment rates as the economic measure. As shown in Panel A, the borrowers for small business purposes do carry significantly higher default rates than for other purposes across all economic states, in particular, during the financial crisis period of 2007 to 2008. The coefficient of the interaction term between the small business dummy and loan grade is 0.097, significant at the 1% level, indicating that the small business borrowers with the lowest credit record are most likely to default. The loans with higher interest rates are more likely to default across all economic states, especially during the financial crisis period. The observation is more evident in the loans for small business purposes. The finding is consistent with our expectation that economic conditions directly affect small business growth, as business failure is more common during economic downturns than during economic growth periods due to declining market demand and profitability. Similar findings can be found in Panel B. The coefficients of the Small Business dummy, loan grade, and loan interest rate during the economic downturn period of 2007 to 2009 are 0.919, 0.496, and 0.551, respectively, which are greater than the corresponding coefficients of the three variables (0.539 for Small Business Dummy, 0.241 for loan grade, and 0.266 for loan interest rate) during the economic growth period of 2010 to

2019. We also test the robustness of coefficient differences across different economic conditions and report in Appendix E. Overall, the small business borrowers, in particular those with poor credit ratings, could face declining cash flows and higher financing costs and therefore are more likely to default during the recession.

Table 7 Default Risk Prediction Under Different Macroeconomic Conditions

The sample consists of funded loans with 36-month duration and with complete information on loan status on LendingClub.com for the period of 2007-2019. SB and Non-SB represent funded loans for "Small Business" and for all other purposes, respectively. Letters A to G are loan grades that represent rankings of loan credit risks with A being the lowest and G being the highest credit risk. "Loan Grade * SB" and "Loan Interest Rate * SB" are interaction terms between small business dummy and loan grade and between loan interest rate and small business dummy, respectively. The model specification is below

$$\text{Default Dummy} = \beta_0 + \beta_1 \times \text{SB} + \beta_2 \times \text{Loan Grade} + \beta_3 \times (\text{Loan Grade} \times \text{SB}) + \beta_4 \times \text{Loan Interest Rate} + \beta_5 \times (\text{Loan Interest Rate} \times \text{SB}) + \beta_i \times \text{Control Variables} + e \quad (2)$$

Panel A shows the results of three sub-sample periods: 2007-2008, 2009-2015, and 2016-2019 using the 3-month Treasury Bill rates to control for monetary policy changes. Panel B shows the results of two sub-periods: 2007-2009 and 2010-2019 using seasonal adjusted unemployment rates to control for business cycle effects. *t*-statistics are in parentheses and robust to heteroskedasticity. Statistical significance at the 1%, 5%, and 10% levels is denoted by "***," "**," and "*," respectively.

Panel A Logistic Regressions Under Different Macroeconomic Conditions Proxied by 3-Month Treasury –Bill Rates

	Dependent Variable: Default Dummy = 1		
	2007-2008	**2009-2015**	**2016-2019**
Small Business (SB)	0.856*** (8.26)	0.388*** (17.74)	0.157*** (8.21)
Loan Grade (A=1, G=7)	0.256*** (6.62)	0.435*** (54.97)	0.094*** (25.69)
Loan Grade * SB	0.097*** (4.58)	0.090*** (7.02)	0.051*** (4.17)
Loan Interest Rate	0.585*** (7.82)	0.618*** (11.27)	0.328*** (8.23)
Loan Interest Rate * SB	0.265*** (5.01)	0.307*** (5.20)	0.158*** (9.00)
Loan Amount	0.00003*** (7.28)	0.00001*** (9.76)	0.00003*** (12.33)
Annual Income	-0.000001* (3.24)	-0.000004*** (10.84)	-0.000001*** (72.06)
FICO Score	-0.004*** (5.43)	-0.009*** (37.88)	-0.007*** (45.76)
Employment Length	-0.014* (3.21)	-0.008*** (13.55)	-0.013*** (59.87)
Annual Installment to Income	0.0031 (1.32)	0.0052*** (40.12)	0.0009 (0.26)
Debt to Income	0.003 (0.04)	0.029*** (26.07)	0.015*** (38.09)
Credit History Length	-0.0005 (0.16)	-0.0003*** (11.24)	-0.0003*** (20.55)
Delinquency 2 Years	0.108 (0.57)	0.052*** (43.95)	0.010* (3.40)

