The Service Industries Journal
Vol. 32, No. 5, April 2012, 699–717

Routledge
Taylor & Francis Group

The impact of banks and non-bank financial institutions on economic growth

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(*Received 30 June 2009; final version received 26 August 2010*)

Empirical studies examining the relationship between financial sector development and economic growth without including non-bank financial institutions (NBFIs) will likely generate biased empirical results. This study provides evidence that NBFIs can have a statistically significant negative impact on economic growth using cross-country data for both emerging and advanced countries. This finding suggests that these non-bank institutions, often loosely regulated, may introduce an excessive level of risk into the financial sector and the general economy. It is consistent with the current global financial crises where NBFIs, such as investment banks and insurance companies, introduced an excessive level of risk into the global economy. Hence, policy-makers may need to consider more timely and effective regulation of NBFIs and insure that adequate transparency and disclosure is provided to all financial markets participants.

Keywords: economic growth; non-bank financial institutions; risk; regulation

Introduction

A growing body of empirical evidence confirms that financial sector development (FSD) can play an essential role in promoting economic growth (Beck & Levine, 2002; Demirguc-Kunt & Maksimovic, 2002; Levine, 2002). Since the basic functions of a financial system can be performed by various types of institutions, under different sets of regulations, it is not clear which broad type of financial structure, bank-dominated or market-based, can more effectively promote economic development. On the other hand, Liang and Reichert (2007) found evidence that a shift in the relative importance from bank-based to market-based financial sector drivers of economic growth takes place for a country's level of economic development expands. These complementary and substitute roles between stock markets and the banking sector focus the debate as to precisely how institutions, markets, law, regulation, and macroeconomic factors interact to promote economic growth (Demirguc-Kunt, 2006; Levine, 2005; Liang & Reichert, 2008, 2010).

The weakness in many of the current empirical models suggests that there are still important variables which have not been included in current economic growth models. For example, Levine (2005) indicates that potentially important non-traditional financial institutions, such as finance companies, pension funds, and mutual funds, are often ignored. As returns on traditional financial intermediation services have declined, it has forced intermediaries to adjust by offering new products and approaches. An example is a shift from direct to indirect investing via pension and mutual funds. Furthermore,

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ISSN 0264-2069 print/ISSN 1743-9507 online

http://dx.doi.org/10.1080/02642069.2010.529437
http://www.tandfonline.com

according to Allen and Santomero (1997, 2001), the net interest rate spread associated with traditional intermediation services has dramatically declined for many banks and has been replaced by greater reliance on fee income derived from sophisticated risk management services such as derivatives. The same basic functions of a financial system can be performed by different institutions or by following different rules of conduct. As the current financial crisis demonstrates, financial intermediaries play a critical role in the economy; therefore, without modeling a wide range of institutions within the financial sector, the empirical results are possibly biased.

From the policy-maker's point of view, if empirical results can provide evidence that commercial banks are no longer the major type of financial institution influencing the relationship between FSD and economic growth, then the restrictions on banking activities, especially those limiting the integration of banking and commerce, might not be an important concern in the current financial environment. The Glass–Steagall Act of 1993 separated commercial banking from the securities industries. However, in many countries, non-depository institutions face substantially less regulation than their commercial banks counterparts. Thus, if this study finds that non-bank financial institutions (NBFIs) have a significant positive impact on economic growth, one can legitimately question such restrictions on banking and commerce. On the other hand, as was dramatically demonstrated during the recent global financial crises, lax, ineffective, or non-existent financial regulation may lead to excessive risk taking on the part of both financial institutions and investors. Many observers point to the excessive risk undertaken during the financial crisis by NBFIs such as investment firms and hedge funds.

Economic theory would suggest that a well-designed, managed, and regulated financial sector can play an important positive role in promoting economic growth. In contrast, a financial sector where the incentives are skewed toward excessive risk-taking and where financial regulation is antiquated and possible non-existence, as was true in the case of credit derivatives, the sector can discourage capital formation and curtail economic development. The ultimate impact is essentially an empirical question which may vary by country and time period.

In this study, the authors explore the impact of NBFIs on economic growth by extending Odedokun's (1996) neoclassical growth model. As mentioned above, Liang and Reichert (2007) found evidence that a shift in the relative importance of bank-based and market-based financial sector factors takes place as the level of economic development expands. Thus, to capture these differences, the estimation sample will be divided into developed and emerging market countries with the expectation that different factors and the relative importance of common factors will vary by the level of economic development. Furthermore, the impact of various types of financial institutions might potentially be highly correlated. To address these high correlations, a principal components analysis is conducted to reduce the number of variables in the model and to transform a set of correlated variables into a set of orthogonal variables. Furthermore, the unique impact of NBFIs on economic growth can be estimated by controlling the impact of commercial banks and central banks economic growth model.

