U.S. BANKING SECTOR DEVELOPMENT AND GROWTH NEXUS

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ABSTRACT

This paper analyzes the dynamic nexus of economic growth and banking sector development across all 50 US states using annual panel data spanning over 1999-2013. Dynamic Panel Cointegration, Dynamic OLS, and Dynamic GMM empirical methodologies are implemented in addition to Dumitrescu-Hurlin and Granger causality tests. The results lead to the same conclusion with some exceptions in support of the Supply-Leading and the Demand-Following hypotheses. Moreover, the results reveal discernible bidirectional causality among real per capita gross state product, bank loan, bank deposit and competing other financial institutions. Thus, policy focus should be on simultaneous promotion of both. **JEL Classifications:** G20, G21

INTRODUCTION

The volume of empirical literature on economic growth and financial development nexus is vast and swelling. Overall financial development concept is fairly broad since it is both bank-based and market-based. The earlier studies that laid foundations for discussions in the overall context include Schumpeter (1911, 1952), Friedman and Schwartz (1963), McKinnon (1973) and Shaw (1973). Their theoretical assertions of positive causal linkages between the above subsequently came under microscopic empirical scrutiny in numerous studies (e.g., King and Levine, 1993a, Allen and Nikumana, 1998; Levine, Loayza and Beck, 2000; Blum, et al., 2002; Tran, 2008; Christopoulos and Tsionas, 2004; Shabhaz, et al. 2010; Adusei, 2012; Loaza and Rancie're, 2006; Demirgue-Kunt and Degatriache, 2000; Gourinchas, Landerretche and Valde's, 2001, Kaminsky and Reinhart,1999; Roussea and Vuthipadadorn, 2005; Apergis, Filippidis and Economidou, 2007; Lucas, 1988; Graff, 1999). In brief, the empirical findings of the aforementioned are mixed in terms of positive causality, bidirectional causality and absence of causality.

The sole focus of this paper is on the impact of bank-based financial development on economic growth because it seems better than the market-based financial development. In particular, it is argued that economic growth could be encouraged more in a bank-based system because it can induce longer-term investment in the real sector, whereas investment in a market-based system is particularly too sensitive to fluctuations in stock prices with short-term investment (Hoshi, Kashyap, and

Scharfstein, 1990).

Without powerful banks to enforce repayment, external investors would be reluctant to finance industrial expansion. If banks are not hampered by regulatory restrictions on their activities, they can exploit economies of scale in information processing, moral hazard amelioration through effective monitoring, and in the formation of long-run relationships with firms of all sizes to ease asymmetric information distortions thereby boosting economic growth.

The bank-based system can encourage productive investment because it is less affected by unstable financial markets. Even in recessions, the close relationship between banks and businesses can allow firms of all sizes to continue investment without pushing them into bankruptcy (Odhiambo, 2011). Futhermore, it is argued that expensive government policies cab be carried out more easily in a bank-based system because it provides governments with more measures with which to intervene in the financial sector (such as credit policy and interest rate regulation) than a market-based system (Pollin, 1995).

However, the bank-based financial system is not without its own disadvantages. According to Odhiambo (2011), a bank-based system is vulnerable to problems, such as, inefficient capital allocation, an intimate relationship between banks and firms and a higher debt ratio. Banks may not be effective gatherers or processors of information in new and uncertain situations involving innovative products and processes (Allen and Gale, 1999).

This study investigates the dynamic short-run and long-run relationship among the growths in real per capita gross state products, bank loan, bank deposit and other competing financial institutions, for 50 U.S. states. The panel unit root, panel cointegration, panel dynamic OLS (DOLS), panel dynamic GMM estimation, vector error-correction estimation, Dumrescu- Hurlin pairwise causality test and Granger causality test for the period 1999-2013. The main strength of this study is ingrained in the applications of several sophisticated and relatively new econometric techniques to ascertain if they yield similar findings.

The remainder of the paper proceeds as follows: a brief survey of directly related literature; empirical methodologies; empirical results; conclusions and implications.

