Jointness in relationship lending: Evidence from UK SMEs

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Abstract: This study provides a UK counterpart to evidence presented by Brick and Palia (2007) regarding jointness in relationship lending that grants credit to small firms. Using the UK survey of Small and Medium-Sized Enterprises from 2008, simultaneous equation results show if the lender considers collateral necessary, a loan is characterised by higher interest rates. In exchange for collateral, high quality borrowers receive an advantage of lower interest rates, as predicted by screening models. Regarding the borrower–lender relationship, the results suggest that over time, borrowers become locked in to the relationship. The results also show that borrowers and lender prefer jointness in loan pricing.

Keywords: loan pricing; collateral; interest rate; borrower-lender relationship

1. Introduction

In their seminal paper on credit rationing in credit markets, Stiglitz and Weiss show how interest rates or collateral can be used as screening device [1]. High interest rates tend to attract higher-risk borrowers, whose projects probably will not prosper sufficiently to cover the cost of money. When interest rates increase, the average risk to projects also increases, threatening the lenders' expectations of returns. Such expectations are optimal when interest rates are lower than the rate that balances supply and demand in the market.

However, even at this optimal interest rate, credit rationing may occur, if borrowers agree to pay a higher price for money than the price prevailing in the market. Conversely, with a fixed rate, increasing collateral requirements increases the risk of the bank's loan portfolio, either by discouraging safer investors or inducing borrowers to invest in riskier projects. Thus in equilibrium, there is a positive relation between collateral and borrower risk.

However, Bester argues that Stiglitz and Weiss's results require banks to choose collateral or interest rates separately [1] [2]. Borrowers with a low probability of bankruptcy are more inclined to accept an increase in collateral requirements for a specific reduction in the interest rate compared with those with a high failure probability. In the absence of market imperfections, no rationing occurs in equilibrium if banks compete by choosing collateral requirements and the interest rate simultaneously to screen investors' riskiness. Yet empirical contributions also suggest that asymmetric information about borrowers' behaviours constitute the greatest limitations on credit [3].

In this context, financial intermediation literature indicates that banks produce information about borrowers through lending relationships [4], [5]. Such specific information about the borrower increases security and raises the value of the firm's strategic information, encouraging the borrower to transmit data and the bank to conduct costly monitoring [6]. Relationship lending should improve the bank's knowledge of the

characteristics of both the borrowing firm and its projects, which makes it less risky to grant a loan. Accordingly, this knowledge should translate into increased availability of debt at a lower cost for the borrower.

However, empirical evidence is less clear-cut regarding the terms of debt contracts. For example, US banks charge lower interest rates to small and medium-sized enterprises (SMEs) with which they have maintained longer lasting or concentrated relationships, but European small firms that maintain more prolonged relationships or work with fewer intermediaries pay more for their loans [7],[8],[9],[10]. Regarding collateral requirements, SMEs that borrow from fewer banks or have longer relationships are less likely to provide collateral. But Berger and Udell also report a positive link between collateralization and interest rates [11]. Because lenders do not determine the interest rate separately from other loan terms, these seemingly contradicting results may reflect a failure of prior research to acknowledge the jointness of debt terms [12].

This study pursues a twofold aim. First, the study examines the simultaneous impacts of borrower–lender relationships on debt term contracts, that is, interest rate premium and collateral requirements. More specifically, the study examines if good borrowers select higher collateral and low interest rates contracts on basis of his private information (adverse selection effect) or if higher-risk borrowers must provide collateral (moral hazard). Furthermore, because in context of SMEs personal collateral has a higher implicit value as a discipline device, hence this study distinguishes business collateral from personal collateral. Second, the study provides a UK counterpart to evidence presented by Brick and Palia, who focused on jointness in relationship lending for credit granted to US small firms [12]. In Europe, this issue has become particularly relevant due the consolidation of the banking industry and the introduction of the Basel III Capital Accord, which requires information-opaque firms to rely on collateral to reduce the risk of bank loan portfolios [13]

2. Literature review and research hypotheses

2.1 Borrower riskiness

According to both conventional wisdom in banking and the banks ex post monitoring function, banks should demand higher collateral from borrowers who are expected to have higher default risks [11], [14], [15]. Therefore, according the moral hazard hypothesis for a given loan amount riskier borrower will be request to put up more collateral because collateral induces more effort by the borrower, reduces the incentives of strategic default and provides the borrower with an incentive to exert effort and reveal truthfully the state of his project after having obtained the loan [14], [16], [17]. This positive relation between collateral and borrowers' ex ante risk is documented by Berger and Udell [11], [7].