By adopting a cross-country study, this study provides insights as to how best to design and regulate the financial sector to promote the maximum level of economic growth. Even though several studies have linked financial crises and banking sector development, more work is needed to examine the relationship among NBFIs and their management policies and the level of economic growth. This is especially true since a given policy might stabilize a financial system in the short run but hinder long-term competitiveness and economic growth. While previous studies have examined the relationship between FSD and economic

growth, this study is the first one to link in a comprehensive way a wide range of financial intermediaries and economic growth. The second section reviews the literatures relative to the relationship between FSD and economic growth. The third section discusses the methodology and the empirical model. The fourth section states the data sample. The fifth section presents the empirical findings, while the last section summarizes the conclusions.

Literature review

Before one can examine the relationship between FSD and economic growth, one needs a clear understanding of the nature and significance of the economic functions performed by financial intermediaries, and the specific channels, such as efficient resource allocation, through which potential economic benefits flow. Secondly, the relative costs and benefits of intermediation will likely change overtime in response to changes in regulation and financial innovation. Thus, a discussion of the recent changes which have taken place in the financial markets is warranted. Finally, the precise nature of the linkage between financial intermediation and economic growth needs to be discussed.

The theory of financial intermediation

As far back as 1911, Schumpeter argued that the services provided by financial intermediaries, mobilizing savings, evaluating projects, managing risk, monitoring managers, and facilitating financial transactions, are essential for technological innovation and economic development (Schumpeter, 1911). Thus, financial intermediaries become the key agents of society to efficiently allocate savings to entrepreneurs. This view asserts that the development of financial intermediaries has a direct impact on the pace of technical change and productivity growth. An early article by Arrow and Debreu (1954) which focused on resource allocation assumes: (1) financial markets are perfect and complete, (2) the allocation of resource is Pareto-efficient, and (3) there is limited scope for intermediaries to improve society's wealth. Later on, Klein (1971) developed a microeconomic model of the banking firms where regulation defines the uniqueness of banking firms among financial intermediaries since transaction costs and information asymmetries would not exist in a perfect and complete market. Benston and Smith (1976) argued that financial intermediaries exist due to various market imperfections, such as regulation, high search costs, asymmetric information, and significant trading costs. In his view, financial intermediaries have a comparative advantage in lowering transaction costs by exploiting: (1) economies of scale due to specialization, (2) cost-effective access to valuable customer information, and (3) low search costs in matching borrowers and lenders. Fama (1980) suggested that in the absence of regulation, such as reserve requirements or interest rate restrictions on deposits, banks would play only a passive role in the economy.

James (1987) examines the impact of bank loans announcements and finds that bank loans or 'inside debt' defines a unique role for banks from the borrower's point of view. This special role of 'inside debt' is also emphasized by Stulz (2000), where banks collect private information about the borrower's projects. This adverse information about the borrower may make it difficult for the borrower to obtain funds from other sources. Diamond (1996) assigns an important 'delegated monitoring' role to financial intermediaries in reducing the probability of borrower default. In his model, banks or other financial intermediaries act as a monitoring agent for depositors. The bank has its own incentive to monitor its lending contracts and fund its assets with low-cost

unmonitored debt (deposits). The key to successful monitoring is asset diversification on the part of the bank.

More recently, Allen and Santomero (1997, 2001) point out that even though transaction costs and information asymmetries have dramatically declined due to competition and enhanced information technology, the aggregate activities of financial intermediaries have significantly increased but in non-traditional ways. An example is a shift from direct to indirect investing via pension and mutual funds. The net interest rate spread associated with traditional intermediation services has dramatically declined and, for many banks, has been replaced by fee income associated with sophisticated risk management services, such as derivatives. The growing complexity of the financial markets and financial products increases 'participation costs' and defines a new role for banks since its customers need advice to analyze the many sophisticated products being offered. Furthermore, banks use asset securitization and derivatives to transfer risk which cannot be eliminated through diversification. Firms rely on financial intermediaries to provide active risk management services because capital markets are not always efficient and firms desire to smooth earnings over time.