BRIEF SURVEY OF DIRECTLY RELATED LITERATURE

The role of the banking-sector development in promoting economic growth has received enormous attention over the recent decades as a focal point of several theoretical and empirical studies (e.g., King et al., 1993; Paganom 1993; Levine, 2005; Ang, 2008). Various authors use variables such as the ratio of deposit money assets to GDP, the ratio of financial system deposit to GDP, liquid liabilities as a share of GDP, private credit as a share of GDP, bank overhead costs, net interest margin, concentration ratio, returns on assets, return on equity and cost to income ratio as proxies for the level of development in the banking sector. Despite a sizeable body of empirical literature on this subject, the direction of the causal effect between banking-sector development and economic growth has been inconclusive. It is thus still open to questions whether banking-sector development enhances economic growth or whether economic growth drives the development of the banking sector. To this effect, four possible related hypotheses and the corresponding empirics merit some discussions.

First, the supply-leading hypothesis (SLH) contends that banking-sector development is a necessary pre-condition to economic growth (Shaw, 1973; King et al., 1993a, b). In other words, the causality runs from the banking-sector development to economic growth. The proponents of this hypothesis maintain that banking-sector development may induce higher economic growth by directly facilitating and increasing savings in the form of financial assets, thereby spurring capital formation and hence promoting economic growth (e.g., Levine, 1997; Neusser and Kugler, 1998; Levine et al., 2000; Chistopoulos and Tsionas, 2004; Quartey and Prah, 2008; Abu-Bader et al., 2008a,b). The impact of the banking sector on the production side of the economy can hardly be over-emphasized (Calderon and Liu, 2008 and Goldsmith, 1969).

Second, the demand-following hypothesis (DFH) suggests that causality runs instead from economic growth to banking-sector development. Supporters of the demand-following hypothesis suggest that banking sector development plays only a minor role in economic growth that is merely a by-product or an outcome of growth in the real side of the economy (Robinson, 1952; Gurley and Shaw, 1967; Goldsmith, 1969; Jung, 1986; Ang, 2008; Odhiambo, 2007; Gries et al., 2009). To explain, as an economy grows, additional banking institutions, banking products and services emerge in the market in response to higher demand for financial services. Thus, the inadequacy of banking institutions in developing countries indicates a lack of demand for their services. Addtionally, as the real side of the economy grows, the banking system develops further, resulting in increasing opportunities for funding investments and diversifying risk (Ang, 2008; Quartey and Prah, 2008; Gries, et al., 2009).

Third, the feedback hypothesis (FBH) suggests that economic growth and banking-sector development can complement and reinforce each other, making banking-sector development and real economic growth mutually interactive. The bidirectional causality implies that banking-sector development is indispensable to economic growth and economic growth essentially requires a developed banking system (Demetriades and Hussein, 1996; Blackburn and Huang, 1998; Levine, 1999; Luintel and Khan, 1999; Khan, 2001; Shan et al., 2001; Calderon and Liu, 2003; Odhiambo, 2007; Wolde-Rufael, 2009; Hassan et al., 2011; Mukhopadhyay et al., 2011; Pradhan and Gunashekar, 2012; Pradhan, et al., 2013).

Fourth, the neutrality hypothesis is supported by (Chandavarkar, 1992) positing no statistically significant relationship between banking-sector development and economic growth. Recently, Raz (2013) found significant causal linkage between bank credit development and economic growth in Indonesia over the period of 1985-2011. Nyasha and Odhiambo (2015) evidenced a positive relationship between economic growth and bank-based financial development in South Africa from 1980 to 2012. Pradhan, et al. (2014) unveiled long-run causal link between banking-sector development and economic growth for a panel of 34 OECD countries over the period spanning over 1960-2011. Overall, the mixed empirical results are largely attributed to differences in econometric techniques used, sample periods, countries studied and proxies for banking sector development.