Because the database lacks information regarding firms that defaulted after the loan have been granted, this study expects that observable risk measures reflect *firm size* [4]. Small firms tend to be both more risky and more informationally opaque than large firms, which have a higher historical performance and track record. Accordingly, the first hypothesis states:

H1: The likelihood of use collateral is higher among high-risk borrowers.

However, the willingness to pledge collateral by borrowers could be taken as a reliable signal of borrower quality if the borrower´s type is private information and unknown to the lender [2]. Accordingly, if the bank cannot discern borrowers' riskiness (hidden information), then collateral may serve as a screening device to distinguish between borrowers [18]. This follows from the observation that a lower-risk borrower has a greater incentive to pledge collateral than a risky borrower, because of his lower probability of failure and loss of collateral. Hence, the second hypothesis is:

H2: The likelihood of use collateral is higher among borrowers whose credit quality is private information.

Because lenders do not know, or not know exactly, the risk quality of the borrower, when they make the loan decision due of information asymmetries, this study uses the variable *credit quality* as a dummy variabl*e,* which reflects the borrowers´ perceptions of their financial situation (see section 3) [2]. The bank may use public information to estimate borrower quality. For instance, Cavalluzzo et al. have been proposed to use Dun and Bradstreet (D&B) scores, or the variance of returns to equity or cash management behavior [19], [20], [21]. However, none of these proxies measures private information on financing choices by the borrower because such information

is publicly available and so will underestimate the effects of any information imperfections [22].

The majority of the theoretical contributions considers secured debt but do not take into account any explicit distinction between personal and business collateral. However, in the context of SMEs, Mann argues that personal collateral is more effective in limiting the borrower's risk preference incentives by enhancing the likelihood that the principal will feel the consequences of any ex post managerial shirking and risk-taking activities personally [23]. Moreover, personal collateral can also better serve as a signalling instrument because the owner of a lower quality firm cannot afford to imitate a high quality firm owner due to the threat of losing the personal assets [12]. In addition, in case of default, personal collateral can be seen as a substitute for equity investment by the owner because personal assets could be sold in order to repay the loan. Thus, this study contends that:

H3: The signaling role of pledging personal collateral is greater than pledging business collateral.

A firm that receives more debt attains higher leverage and increases the risk of non-repay, leading the bank to ask for more collateral [9]. Moreover, because long-term debt gives de borrower more opportunities to alter the project (i.e., asset substitution) or to use it for perk consumption, loan size and loan maturity are also an indicators of loans made according to the differences in private information [24], [25], [26]. Hence, this study expects the information advantage of the borrower over the lender to be higher for large and long-term loans, since the lender is less forward-looking than the borrower. Accordingly, the hypothesis four is:

H4: Loan size and loan maturity relates positively to collateral requirements.

2.2 Relationship lending

The existing literature on relationship lending provides conflicting predictions on how the strength of the relationship between borrower and lender affects loan term contracts. By establishing a solid relationship with the borrower, the lender learns about the hidden attributes and actions of the borrower, thus reducing information asymmetries. Hence, by enable reputation building the terms of loan contracts may become more favorable to the borrower if the firm has transactions with a specific relationship lender over a long period of time, and thus resulting in a lower likelihood of collateral being pledged [27]. However, the proprietary information gained by the relationship lender increases its ex post bargaining power (Sharpe, 1990). This information monopoly may be exploited to the detriment of the borrower (e.g., by charging higher interest rates or requiring more collateral - Degryse and Van Cayseele 2000; Rajan 1992). Because switching to other banks would involve high costs the borrower is locked in to the relationship. Accordingly:

H5a: If the benefits of relationship lending dominate, relationship lending relates negatively to collateral requirements..

Alternatively:

H5b. If the cost of hold-up problems associated with relationship lending dominates, relationship lending relates positively to collateral requirements.