Recent financial sector trends

As mentioned before, when markets are perfect and complete, the allocation of resource is Pareto-efficient and there would be no scope for intermediary to improve social welfare. In addition, the Modigliani–Miller theorem asserts that financial structure does not matter since households can construct well-diversified portfolios, which offset any position taken by intermediaries; hence, financial intermediaries cannot create value. However, reality is not as theory would suggest. First, diversification is not always easy and suitable for all individuals due to high participation costs. Even though technology and financial innovation have substantially reduced information costs and asymmetries, the needs for financial intermediaries have not declined. Capital markets are not perfect and not entirely efficient. Merton (1998) and Diamond (1996) suggest that financial intermediaries can transact at near zero cost and distribute risk across different markets using unmonitored debt (deposits).

Allen and Gale (1994) point out several broad trends in the financial market:

(a) the market capitalization of corporate equity relative to GDP has dramatically increased;
(b) the ratio of the ownership of corporate equity owned by individuals relative to institutional holdings has decreased substantially;
(c) the share of corporate equity owned by financial institutions has significantly increased, and
(d) the share of mutual funds, closed-end funds, and pension funds owned by households has increased dramatically.

The developments of large global financial intermediaries are driven by the perceived benefits of economies of scale and scope and the need for broader diversification (Diamond, 1996). Increased competition, deregulation, and globalization increased the operational challenges and competitive pressures on financial institutions, as witnessed during the current financial crisis. This is especially true for market-based financial systems where competition is especially strong and economic growth puts strong pressures on financial institutions to become increasingly more efficient and forces them to seek non-traditional sources of income. As a result, this one-way flow of causation from FSD to economic growth described by Schumpeter is no longer the only exclusive

model. For example, as discussed in the next, Liang and Reichert (2006) obtain a 'demand-following' role for the FSD during the later stages of economic development as discussed below. Allen and Santomero (1997, 2001) examine the current trend for banks to move away from tradition intermediation services such as deposit taking and lending and focus more on fee-based off-balance sheet activities such as derivatives. As such, banks have emphasized the development and provision of risk management services to their customers. In addition, Bossone (2001) provided a comprehensive look at the future evolution of the banking system.

FSD and economic growth

A good deal of the empirical literature focusses on whether causality runs from FSD to economic growth (supply-leading role) or whether the demand for FSD is a derived demand. Thus, FSD can play either a leading role in economic growth or it may take a more passive role (derived demand) in response to expanding economics needs. In an early paper, Patrick (1966) stated that in the beginning stages of economic development, causation runs from economic development to FSD. This view has been labeled 'demand-following' where the lack of financial institutions in underdeveloped countries is viewed as an indication of the low demand for their services. But as economic growth takes place, the direction of causality may reverse and a 'supply-leading' relationship may develop, where the efficiency gains associated with the intermediation process help stimulate continued economic growth in the later stages of a county's economic growth cycle. Furthermore, expanded FSD can take place along a 'financial sector broadening' dimension where consumers and firms, acting as both investors and borrowers, have more efficient access to basic intermediation service. Expanded access to financial services saves time and lowers transactions costs. To the extent that economies of scale exist, the development of large-scale financial intermediaries and markets drives information and transaction costs even lower.

During the later stage of economic development, both households and firms demand more sophisticated risk management-related services (Allen & Santomero, 2001). Financial intermediates, attempting to take advantage of economies of scope, offer both traditional credit products and risk management services. The result is to move the economy towards a Pareto optimal allocation of both real and financial sector resources. This is an example of 'financial sector deepening'. Ahmed and Chowdhury (2007) evaluate the role of NBFIs in Bangladesh and conclude that this sector has served as a catalyst for economic growth as it provides longer-term funding via the debt and equity markets and acts as a 'systemic risk mitigator' in times of economic distress. On the other hand, in a recent analysis of economic growth in China, Cheng and Degryse (2010) examine the role of both the bank and non-bank financial sectors. Using province-level panel data, the authors find that bank credit in particular contributes to local economic growth. On the other hand, the development of NBFIs was not correlated with economic growth. The authors attribute these differences to recent banking reforms and the fact that non-banking financial institutions are relatively undeveloped compared with the banking sector.