EMPIRICAL METHODOLOGIES

To restate, this paper studies the dynamic causal relationships among the growths of real per capita gross state product, bank loan, bank deposit and other competing financial institutions for 50 U.S. states using panel unit root, panel conitegration, panel dynamic OLS (DOLS), following Saikonen (1992) and Stock and Watson (1993), panel dynamic GMM estimation, vector error-correction estimation (Engle and Granger, 1987), Dumitrescu and Hurlin (2012) pairwise causality test and well-known Granger causality test for the sample period 1999-2013. Annual data from 1999 through 2013 are employed, as obtained from the World Bank, the US Bureau of Labor Statistics, the International Monetary Fund and the Federal Reserve System. Baltagi (2008) provides a summary of the advantages of panel data. Some of the advantages include: (i) controlling for individual heterogeneity; (ii) more informative data, degrees of freedom, efficiency and less collinearity among the variables; (iii) allowing the construction and testing of more complicated models; and (iv) panel unit root tests that have more standard asymptotic distributions.

To investigate the possibility of panel cointegration, it is first necessary to determine the existence of unit roots in the pooled data set. Panel unit root tests, proposed by Im, Peseran and Shin (IPS) (1997, 2003); Hadri (1999); Levin, Lin and Chu (LLC) (2002) and Breitung (2000) are invoked.

The next step is to test for the existence of cointegrating relationships among LGSP, LLOAN, LDEPT and LINST following Pedroni (1999, 2000 and 2001). Four panel statistics and three group panel statistics to test the null hypothesis of no cointegration against the alternative hypothesis of cointegration are applied. In the case of panel statistics, the first-order autoregressive term is assumed to be the same across all the cross sections. If the null hypothesis is rejected in the panel case, then the variables are co-integrated. On the other hand, if the null hypothesis is rejected in the group panel case, then cointegration among the relevant variables exists.

Pedroni's panel cointegration tests are residual-based tests for the null of no cointegration in heterogeneous panels. Two classes of statistics are considered in the context of Pedroni test. The first type is based on pooling the residuals of the regression along the within-dimension of the panel, whereas the second type is based on pooling the residuals of the regression along the between-dimension of the panel. For the first type, the test statistics are the panel v-statistic, the panel ρ-statistic, the panel PP-statistic, and the panel ADF-statistic. These statistics are constructed by taking the ratio of the sum of the numerators and the sum of the denominators of the analogous conventional time series statistics across the individual members of the panel. The tests for the second type include the group ρ-statistic, the group PP-statistic, and the group ADF-statistic. They are simply the group mean statistics of the conventional individual time series statistics. All statistics have been standardized by the means and variances so that they are asymptotically distributed $N(0,1)$ under the null hypothesis of no cointegration. As one-sided tests, large positive values of the panel ρ-statistic reject the null hypothesis of no cointegration. For the remaining statistics, large negative values reject the null hypothesis. In addition, Kao Cointegration test is applied for further confirmation of the findings.

Panel Dynamic OLS and Vector Error-Correction Estimation

To complement the cointegration results, the dynamic OLS (DOLS) approach and the maximum-likelihood estimates (MLE) are applied for estimating the vector error-correction models. The panel Dynamic Ordinary Least Squares (DOLS) methodology provides the estimation of the statistical long-run relationship augmented by lags. This improves the efficiency of the long-run estimates but does not provide guidance on the short-run behavior. For bidirectional causality, the following four models are estimated by DOLS:

$$LGSP_{it} = \alpha_0 + \alpha_1 LLON_{it} + \alpha_2 LDEPT_{it} + \alpha_3 LINST_{it} + \quad (1)$$

$$LLOAN_{it} = \delta_0 + \delta_1 LGSP_{it} + \delta_2 LDEPT_{it} + \delta_3 LINST_{it} + \quad (2)$$

$$LDEPT_{it} = \lambda_0 + \lambda_1 LGSP_{it} + \lambda_2 LDEPT_{it} + \lambda_3 LINST_{it} + \quad (3)$$

$$LINST_{it} = \beta_0 + \beta_1 LGSP_{it} + \beta_2 LDEPT_{it} + \beta LLOAN_{it} + \quad (4)$$

Where, LGSP is the economic growth indicator as measured by the logarithm of real per capita gross state product, LLOAN, LDEPT and LINST are the logarithms of bank loan, bank deposit and other competing financial institutions, (Large credit unions, and Savings and Loan Associations), respectively. LLOAN, LDEPT and LINST are used as indicators of bank-based financial development in this paper unlike a host of previous studies. Additionally, i= 1, 2, 3, 50 and t= 1999, 2000,….., 2013.