3. Method, sample and variables

Building on the methodology suggested by Brick and Palia, this study uses a simultaneous equation modelling to analyse the contractual terms of bank loans, mainly the interest rate premium (IRP), and collateral [12]. Because personal collateral (PC) has a higher implicit value, due the costs of managerial shirking and risk-taking activities by owners, this study differentiates between personal (PC) and business collateral (BC) [12]. Appendixes 1 and 2 present the definitions of all variables and the correlation matrix, respectively. The simultaneous system of equations is defined as:

$$IRP = \alpha_{IRP} + \beta_{IRP}BC + \delta_{IRP}PC + \lambda_{IRP}X + \varphi_{IRP}W + \varepsilon_{IRP} \quad (1)$$

$$BC = \alpha_{BC} + \beta_{BC}IRP + \delta_{BC}PC + \lambda_{BC}X + \varphi_{BC}W + \varepsilon_{BC}. \quad (2)$$

$$PC = \alpha_{PC} + \beta_{PC}IRP + \delta_{PC}BC + \lambda_{PC}X + \varphi_{PC}W + \varepsilon_{PC}. \quad (3)$$

For each potential endogenous variable, this study employs specific instruments and relies on instrumental variables (IV) to measure the independent variables. The IV variables in the IRP, BC and PC equations equation are firm delinquency, fixed assets and CEO age, respectively. Exogeneity tests rely on methods proposed by Rivers and Vuong [28]. The specification also differentiates a vector of IV (X, in reference to firm, loan and borrower–lender characteristics) and control variables (W) for the industry and organizational form.

To tests simultaneity in terms of lending, the study uses the UK Survey of Small and Medium-sized Enterprises Finance (UKSMEF) from 2008 (See UK Data Archive Study number 6314 for

further details). The sample comprises 326 SMEs for which the UKSMEF provides information about whether each borrower pledges BC or PC to a primary lender, as well as the IRP paid. The survey features detailed questions about borrower–lender relationships in a wider sense than just the nature of the loan contract. These data show that 36% of firms pledged BC, and 21% pledged PC. The mean IRP that firms pay is 4.35% (median = 5%). Their mean total assets reach 1 519 540 pounds (firm size), and 58% of firms perceive themselves as low risk borrowers (according to mean credit quality variable). Their relationships with the main bank last for 14.5 years. The mean value of loan size is 546 074 pounds, with a maturity of 9.6 years, and 40% of firms negotiated a fixed rate.

In line with Bester, the authors hypothesize that low-risk borrowers choose a contract with high collateral and low interest rates on basis of private information [2]. Credit quality provides a proxy for private information, known only to the borrower; lenders do not know exactly borrowers' risk quality. Because the survey does not reveal borrowers who defaulted after receiving the loan, the authors use firm size to signal good (low risk) borrowers [29], [4]. Because failure probability decreases with size, it should correlate negatively with risk, loan collateralization, and the IRP. Other important loan-specific variables include size and maturity. Long-term debt gives borrowers enough opportunities to alter the project subtly, even from low- to high-risk projects, so loan size and time to maturity should have positive impacts on the incidence of secured debt [24]. If the value of the collateral is more stable or objectively ascertainable than the distribution of returns from the project, the borrower could trade it for better interest rates [2]. Such a signal should be possible because higher quality firms find it less costly to pledge collateral, with their smaller probability of default. To capture the relational effects between the lender and borrower, this analysis uses relationship length.

4. Empirical results

Consistent with Brick and Palia (2007), this study find strong evidence of jointness in terms of lending.

[Insert Table 1]

Both the BC and PC variables are positive and statistically significant (1% level) in the IRP equation. Table 1 also indicates a significant substitution effect at 1% between collateral forms. Consistent with theories that view collateral as an incentive to mitigate moral hazard, these findings support the H1, suggesting that if lenders consider pledging collateral necessary, the loan is characterized by higher interest rates.

However, the coefficient of the credit quality variable (proxy for private information) is positive and significant in collateral equations and negative and significant at the 10% level in the IRP equation. In line with Jiménez et al., these results support the H2, that is, in exchange for collateral high-quality borrowers receive lower interest rates [25]. These results are also supported by the size variable (proxy for observable risk). A negative, statistically coefficient at the 1% level occurs for size in the BC equation; lenders ask high-risk borrowers to pledge more collateral. The effect of this variable is marginal in the IRP. Moreover, as predicted by H3, riskier (small) borrowers, knowing they are riskier, are reluctant to post collateral, especially PC, and lack confidence that they will not default.