Methodology

Most of the empirical research focusses on the direct relation between FSD and economic growth. Indicators of FSD that have been used in the literature consist of broad measures of banking activity such as the provision of private credit (lending) and measure of

liquidity, such as M2 or M3. In addition, some studies go beyond the banking system and examine the role of the stock market in FSD (Levine, 1998; Liang & Reichert, 2010). Based upon its flexibility and widespread usage, this study adopts Odedokun's neoclassical aggregate production function model to examine the impact of NBFIs on economic growth. While Odedokun's most recent research focusses on the impact of income inequality and international economic aid on economic growth, he published a paper with Jalilian in 2000 which examines the impact of the components of private investment using a generalized Solow model similar to the one employed in his 1996 paper (Jalilian & Odedokun, 2000). Some earlier papers of his employ a similar model to examine the impact of the size of the monetary sector on economic growth among industrial countries Odedokun (1999), the relationship between financial intermediation and economic growth in developing countries Odedokun (1998), and the relative effects of private and public investment on economic growth in developing countries Odedokun (1997). The literature surrounding Solow-type growth models is voluminous and a complete review is beyond the scope of this paper. Some recent papers include Alfo, Giovanni, and Waldmann (2008) who examined cross-country differences to improve an extended Solow growth model, while Philips (2007) examined growth convergence and allowed for heterogeneous technology, and Jeong and Townsend (2007) examined the sources of total factor productivity, including financial deepening and sectoral-Solow model residuals. Finally, Ding and Knight (2009) use an augmented Solow model to evaluate China's dramatic economic growth.

In Odedokun's Solow-type growth model, FSD is just one of several inputs in the production function as specified in Equation (1). This theoretical model allows the researcher to expand the precise definition of FSD and minimizes the possibility of omitting relevant variables:

$$Y_t = f(L_t, K_t, F_t, Z_t), \tag{1}$$

where Y represents aggregate output or real GDP, L represents labor, K indicates the capital stock, F represents alternative measure of the level FSD (in Odedokun's model, FSD is measured by M3), Z represents a vector of other factors, such as the level of exports (X) and business investment (I), that can be regarded as inputs in the aggregate production process, and 't' represents a specific year. By taking the differential of Equation (1) and rearranging the resulting expression, Odedokun proposes estimating Equation (2):

$$\dot{Y}_t = B_0 + B_1\dot{L}_t + B_2\left(\frac{I}{Y}\right)_t + B_3\dot{F}_t + B_4\dot{X}_t + u_t, \tag{2}$$

where $(\cdot)$ represents the annual rates of growth of the relevant variables. Odedokun's model estimates the degree and directional effect of FSD on economic growth rate by the size and sign of the estimate of B_3. This specification which measures FSD as the annual rate of growth helps reduce the level of multicollinearity in the model. One potential limitation of the model is the presumed one-way causality between FSD and economic growth. Using a different approach, Levine (1998, 1999) and Beck, Levine, and Loayza (2000) control for possible simultaneity by including instrumental variables using two-stage least squares and conclude that simultaneity has little impact on the empirical

results. Thus, the general model specification identified in equation form the basis of the current research.

The first step is to develop precise and comprehensive measures of FSD. In addition to the narrow liquidity view of FSD (M3 or $\dot{F}$), the model includes two broader measures of FSD ($\dot{\text{FSD}}1_{it}$ and $\dot{\text{FSD}}2_{it}$) which are viewed as being complementary measures to $\dot{F}$.

Complementary FSD measures

As indicated in the literature review, various measures of FSD have been employed by different authors. Therefore, two alternative definitions for FSD are used in this research. First, we define that a narrow measure of FSD ($\dot{\text{FSD}}1$) views the existence of non-banking sectors as determined by exogenous regulatory factors. The second broader measure ($\dot{\text{FSD}}2_{it}$) includes other important NBFIs as suggested by the literature. The specific components $\dot{\text{FSD}}1_{it}$ are: (1) bank deposits divided by GDP (DEPGDP), (2) bank assets divided by GDP (BKLNGDP), (3) bank private credits divided by GDP (BKLNGDP2), and (4) the relative size of commercial bank and central bank assets to total real sector assets (BKLNCB). The various measures for $\dot{\text{FSD}}2_{it}$ include two variables specifically related to central banks (CBASSET and CBGDP) and two variables (FILN and FILNGDP) which relate to the operation of other financial institutions such as insurance companies, pension funds, etc.[1]