Dynamic GMM Method

Next, this paper uses the GMM dynamic panel method, developed by Arellano and Bond (1991) and Arellano and Bover (1995). The advantage of this methodology is that it points out the econometric problems caused by unobserved country-specific effects and endogeneity of the independent variables in lagged–dependent-variable models. This methodology allows the relaxing of strong exogeneity of the explanatory variables by allowing them to be correlated with current and previous realizations of the error term. The inclusion of both cross-country and time-series data induces additional information about the over-time change in the dependent variable and its determinants to obtain more precise results. To this effect, the above models are estimated on first-difference differencing.

For long-run causal flows and short-run dynamics in terms of interactive feedback effects, the following VECMs for LGSP, LLOAN, LDEPT, and LINST as dependent variables are specified, respectively following (Engle and Granger, 1987):

$$\Delta LGSP_{it} = \alpha_1 + \lambda_1 \mathcal{E}_{it-1} + \sum_{i=1}^{m} \beta_{it}\,\Delta LGSP_{it-j} + \sum_{i=1}^{n} \psi_{it}\,\Delta LLOAN_{it-j} + \sum_{i=1}^{K} \Pi_{it}\,\Delta LDEPT_{it-j} + \sum_{i=1}^{l} \Phi_{it}\,\Delta LINST_{it-j} + \mathcal{E}_{it} \quad (5)$$

$$\Delta LLOAN_{it} = \alpha'_1 + \lambda_2 \mathcal{E}'_{it-1} + \sum_{i=1}^{m} \beta'_{it}\,\Delta LLOAN_{it-j} + \sum_{i=1}^{n} \psi'_{it}\,\Delta LGSP_{it-j} + \sum_{i=1}^{K} \Pi'_{it}\,\Delta LDEPT_{it-j} + \sum_{i=1}^{l} \Phi'_{it}\,\Delta LINST_{it-j} + \mathcal{E}'_{it} \quad (6)$$

$$\Delta LDEPT_{it} = \alpha''_1 + \lambda_3 \mathcal{E}''_{it-1} + \sum_{i=1}^{m} \beta''_{it} \Delta LDEPT_{it-j} + \sum_{i=1}^{n} \psi''_{it} \Delta LGSP_{it-j} + \sum_{i=1}^{K} \Pi''_{it} \Delta LLOAN_{it-j} + \sum_{i=1}^{l} \Phi''_{it} \Delta LINST_{it-j} + \mathcal{E}''_{it} \quad (7)$$

$$\Delta LINST_{it} = \alpha'''_1 + \lambda_{14} \mathcal{E}'''_{it-1} + \sum_{i=1}^{m} \beta'''_{it} \Delta LINST_{it-j} + \sum_{i=1}^{n} \psi'''_{it} \Delta LGSP_{it-j} + \sum_{i=1}^{K} \Pi'''_{it} \Delta LLOAN_{it-j} + \sum_{i=1}^{l} \Phi'''_{it} \Delta LDEPT_{it-j} + \mathcal{E}'''_{it} \quad (8)$$

λ_1, λ_2, λ_3 and λ_4 are the numerical coefficients of the error-correction terms (E_{it-1}'s) in models (5), (6), (7) and (8), respectively. The expected sign of each of the above is negative for long-run convergence. Also, the magnitude of each numerical coefficient reveals the speed of adjustments toward long-run equilibrium. The sum of the coefficients of lagged variables show short-run net interactive feedback effect.

Causality Tests

Finally, both pairwise Dumitrescu-Hurlin panel causality tests and Granger causality tests are performed.

EMPIRICAL RESULTS

Results of Panel Unit Root Tests are reported in Table 1. As observed in Table 1, the results of panel unit root tests portray a mixed picture of the orders of integration of the variables. LLC, Breitung, and Hadri tests strongly reject the null hypothesis of unit root. The IPS test cannot reject the presence of unit root for all four variables. The Hadri test has a different null hypothesis (stationarity) and provides strong evidence of unit root for all variables The LLC test rejects the presence of unit root for LGSP and LDEPT. On first differencing, stationarity is restored in all four variables as shown in the lower panel.