Inquiries Last 6 Months	0.050*** (13.02)	0.061*** (66.19)	0.090*** (18.93)
Public Records	0.047 (1.49)	0.075*** (27.82)	0.035*** (17.82)
Revolving Utilization	0.055 (0.88)	0.020 (0.26)	0.109*** (14.55)
Open Accounts	0.005* (3.19)	0.007*** (18.44)	0.003 (0.09)
Months Since Last Delinquency	-0.0022 (0.24)	-0.0021*** (25.03)	-0.0027*** (69.88)
Mortgage	0.135 (0.14)	0.138 (0.61)	0.109 (2.19)
Own	0.082 (0.26)	0.037 (2.04)	0.117 (0.31)
Rent	0.111 (0.47)	0.145 (2.13)	0.065 (0.10)
Obs.	91,813	271,053	286,867
Pseudo R^2	0.121	0.092	0.094

Panel B Logistic Regressions Under Different Macroeconomic Conditions Proxied by Unemployment Rates

	Dependent Variable: Default Dummy = 1	
	2007-2009	**2010-2019**
Small Business (SB)	0.919*** (6.59)	0.539*** (5.45)
Loan Grade (A=1, G=7)	0.496*** (17.98)	0.241*** (35.89)
Loan Grade * SB	0.088*** (7.15)	0.043*** (4.66)
Loan Interest Rate	0.551*** (8.20)	0.266*** (36.57)
Loan Interest Rate*SB	0.449*** (9.63)	0.218*** (8.96)
Loan Amount	0.00002*** (8.84)	0.00002*** (16.08)
Annual Income	-0.000001*** (4.52)	-0.000001*** (87.15)
FICO Score	-0.004*** (11.82)	-0.008*** (88.74)
Employment Length	-0.024** (5.55)	-0.013*** (96.03)
Annual Installment to Income	0.0035 (1.49)	0.0007 (0.26)
Debt to Income	0.023 (2.00)	0.014*** (13.15)
Credit History Length	-0.0009 (1.15)	-0.0004*** (36.59)

Delinquency 2 Years	0.050 (0.26)	0.023*** (26.06)
Inquiries Last 6 Months	0.053*** (27.05)	0.049*** (10.54)
Public Records	0.062* (3.33)	0.048*** (44.83)
Revolving Utilization	0.038 (0.02)	0.088*** (14.95)
Open Accounts	0.010 (0.63)	0.001 (1.51)
Months Since Last Delinquency	-0.0019 (0.11)	-0.0024*** (87.99)
Mortgage	0.188 (1.30)	0.154 (0.68)
Own	0.183 (0.69)	0.066 (0.12)
Rent	0.170 (1.78)	0.166 (0.79)
Obs.	136,529	513,204
Pseudo R^2	0.090	0.088

V. Conclusions

Our empirical research findings show that P2P personal loan borrowers for small business financing purposes pay significantly higher interest rates than borrowers for other purposes, controlled for borrowers and loan characteristics. The higher interest rates can be justified by the higher default risk carried by small business borrowers. Furthermore, small business borrowers are more sensitive to high interest rates and more likely to default than non-small business borrowers. Robustness check further supports that the default risk and credit risk premiums are sensitive to macroeconomic shocks and destabilized financial markets. The borrowers with poor credit records are more likely to default across all economic states, especially during economic downturns, and suffer the most from high credit risk premiums. The observation is more evident in the loans for small business purposes due to the higher sensitivity of small businesses to declining market demand, profitability, and poor financial market conditions. Future research includes developing an alternative credit risk model to allow small business borrowers to provide financial information on their businesses and be charged an interest rate based on their overall financial conditions. As the COVID-19 pandemic hit the global market and impacted all businesses, especially small businesses, continuous monitoring is necessary on the trend of P2P lending due to the dramatic change in both demand for and supply of P2P funds after the pandemic.

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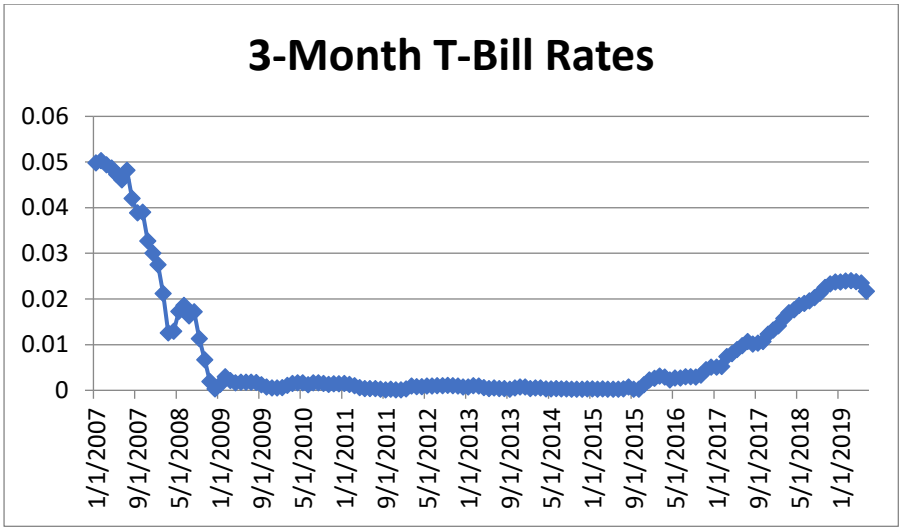
Appendix A: Variable Definitions