The negative coefficient of loan size and loan maturity in the IRP equation indicates collateral has implications for the cost of borrowing too. Thus, as state by H4, borrowers are more likely to pledge collateral (BC and PC) to receive a lower interest rate, in accordance with signalling theory. The loan maturity and loan size could also be endogenous variables [12]. Due data limitations from the data set it is difficult to identify instrumental variables for loan maturity and loan size that would not be correlated with IRP and collateral variables. Hence, as robustness, this study tests the impact of the independent variables when the simultaneous equations exclude loan maturity. The results of the three regressions do not change materially (these results are available upon request).

The length of the borrower–lender relationship also decreases the likelihood of pledging any kind of collateral, but the interest rate increases with the duration of the relationship. Thus, the results suggest that the hold-up problems associated with relationship lending dominates in accordance with the H5b. Hence, consistent with the bargaining hypothesis, over the duration of relationship, the main bank uses explicit loan interest rates as a loss leader to secure long-term rents from relationship business [8]. Because previous studies of duration analyses of lending relationships support the hold-up theory, this study controls for the possibility of a nonlinear relation in the lending relationship and debt term contracts by including the square of the relationship variable [30],[1]. For the IRP equation, the positive and negative signs of relationship

length and its square indicate a concave relation between relationship lending and the interest rate. For the collateral equations, the results suggest an opposite result, namely, an inverted U-shaped function of the degree of the collateralization.

The asymmetric evolution of information between the lender and other banks reduces ex post competition, so relationship duration offers the main bank monopoly power [5]. Over time then, borrowers get locked in to a relationship. Because information asymmetry is more likely among young borrowers, the use of collateral to signal credit quality should be more frequent among young borrowers than older borrowers [25]. Hence as robustness, this study adds two interaction variables to the previous simultaneous system equation. The first interaction variable (INTER1) results from the interaction between borrowers credit quality and young firms. This study defines young firms, firm which age is below to the first quartile of the age of the firms in the sample, which is 8 years. The second interaction variable (INTER2) aims to control if the main bank charges high interest rates or requires more collateral (hold-up problem) by exerting its ex post bargaining power and thus locked-in the firm in the relationship. The variable INTER2 results from the interaction between the variable relationship length and older firms. As older firms, this study defines firms which age is above the third quartile (15 years) of the firms´ age sample. The results are reported on table 2.

[Insert Table 2]

Table 2 values indicate that the coefficient the variable INTER1 is positive and statistically significant (at 10% level), in PC equation (1.282); in the IRP equation the coefficient is negative (-2.080) and statistically significant at 1% level. In BC equation, beside positive, the coefficient of the variable INTER 1 (.198) is not statistically significant. This result could be due because young firms tend to be smaller, hence, more likely BC constrained [22]. These findings confirm previous results that collateral, especially PC can be used to reveal borrowers types; high quality borrowers signal the real value and their beliefs in the quality of the project to the bank by posting PC, which in turn influences positively the quality of the credit request, as perceives by the bank. Consequently, the bank charges a low interest rate. The owner of a low quality firm cannot afford or imitate the high quality firm owner due the threat of losing personal assets [12]. In addition, the PC can be seen as a substitute for equity because these personal assets could be sold and the proceeds may be then use by the firm to repay the loan.

Regarding the variable INTER 2, the positive coefficients in collateral equation (.003 and .283 in BC and PC collateral equations, respectively), beside not statistically significant, suggest that collateral requirements maybe positively related to the intensity of the lending relationship. Thus, collateral is the result of hold-up but at the same time, it causes hold-up. Since an asset can be pledged only once, it defines the order of seniority among creditors and its evaluation is likely to be costly; so borrowers get locked in to a relationship [31]. Furthermore, the positive coefficient (.042, significant at 10% level) in the IRP equation still suggests that the main bank uses explicit loan interest rate as a loss leader to secure long-term rents on relationship businesses.