Table 2 contains the Pedroni and Kao cointegration tests results using the Bayesian information criterion (BIC) to automatically select the appropriate lag-length. The Pedroni and Kao tests are based on the residuals of the regressions. All tests are derived under the null hypothesis of no cointegration. With the exception of Pedroni's Panel-v statistics, panel-rho, and group-rho statistics in case of constant + trend, reject the null hypothesis of no cointegration among the variables This means that these variables have a significant long-run relationship. Kao test (1999) results are reported at the bottom of Table 2. This test also rejects the null hypothesis of no cointegration at 1% level of significance. Once again, the results strongly reaffirm the presence of cointegrating relationships among the variables.

DOLS results are reported in Table 3. In growth model, the coefficients of bank loan (2.218) and bank deposit (8.3218) are positive and significant at 1% level of significance suggesting that they lead the growth of real per capita gross state product in the long run. On the other hand, other competing financial institutions have significant negative effect on such growth rate. In the bank loan model, growths in real per capita gross state product and bank deposit have significant positive effects on bank loan growth, but growth of other competing financial institutions have significant negative effect on bank loan growth. In the bank deposit model, growths in real per capita gross state product and other competing financial institutions have significant positive effects on bank deposit growth. In the model for other competing financial institutions, growths in real per capita gross state product and bank deposit have significant negative effects on the growth in other competing financial institutions, but bank loan growth has significant negative effect. The results suggest, as real per capita gross state product rises, the banking sector develops. Also, the banking sector development spurs economic growth. To add further, the dynamic OLS results support both 'supply-leading' and 'demand-following' hypotheses.

GMM estimates are reported in Table 4. In Panel A, the effects of lagged growth in real per capita gross state product and bank loan growth unleash highly significant positive effects on the current growth of real per capita gross state product. In contrast, lagged growths in bank deposit and other competing financial institutions have significant negative effects on the growth in per capita gross state product. Panel B shows that preceding bank loan growth and growth in real per capita gross state product have significant positive effects on current bank loan growth. But other competing financial institutions have significant negative effect on bank loan growth. Panel C shows that previous periods' bank deposit growth, bank loan growth and growth in real per capita gross state product have significant positive effects on current bank deposit growth. In contrast, other competing financial institutions have significant negative effect on current bank deposit growth. Panel D indicates that previous periods' growth in other competing financial institutions, growth in real per capita gross state product and bank loan growth have significant positive effects, but bank deposit growth has significant negative effect on growth in other competing financial institutions. GMM J-statistics at 505 in LGSP model, 657.8875 in LLOAN model, 810.9393 in LDEPT model, and 7.98.9950 in LINST model confirm no misspecifications of the models. The GMM estimates indicate that real per capita gross state product growth has significant positive impact on bank loan growth (LLOAN model), bank deposit growth (LDEPT model) and growth in other competing financial institutions (LINST model). The estimates indicate that bank loan growth has significant positive impact on (LGSP model), (LDEPT model) and (LINST model).

Thus, both dynamic OLS cointegration estimates and GMM estimates lead to the same conclusions. To add further, the GMM estimates are for short-term impact, while dynamic OLS (DOLS) estimates provide information on the long run.

The estimated results of vector error-correction models are produced in Table 5. The estimated coefficients of the error-correction terms () in all four models are negative, as expected. They are statistically highly significant in terms of the associated respective t-value. The statistical significance of the error-correction terms further affirms the existence of long-run equilibrium relationship among the variables and adjustments take place within the current period based on the disequilibrium of the preceding periods for each model. In model 1, the lagged coefficients of bank loan growth have net positive effect and those of bank deposit have net negative effect on real per capita gross state product growth. In model 2, the lagged coefficients of real per capita gross state product growth and growth in other competing financial institutions have net positive effect, but those of bank deposit growth have net negative effect on bank loan growth. In model 3, the lagged coefficients of real per capita gross state product growth and growth in other competing financial institutions have net positive effect on bank deposit growth. In model 4, none of the lagged coefficients have discernible net effect on growth in other competing financial institutions. From these findings, it is inferred that banking sector development is very important for enhancing real per capita gross state product growth and such growth is also important for spurring banking-sector development.