Variable	Definition (LendingClub variable names are in bold)	Description
Loan Grade	**grade**	LendingClub assigned loan grades. There are seven grades: A, B, C, D, E, F, G. Each grade has five subgrades and they are A1-A5, B1-B5, C1-C5, D1-D5, E 1-E5, F1-F5, G1-G5.
Loan Purpose	**purpose**	A category provided by the borrower for the loan request. There are fourteen purposes: car, credit card, debt consolidation, educational, home improvement, house, major purchase, medical, moving, renewable energy, small business, vacation, wedding, other
Loan Interest Rate	**int_rate**	Interest rate on the loan
Loan Amount	**loan_amnt**	The listed amount of the loan applied for by the borrower. If at some point in time, the credit department reduces the loan amount, then it will be reflected in this value.
Annual Income	**annual_inc**	The self-reported annual income provided by the borrower during registration
FICO Score	**FICO Score =** (**fico_Range_High** + **fico_Range_Low**)/2	fico_Range_High: The upper boundary range the borrower's FICO at loan origination belongs to fico_Range_Low: The lower boundary range the borrower's FICO at loan origination belongs to
Employment Length	**emp_leng**	Employment length in years. Possible values are between 0 and 10 where 0 means less than one year and 10 means ten or more years.
Annual Installment to Income	**install_income = installment*12/annual_inc**	The borrower's annual payment to income ratio, where Installment: The monthly payment owed by the borrower if the loan originates annual_inc: The self-reported annual income provided by the borrower during registration
Debt to Income	**dti**	The borrower's debt to income ratio calculated using the borrower's total monthly debt payments on the total debt obligations, excluding mortgage and the requested LendingClub loan, divided by the borrower's self-reported monthly income.
Credit History Length	**credit_history = issue_d - earliest_cr_line**	Number of months of the borrower's credit history, where

		earliest_cr_line: The month the borrower's earliest reported credit line was opened issue_d: The month which the loan was funded
Delinquency 2 Years	**delinq_2yrs**	The number of 30+ days past-due incidences of delinquency in the borrower's credit file for the past 2 years
Inquiries Last 6 Months	**inq_last_6mths**	The number of inquiries in past 6 months, excluding auto and mortgage inquiries
Public Records	**pub_rec**	Number of derogatory public records
Revolving Utilization	**revol_util**	Revolving line utilization rate, or the amount of credit the borrower is using relative to all available revolving credit
Open Accounts	**open_acc**	The number of open credit lines in the borrower's credit file
Months Since Last Delinquency	**mths_since_last_delinq**	The number of months since the borrower's last delinquency
Home Ownership	**home_ownership**	The home ownership status provided by the borrower during registration or obtained from the credit report. Values are: RENT, OWN, MORTGAGE.

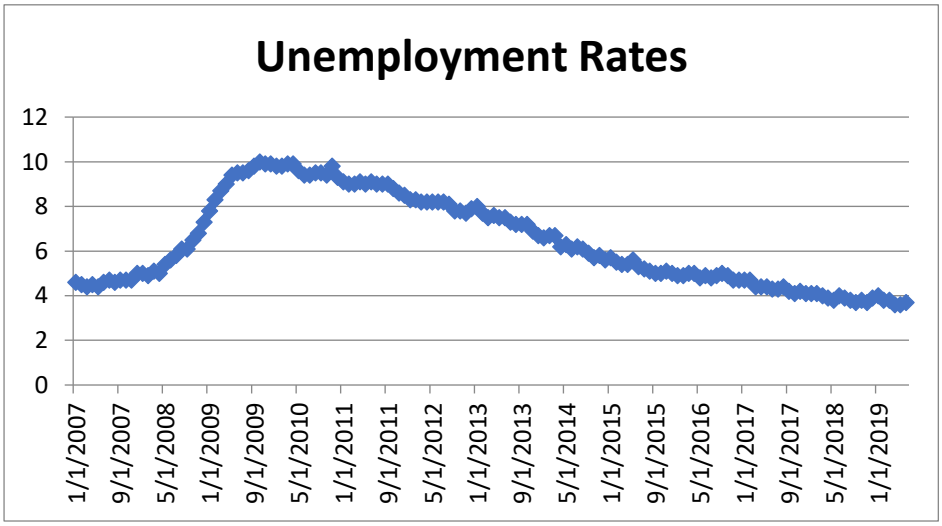
Appendix B: Figure 1 3-Month Treasury - Bill Rates