Principal components analysis

To address high correlations within these complementary measures of FSD measures, a principal components analysis is conducted to reduce the number of variables and the highly degree of multicollinearity within the model. Equation (2) is then modified by adding the principal components of $\dot{\text{FSD}}1_{it}$ and $\dot{\text{FSD}}2_{it}$ separately into the model. The precise number of principal components included is based on the degree of variability explained by the individual components. The model's adjusted R^2 is used to determine the degree to which the explanatory power of the model is enhanced by including non-bank financial activity into the model. A fixed-effects panel specification is employed to account for differences across countries. The annual rate of growth for variables $\dot{Y}$, $\dot{L}$, $\dot{X}$, and $\dot{F}$ is computed as the first-difference of its natural logarithm. A unit root test is then conducted to examine each series for stationarity prior to inclusion in the model. If the series is not stationary, the explanatory variable's first difference is computed and included in the model. Brief definitions of each of the control variables are presented in Table 1. Note that the World Bank Economic Indicators database does not contain an annual estimate of each countries labor force but does provide an estimate of that countries population by year. Thus, a country's population is used as a proxy measure for its labor force. Complementary measures of FSD are defined in Table 2. Principal component results are available upon request.

Equation (3) expands the basic Odedokun model to include several complementary measures of FSD derived using principle component analysis:

$$\dot{Y}_{it} = b_0 + b_1\dot{L}_{it} + b_2\left(\frac{I}{Y}\right)_{it} + b_3\dot{X}_{it} + b_4\dot{F}_{it} + b_5\dot{\text{FSDPC}}1_{it} + b_6\dot{\text{FSDPC}}2_{it} + b_7\dot{\text{FSDPC}}3_{it} + \mu_{it}, \tag{3}$$

Table 1. Variable from World Bank 2006 indicators.

Definition	Abbreviation
Population growth (annual %)	Pop
Gross fixed capital formation (constant 2000 US$)	Investment
Exports of goods and services (constant 2000 US$)	Export
Liquid liabilities (M3) as % of GDP	M3%
GDP (constant 2000 US$)	GDP
Model variables	Calculation
(a) $\dot{Y}$	= [log(GDP) − log(GDP(−1))]
(b) $\dot{L}$	Pop
(c) I/Y	= [Investment/GDP]
(d) $\dot{X}$	= [log(Export) − log(Export(−1)]
(e) $\dot{F}$	= [log(fsd) − log(fsd(−1))] where fsd = (M3%/100)*GDP

Table 2. Complementary measures of FSD from the website of World Bank.

Variable name	Definition
Part A. $FSD1_{it}$: Relevant measures for banking sector development	
DEPGDP	Bank deposits divided by GDP
BKLNCB	Percentage of domestic non-financial real sector assets held by commercial banks (denominator: the total held by central banks and commercial banks)
BKLNGDP	Commercial banks claims on domestic non-financial real sector assets divided by GDP
BKLNGDP2	Private credits by deposit money bank to GDP
Part B. $FSD2_{it}$: Relevant measures for FSD	
DEPGDP	Bank deposits divided by GDP
BKLN	Percentage of domestic non-financial real sector assets held by commercial banks (denominator: the total held by central banks, commercial banks, and other financial institutions)
BKLNGDP	Commercial banks claims on domestic non-financial real sector assets divided by GDP
BKLNGDP2	Private credits by deposit money bank to GDP
CBASSET	Percentage of domestic non-financial real sector assets held by central banks (denominator: the total held by central banks, commercial banks, and other financial institutions)
CBGDP	Central banks claims on domestic non-financial real sector assets divided by GDP
FILN	Percentage of domestic non-financial real sector assets held by other financial institutions(denominator: the total held by central banks, commercial banks, and other financial institutions)
FILNGDP	Other financial institutions claims on domestic non-financial real sector assets divided by GDP

where $\dot{Y}_{it}$ is the economic growth is measured as the annual growth rate of real GDP. $\dot{L}_{it}$ the labor force growth is proxied by population growth which was calculated as the annual rate of population growth, (I/Y) the investment/GDP ratio is computed as gross nominal fixed capital formation divided by nominal GDP, $\dot{X}_{it}$ the real export growth is calculated as the annual rate of growth of exports of goods and services, $\dot{F}_{it}$ the liquid liability growth is calculated as the annual growth rate of liquid liabilities (M3), $\dot{FSDPC1}_{it}$ represents the first principal component of complementary FSD measures, $\dot{FSDPC2}_{it}$ represents the

second principal component of complementary FSD measures, $\dot{FSDPC3}_{it}$ represents the third principal component of complementary FSD measures, u_{it} the normally distributed error term, i the specific country and t the specific year.