Pairwise Dumitrescu-Hurlin panel causality test results are shown in Table 6. The results depict bidirectional causality among growths in real per capita gross state products, bank loan, bank deposit and other competing financial institutions. Unidirectional causality runs from economic growth to bank deposit growth and from bank loan growth to bank deposit growth. The results thus support the 'demand-following hypothesis' and 'supply-leading hypothesis' across 50 U.S. states. In other words, the banking sector development is important to promote economic growth. Furthermore, economic growth has relatively stronger influence on the banking sector development. In fact, they mutually reinforce each other by interactions. The results are in disagreement with those of Greenwood and Smith (1997). However, the results are in partial agreement with the neutrality hypothesis, as recorded in Lucas (1988).

Pairwise Granger causality test results are reported in Table 7. In short, the results indicate bidirectional causality among all four variables of interest. However, the causal flows from gross state product to both bank loan and deposits are relatively more robust in terms of the respective F-statistic. Other financial institutions exert greater influence on gross state product than its vice versa. The same is true with regard to the impact of bank deposit on bank loan than its reverse. Likewise, bank loan positively affects that of other financial institutions more than its opposite. Similarly, other financial institutions impact more on bank deposits than its converse.

CONCLUSIONS AND IMPLICATIONS

In recapitulation, the Pedroni and the Kao cointegration tests confirm the presence of long-run relationship among the variables at 1 percent level of significance. The dynamic OLS (DOLS) estimates indicate that growths in bank loan, bank deposit and other competing financial institutions have highly significant positive effect on economic growth at state levels. Also, economic growth and bank deposit growth have highly significant positive effects on bank loan growth. Economic growth and growth in other competing financial institutions have significant positive effect on bank deposit growth. The GMM results reveal that bank loan growth has significant positive impact on economic growth. At the same time, economic growth has significant positive impact on bank loan growth. Both economic growth and bank loan growth have significant positive impact on bank deposit growth. Furthermore, bank loan growth and bank deposit growth have significant positive impacts on growth in other competing financial institutions. The coefficients of the error- correction terms () are negative, as expected. They are statistically highly significant in terms of the associated t-values in all four models signifying long-run equilibrium relationship among the variables with reinforcing short-run feedback effects.

Bank loan growth and bank deposit growth are found interactive and mutually reinforcing in the short run. In this pursuit, commercial banks and their competitors play an important role in the overall economy. As evidenced, both economic growth and banking-sector development are intertwined. Due to their mutual reinforcement and interactions, both need to be emphasized simultaneously in the macroeconomic policy arena. In closing, inclusive expansion of banking services is a necessity to lift per capita median income of all states.

One of the limitations of the paper is its use of heterogeneous panel data set that might have mimicked the actual picture to some extent. The use of state-by-state long time series data could shed more light and provide sharper insights since each state is structurally different. This may be a future possible extension of this paper.

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TABLE 1: PANEL UNIT ROOT TESTS

METHOD				
Variable (level)	**LLC**	**Breitung**	**IPS**	**Hadri**
LGSP	-10.0990 (0.0000)	-1.8799 (0.0301)	0.57377 (0.7169)	15.6886* (0.0000)
LDEPT	-23.6589 (0.0000)	-4.2171 (0.0000)	-23.6589 (0.1646)	45.10756* (0.000)
LLOAN	1.0468 (0.8524)	1.7793 (1.0000)	4.4218 (0.0600)	12.9228* (0.0000)
LINST	8.0089 (1.0000)	-10.4624 (0.0000)	7.4493 (1.0000)	10.2295* (0.0000)
METHOD				
VARIABLE (DIFFERENCES)	LLC	Breitung	IPS	Hadri
LGSP	-5.9785* (0.0000)	-10.8050* (0.0000)	-1.2997 (0.0342)**	4.8477* (0.0000)
LDEPT	-33.7010* (0.0000)	-14.0385* (0.0000)	-33.7010 (0.0000)	-26.0365* (0.0000)
LLOAN	8.6991 (0.0996)	-12.3653* (0.0000)	0.4676* (0.0000)	2.0041** (0.0250)
LINST	-4.6765* (0.0000)	-2.1725* (0.0149)	5.6064 (1.0000)	13.1377* (0.0000)