4. Conclusion

This study builds on work in the United States regarding jointness in lending terms. Using the UKSME 2008, the results from a simultaneous equation estimation show that if the lender considers collateral necessary, the loan includes higher interest rates. However, in exchange for collateral, high-quality borrowers receive the advantage of lower interest rate, as predicted by screening models. Loan characteristics also have implications for the cost of borrowing; borrowers pledge collateral to receive lower interest rates and borrow more with long maturities, in line with signalling theory.

Consistent with Brick and Palia, the results broadly indicate that borrowers and lenders prefer jointness in loan pricing. Lenders might insist that borrowers pay implicit interest upfront to reduce lenders' interim loss exposure. Furthermore, it might be advantageous, both legally and in terms of reputation, for lending institutions to mask efforts to shade interest rates to relationship borrowers by exchanging value in implicit ways that other customers, regulators and litigious parties cannot easily observe.

Because empirical evidence indicates that the loan market is highly segmented, future research should examine the impact of lender characteristics on loan characteristics that is taking into account self-selection among borrowers and lenders [32] [33]. Moreover, it is important to examine how macro-economic shocks (such as recessions or a credit crunch) affect the use of collateral [34], [35].

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Appendix 1: Variables definition

Dependent variables	
Interest rate premium	Difference between the contractual interest rate and the prime rate
Business collateral	Equals 1 if the firm is required to post business collateral; 0 otherwise
Personal collateral	Equals 1 if the owner is required to post personal collateral/guarantees; 0 otherwise
Independent variables	
Credit quality	Equals 1 if the firm show a low level of financial distress; 0 otherwise
Firm size	Natural logarithm of firm's total assets
Loan size	Natural logarithm of the loan size measured in pounds
Loan maturity	Natural logarithm of the loan maturity in years
Fixed rate	Equals 1 if the loan has a fixed rate; 0 otherwise
Relationship length	Natural logarithm of the relationship length in years with the main bank
Control variables	
Industry	Equals 1 it the firms belongs to industry x (with x varying 1 to 9 to distinguish among 9 industries); 0 otherwise
Organizational form	Equals 1 it the firms belongs to organizational form x (with x varying 1 to 4 to distinguish legal organizational forms); 0 otherwise
Instrumental variables	
Firm delinquency	Equals 1 if the firms has previously defaulted; 0 otherwise
Fixed assets	Equals 1 if the loan must be supported by a compensating balance sheet assets; 0 otherwise
CEO age	Natural logarithm of the age of the CEO in years

Appendix 2: Descriptive statistics and correlations

	Mean	Median	1	2	3	4	5	6	7	8	9	10	11	12
Interest rate premium	1	4.35	5	1										
Business collateral	2	0.36	0	-0.14^{**}	1									
Personal collateral	3	0.21	0	-0.01	-0.24^{**}	1								
Credit quality	4	0.58	0	-0.087	0.14^{**}	-0.01	1							
Firm size	5	1,519,540	750,000	-0.22^{**}	0.32^{**}	-0.12^{***}	0.09^{***}	1						
Loan size	6	546,073.62	750,000	-0.27^{**}	0.29^{**}	0.02	0.04	0.52^{**}	1					
Loan maturity	7	9.62	12.50	-0.10^{***}	0.20^{**}	0.02	0.02	0.14^{**}	0.26^{**}	1				
Fixed rate	8	0.40	0.50	0.51^{**}	-0.14^{**}	-0.11^{***}	-0.06	-0.15^{**}	-0.19^{**}	-0.19^{**}	1			
Relationship length	9	14.50	10.00	0.04	0.10^{***}	-0.03	0.13^{**}	0.18^{**}	0.13^{***}	-0.01	-0.06	1		
Firm delinquency	10	0.22	0	0.20^{**}	-0.08	0.017	-0.19^{**}	-0.12^{***}	-0.11^{***}	-0.02	0.08	0.07	1	
Fixed assets	11	0.53	1	-0.07	0.19^{**}	-0.07	0.11^{***}	0.12^{***}	0.09	0.13^{*}	-0.06	-0.02	-0.05	1
CEO age	12	50.04	43.00	0.03	0.03	0.09^{***}	0.09	0.13^{**}	0.06	-0.02	-0.10^{***}	0.26^{**}	-0.06	-0.02	1