Source: Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis. https://fred.stlouisfed.org/series/TB3MS.



Appendix B: Figure 2 Unemployment Rates (Seasonally Adjusted)

Source: U.S. Bureau of Labor Statistics, retrieved from FRED, Federal Reserve Bank of St. Louis. https://fred.stlouisfed.org/series/UNRATE.



Appendix C: Regression with Year Fixed Effects and Macro Conditions

SB*TB is the interaction term between small business dummy and macroeconomics conditions based on 3-month TB rates, where TB =1, 2, and 3 when the periods are 2007-2008, 2009-2015, and 2016-2019, respectively. SB * UR is the interaction term between small business dummy and macroeconomics conditions based on unemployment rates, where UR =1 and 2 when the periods are 2007-2009 and 2010-2019, respectively. Loan Grade*Year Fixed Effects is the Grade Level times Year Dummy.

	Dependent Variable: Risk Premium				
	Model 1: With year fixed effects	**Model 2: 3-month TB Macro Cond.**	**Model 3: 3-month TB Macro Cond.**	**Model 4: Unemployment Macro Cond.**	**Model 5: Unemployment Macro Cond.**
Small Business (SB)	0.005***	0.004***	0.007***	0.003***	0.002***
	(12.47)	(6.71)	(9.00)	(4.44)	(12.60)
Loan Grade (A=1, G=7)			0.035***		0.035***
			(12.54)		(12.55)
SB * TB (1 if <2009; 3 if >2015; 2 between)		-0.023***	-0.025***		
		(10.93)	(29.37)		
SB * UR (1 if <2010; 2 if >=2010)				-0.015***	-0.037***
				(5.22)	(5.05)
Loan Grade * Year Fixed Effects	Yes	No	No	No	No
Loan Amount	0.00005***	0.00005***	0.00005***	0.00005***	0.00005***
	(17.91)	(22.90)	(13.30)	(22.86)	(13.09)
Annual Income	-0.000005***	-0.000002***	-0.000007***	-0.000002***	-0.000007***
	(-5.57)	(-23.96)	(-19.40)	(-23.94)	(-19.47)
FICO Score	-0.00004***	-0.00006***	-0.00003***	-0.00006***	-0.00003***
	(-31.72)	(-44.71)	(-23.16)	(-44.75)	(-23.90)
Employment Length	0.00007	0.00001	-0.00005***	0.00002	-0.00005***
	(1.09)	(0.97)	(-6.39)	(0.98)	(-6.23)
Annual Installment to Income	0.000002**	0.000003**	0.000002**	0.000006**	0.000002**
	(2.19)	(2.45)	(2.08)	(2.45)	(2.07)
Debt to Income	0.00011***	0.00010***	0.00004***	0.00010***	0.00004***
	(32.21)	(19.55)	(12.32)	(19.56)	(12.10)
Credit History Length	-0.000004***	-0.000004***	-0.000005***	-0.000004***	-0.000005***
	(-12.47)	(-15.70)	(-15.76)	(-15.67)	(-15.74)
Delinquency 2 Years	0.00003	0.00001	0.00001	0.00002	0.00002
	(1.21)	(0.15)	(0.83)	(0.23)	(0.78)
Inquiries Last 6 Months	0.001***	0.010***	0.002***	0.011***	0.002***
	(28.23)	(41.38)	(54.85)	(41.28)	(54.79)
Public Records	0.0001	0.0005***	0.0003***	0.0005***	0.0003***
	(1.70)	(4.47)	(6.29)	(4.48)	(6.39)
Revolving Utilization	0.001	0.009***	0.006***	0.009***	0.006***
	(0.23)	(29.13)	(47.42)	(29.12)	(47.52)