Note: LLC = Levin, Lin, Chu (2002) IPS = Im, Pesaran and Shin (2003). The statistics are asymptotically distributed as standard normal with a left hand side rejection area, except the Hadri test, which is right sided. * and ** indicate the rejection of the null hypothesis of nonstationarity (LLC, Breitung, IPS) or staitonarity (Hadri) at 1 and 5 percent level of significance, respectively. Total number of observations (NT) range between 861 and 867.

TABLE 2: THE PEDRONI PANEL CO-INTEGRATION TEST

Test	Constant + Trend
Panel v-Statistic	-1.4021 (0,9196)
Panel rho-Statistic	2.9059 (0.9982)
Panel PP-Statistic	-6.4522 (0.0000)*
Panel ADF-Statistic	-6.4522 (0.0000)*
Group rho-Statistic	5.6386 (1.0000)
Group PP-Statistic	-5.6386 (0.0000)*
Group ADF-Statistic	-5.3050 (0.0000)*
Kao Test	-20..99366 Prob. 0.0000

Note: All reported values are asymptotically distributed as standard normal. Probability Statistics are within parentheses. * indicates the rejection of the null hypothesis of no cointegration at 1% level of significance.

TABLE 3: PANEL DYNAMIC ORDINARY LEAST SQUARES (DOLS)

Table 3A: Dependent Variable: LGSP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LLOAN	2.218386	5.06E-11	4.38E+10	0.0000
LDEPT	8.321830	1.73E-10	4.81E+10	0.0000
LINST	-10.69039	2.44E-10	-4.38E+10	0.0000

Table 3B: Dependent Variable: LLOAN

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGSP	1.196298	8.18E-12	1.46E+11	0.0000
LDEPT	5.631936	7.94E-12	7.09E+11	0.0000
LINST	-1.733163	7.66E-12	-2.26E+11	0.0000

Table 3C Dependent Variable: LDEPT

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LLOAN	-7.707021	4.77E-12	-1.62E+12	0.0000
LGSP	8.916713	1.43E-11	6.23E+11	0.0000
LINST	14.82592	8.67E-12	1.71E+12	0.0000

Table 3D: Dependent Variable: LINST

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGSP	-0.604073	1.45E-12	-4.17E+11	0.0000
LLOAN	0.560614	6.32E-13	8.87E+11	0.0000
LDEPT	-0.117301	1.36E-12	-8.65E+10	0.0000

TABLE 4: RESULTS OF PANEL GENERALIZED METHODS OF MOMENTS (GMM)

Panel A: Dependent Variable: LGSP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.713152	0.341630	22.57750	0.0000
LGSP(-1)	0.425847	0.035046	12.15022	0.0000
LLOAN	0.230250	0.012877	17.88088	0.0000
LDEPT	-0.219997	0.015436	-14.25226	0.0000
LINST	-0.344507	0.028695	-12.00591	0.0000
R-square	0.965736	J-statistic		505.5681
Adjusted R-square	0.965567	Prob (J-statistic)		0.000000

Panel B: Dependent Variable: LLOAN

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LLOAN(-1)	0.808454	0.018021	44.86188	0.0000
LGSP	1.382656	0.066034	20.93849	0.0000
LDEPT	-0.385404	0.031750	-12.13821	0.0000
LINST	-0.847279	0.050169	-16.88865	0.0000
R-square	0.989256	J-statistic		657.8875
Adjusted R-square	0.989216	Prob (J-statistic)		0.000000

Panel C: Dependent Variable: LDEPT

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LDEPT(-1)	0.709072	0.014728	48.14471	0.0000
LLOAN	0.060225	0.018950	3.177940	0.0015
LGSP	0.619445	0.042210	14.67520	0.0000
LINST	-0.476093	0.029695	-16.03278	0.0000
R-square	0.994555	J-statistic		810.9393
Adjusted R-square	0.994535	Prob (J-statistic)		0.000000