***, ** Significant at 1% and 5% level.

Table 1. Simultaneous system of equations estimations

Instrumented variable	IRP			BC			PC		
Instrumental variable	PC / CEO age			PC / CEO age			IRP / Firm delinquency		
	Coef.	S.E.		Coef.	S.E.		Coef.	S.E.	
Interest rate premium (fitted value)				0.059	(0.060)		0.071	(0.311)	
Business collateral (fitted value)	1.393	(0.547)	**				-120.180	(60.836)	*
Personal collateral (fitted value)	6.005	(1.887)	***	-16.243	(1.835)	***			
Credit quality	-0.505	(0.285)	*	0.930	(0.312)	***	7.352	(3.754)	*
Firm size	-0.001	(0.095)		-0.207	(0.097)	**	2.944	(1.407)	**
Loan size	-0.576	(0.148)	***	0.616	(0.132)	***	3.707	(2.088)	*
Loan maturity	-0.159	(0.219)	***	0.995	(0.263)	***	2.371	(1.687)	*
Relationship length	0.059	(0.028)	**	-0.094	(0.031)	***	-0.499	(0.286)	*
(Relationship length)^2	-0.001	(0.001)	***	0.002	(0.001)	***	0.014	(0.007)	*
Fixed rate	3.117	(0.336)		-1.485	(0.357)		-5.629	(3.060)	
Constant	8.500	(1.500)	***	-4.720	(1.803)	***	-94.332	(46.354)	**
N	326			326			326		
R-Square/Log-Likelihood	0.316			330.35			319.97		

Notes: This table presents the results of two-stage least-squares (2SLS) regressions treating IRP, BC and PC as endogenous variables from a sample of 326 firms reported by the UK Survey of Small and Medium-sized Enterprises Finance (UKSMEF) from 2008. For variables definitions see appendix 1. Standard errors are reported in parentheses. This study controls for industry (nine dummy variables) and organizational form (four dummy variables), but these results are not reported here. *** Statistically significant at 1% level. ** Statistically significant at 5% level. * Statistically significant at 10% level.

Table 2. Simultaneous system of equations estimations with interaction effects

Instrumented variable	IRP		BC		PC	
Instrumental variable	PC		PC		IRP	
	CEO age		CEO age		Firm delinquency	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Interest rate premium (fitted value)			0.506	(0.056)	-0.046	(0.075)
Business collateral (fitted value)	5.125	(0.870) ***	-14.874	(1.507) ***	-21.737	(3.301) ***
Personal collateral (fitted value)	21.353	(3.382) ***	0.587	(0.304) **	0.785	(0.434) *
Credit quality	-0.444	(0.311)	0.198	(0.490)	1.282	(0.669) *
INTER1	-2.080	(0.491) ***	-0.152	(0.087) *	0.699	(0.156) ***
Firm size	0.294	(0.109) **	0.581	(0.124) ***	0.814	(0.188) ***
Loan size	-1.353	(0.199) ***	0.993	(0.242) ***	2.283	(0.424) ***
Loan maturity	-0.648	(0.231) ***	-0.925	(0.525) *	-2.636	(0.748) ***
Relationship length	0.072	(0.032) **	0.003	(0.144)	0.283	(0.197)
INTER2	0.042	(0.025) *	0.206	(0.119) *	0.740	(0.200) ***
(Relationship length)²	-0.002	(0.001) ***	-1.224	(0.318) ***	-0.885	(0.390) **
Fixed rate	4.620	(0.429) ***				
Constant	10.802	(1.456) ***	-4.751	(1.803) ***	-18.179	(3.318) ***
N	326		326		326	
R-Square/Log-Likelihood	0.296		314.71		273.42	

Notes: This table presents the results of two-stage least-squares (2SLS) regressions treating IRP, BC and PC as endogenous variables from a sample of 326 firms reported by the UK Survey of Small and Medium-sized Enterprises Finance (UKSMEF) from 2008. The variable INTER 1 is the interaction of the variable credit quality with young firms. The variable INTER 2 is the interaction between the variable relationship length and older firms. According a quartile split young firms are firms that have been in business for less than eight years and older firms are defined as those that persisted long enough to reach the third quartile – 15 years. For the remain variables definitions see appendix 1. Standard errors are reported in parentheses. This study controls for industry (nine dummy variables) and organizational form (four dummy variables), but these results are not reported here. *** Statistically significant at 1% level.** Statistically significant at 5% level.* Statistically significant at 10% level.