Open Accounts	0.00004*** (9.21)	0.00004*** (3.04)	0.00004*** (7.00)	0.00004*** (3.36)	0.00004*** (6.97)
Months Since Last Delinquency	-0.000005*** (-3.66)	-0.000004*** (-3.20)	-0.000002 (-1.66)	-0.000004*** (-3.07)	-0.000002 (-1.49)
Mortgage	0.0002 (0.17)	0.008 (1.15)	0.001 (1.16)	0.008 (1.27)	0.0005 (0.47)
Own	0.0008 (0.97)	0.003 (1.17)	0.001 (1.04)	0.003 (1.28)	0.003 (0.35)
Rent	0.0006 (0.72)	0.002 (0.85)	0.002* (1.78)	0.002 (0.97)	0.001 (1.08)
Obs.	649,733	649,733	649,733	649,733	649,733
Adjusted R^2	0.912	0.275	0.885	0.275	0.885

Appendix D: Statistical Tests on Coefficient Differences across Risk Premium Regressions Under Different Economic Conditions

Panel A Multiple Regressions Under Different Economic Conditions Proxied by 3-Month Treasury-Bill Rates

	Dependent Variable: Risk Premium					
	2007-2008 (I)	**2009-2015 (II)**	**2016-2019 (III)**	**I vs II**	**II vs III**	**I vs III**
Small business (SB)	0.009***	0.013***	0.005***	-0.004	0.008***	0.004
	(3.37)	(4.34)	(12.10)	(-1.00)	(2.65)	(1.48)
Loan Grade (A=1, G=7)	0.039***	0.029***	0.010***	0.010*	0.019***	0.029***
	(12.92)	(6.50)	(12.33)	(1.86)	(4.19)	(9.28)
Loan Grade * SB	0.002***	0.001***	0.002***	0.001***	-0.001***	0.000
	(12.22)	(6.10)	(10.52)	(4.32)	(-3.98)	(0.001)

Panel B Multiple Regressions Under Different Macroeconomic Conditions Proxied by Unemployment Rates

	Dependent Variable: Risk Premium		
	2007-2009 (I)	**2010-2019 (II)**	**I vs II**
Small Business (SB)	0.011***	0.007***	0.004
	(3.49)	(4.20)	(1.12)
Loan Grade (A=1, G=7)	0.036***	0.012***	0.024***
	(22.37)	(12.78)	(12.88)
Loan Grade * SB	0.003***	0.004***	-0.001
	(2.99)	(3.18)	(0.62)

Appendix E: Statistical Tests on Coefficient Differences across Default Risk Regressions Under Different Economic Conditions

Panel A Logistic Regressions Under Different Macroeconomic Conditions Proxied by 3-Month Treasury-Bill Rates

Dependent Variable: Default Dummy = 1						
	2007-2008 (I)	**2009-2015 (II)**	**2016-2019 (III)**	**I vs II**	**II vs III**	**I vs III**
Small Business (SB)	0.856***	0.388***	0.157***	0.468***	0.231***	0.699***
	(8.26)	(17.74)	(8.21)	(4.42)	(7.95)	(6.63)
Loan Grade (A=1, G=7)	0.256***	0.435***	0.094***	-0.179***	0.341***	0.162***
	(6.62)	(54.97)	(25.69)	(-4.53)	(39.11)	(4.17)
Loan Grade * SB	0.097***	0.090***	0.051***	0.007	0.039***	0.046*
	(4.58)	(7.02)	(4.17)	(0.28)	(2.20)	(1.88)
Loan Interest Rate	0.585***	0.618***	0.328***	-0.033	0.29***	0.257***
	(7.82)	(11.27)	(8.23)	(-0.36)	(4.28)	(3.03)
Loan Interest Rate * SB	0.265***	0.307***	0.158***	-0.042	0.149***	0.107**
	(5.01)	(5.20)	(9.00)	(-0.53)	(2.42)	(1.92)

Panel B Logistic Regressions Under Different Macroeconomic Conditions Proxied by Unemployment Rates

Dependent Variable: Default Dummy = 1			
	2007-2009 (I)	**2010-2019 (II)**	**I vs II**
Small Business (SB)	0.919***	0.539***	0.38**
	(6.59)	(5.45)	(2.22)
Loan Grade (A=1, G=7)	0.496***	0.241***	0.255***
	(17.98)	(35.89)	(8.98)
Loan Grade * SB	0.088***	0.043***	0.045***
	(7.15)	(4.66)	(2.93)
Loan Interest Rate	0.551***	0.266***	0.285***
	(8.20)	(36.57)	(4.22)
Loan Interest Rate*SB	0.449***	0.218***	0.231***
	(9.63)	(8.96)	(4.39)