Panel D: Dependent Variable: LINST

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINST(-1)	0.798930	0.004507	176.8612	0.0000
LDEPT	-0.144304	0.002094	-68.92659	0.0000
LOAN	0.042506	0.002443	17.40252	0.0000
LGSP	0.265098	0.007566	35.03750	0.0000

R-square	0.998136	J-statistic	798.9950
Adjusted R-square	0.998129	Prob (J-statistic)	0.000000

TABLE 5: VECTOR ERROR-CORRECTION ESTIMATES

Model No:	Δ(LGSP) 1	Δ (LLOAN) 2	Δ (LDEPT) 3	Δ (LINST) 4
ECM_{t-1}	-0.083349	-2.033715	-1.982509	-1.832744
	[-3.80100]	[-16.8269]	[-17.0279]	[-19.0090]
Δ(LGSP(-1))	-0.492680	0.761338	0.787571	0.172619
	[-16.0696]	[4.50540]	[4.83808]	[1.28052]
Δ(LLOAN(-1))	0.092633	-0.542686	-0.032175	-0.029221
	[4.04430]	[-4.29874]	[-0.26457]	[-0.29016]
Δ(LDEPT(-1))	-0.062868	-0.026914	-0.503859	-0.009653
	[-2.53354]	[-0.19678]	[-3.90018]	[-0.08848]
Δ(LINST(-1))	0.008198	0.797984	0.760096	0.064975
	[1.04324]	[18.4246]	[18.2179]	[1.88057]
C	0.000318	-0.000464	-8.07E-05	0.001792
	[0.03408]	[-0.00902]	[-0.00163]	[0.04370]
R-square	0.359439	0.597771	0.580525	0.495319
Adj. R-square	0.355710	0.595429	0.578084	0.492382
F-statistic	96.40239	255.3194	237.7600	168.6131

TABLE 6: PAIRWISE DUMITRESCU-HURLIN PANEL CAUSALITY TESTS

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
LLOAN does not homogeneously cause LGSP	1.70202	-1.76567	0.0775
LGSP does not homogeneously cause LLOAN	4.82690	5.14871	3.E-07
LDEPT does not homogeneously cause LGSP	2.66207	0.35861	0.7199
LGSP does not homogeneously cause LDEPT	4.87481	5.25471	1.E-07
LINST does not homogeneously cause LGSP	5.18072	5.93161	3.E-09
LGSP does not homogeneously cause LINST	3.68098	2.61315	0.0090
LDEPT does not homogeneously cause LLOAN	2.81988	0.70780	0.4791
LLOAN does not homogeneously cause LDEPT	1.62854	-1.92826	0.0538
LINST does not homogeneously cause LLOAN	5.30124	6.19827	6.E-10
LLOAN does not homogeneously cause LINST	5.92170	7.57117	4.E-14
LINST does not homogeneously cause LDEPT	4.35220	4.09836	4.E-05
LDEPT does not homogeneously cause LINST	3.32197	1.81877	0.0689

TABLE 7: PAIRWISE GRANGER CAUSALITY TESTS

Null Hypothesis:	Obs	F-Statistic	Prob.
LLOAN does not Granger Cause LGSP	765	64.6769	1.E-26
LGSP does not Granger Cause LLOAN		183.422	1.E-65
LDEPT does not Granger Cause LGSP	765	101.159	1.E-39
LGSP does not Granger Cause LDEPT		185.243	3.E-66
LINST does not Granger Cause LGSP	765	196.867	1.E-69
LGSP does not Granger Cause LINST		139.877	2.E-52
LDEPT does not Granger Cause LLOAN	765	107.155	1.E-41
LLOAN does not Granger Cause LDEPT		61.8846	1.E-25
LINST does not Granger Cause LLOAN	765	201.447	6.E-71
LLOAN does not Granger Cause LINST		225.025	2.E-77
LINST does not Granger Cause LDEPT	765	165.384	2.E-60
LDEPT does not Granger Cause LINST		126.235	5.E-48