Empirical results

The countries included in the analysis were selected using the classification employed in IMF's 2005 World Economic Outlook report. In an early paper, Patrick (1966) recognized that a potential shift from capital broadening to capital deepening will likely take place over time. More recently, Liang and Reichert (2007) found evidence that a shift in the relative importance from bank-based to market-based financial sector drivers of economic growth takes place as a country's level of economic development expands. In addition, the relative importance of bank *vs.* NBFIs, such as insurance companies may change. Hence, one would expect the relationship between the structure of the financial sector and rate of economic growth to change overtime, suggesting that pooling the data sample might not be appropriate; hence, separate models for developed and emerging market countries are estimated.

The IMF divides countries into two major groups: advanced economies and emerging countries. The total number of countries classified as advanced is 29 and the number classified as emerging is 146. The data for this study are provided by the 2005 World Bank Economic Indicators publication which includes data from 1960 to 2004 and the data set provided by Beck, Demirguc-Kunt, and Levine (1999). The World Bank does not collect all the data itself but relies upon a variety of data sources. The World Bank makes a determined effort to insure that the data are defined and collected as comparably between countries and over time as possible. To insure a balanced panel design, only countries with reported data for all the variables and for all years are included in the estimation sample. Thus, for some of the countries and for certain models, there was missing data for selected variables and years; hence, the final sample of countries will vary by model. In Table 3, the first column labeled 'Panel(s)' indicates which of the three models/panels (A, B, or C) and reported in subsequent tables where each country has been included in the estimation sample.

Advanced countries

Table 4 reports descriptive statistics and correlations for each variable in the $FSD1_{it}$ model, while Table 5 does the same for each variable in the $FSD2_{it}^{2}$ model. As expected, the underlying variables are highly correlated with each other. For $FSD1_{it}$, the first component (C1BK) is interpreted as a measure of 'banking sector broadening' while the second component (C1BK2) can be interpreted to measure 'banking sector deepening'. For $FSD2_{it}$, the first component (C3BK) is interpreted as an alternative measure of 'banking sector development'. The second component (C5FI) is interpreted to measure 'non-bank financial development'. The third component (C4CB) is interpreted to measure 'central bank development'. Thus, it is the last two components, C5FI and C4CB, that provide a unique dimension to the analysis.

As mentioned before, after obtaining scores for each of these five principle components, a unit root test is used to examine stationarity. When a component score is not stationary, its first difference is calculated. The first difference is indicated in the form of 'D (component name)'; for example, D(C4CB) indicates that the principal component C4CB was included in the model in the first difference form. The next step is to include the principal components of $\dot{FSD1}_{it}$ and $\dot{FSD2}_{it}$ separately into the economic growth model with cross-section fixed effects and autoregressive adjustment terms [AR(t)] as needed.

Table 3. List of countries.

Panel(s)	Country code	Country name	Panel	Country code	Country name
A. Emerging and developing countries ($N = 70$)					
A,B	DZA	Algeria	A,B	MDG	Madagascar
A	ATG	Antigua and Barbuda	A,B,C	MWI	Malawi
A,B,C	ARG	Argentina	A,B,C	MYS	Malaysia
A,B	BGD	Bangladesh	A,B	MLI	Mali
A,B	BEN	Benin	A,B	MRT	Mauritania
A,B,C	BOL	Bolivia	A,B	MUS	Mauritius
A	BWA	Botswana	A,B,C	MEX	Mexico
A,B,C	BRA	Brazil	A,B,C	MAR	Morocco
A,B	BFA	Burkina Faso	A,B	MOZ	Mozambique
A,B,C	CHL	Chile	A,B,C	NIC	Nicaragua
A	CHN	China		NER	Niger
A,B,C	COL	Colombia	A,B,C	NGA	Nigeria
A	COM	Comoros	A,B	PAK	Pakistan
A	ZAR	Congo, Dem. Rep.	A,B	PAN	Panama
A,B	COG	Congo, Rep.		PNG	Papua New Guinea
A,B,C	CRI	Costa Rica	A,B,C	PRY	Paraguay
A,B	CIV	Cote d'Ivoire	A,B,C	PER	Peru
A,B,C	DOM	Dominican Republic	A,B,C	PHL	Philippines
A,B,C	ECU	Ecuador	A,B,C	RWA	Rwanda
A,B,C	EGY	Egypt, Arab Rep.	A,B	SEN	Senegal
A,B,C	ETH	Ethiopia	A,B,C	ZAF	South Africa
A,B	GAB	Gabon	A,B	LKA	Sri Lanka
A,B	GMB	Gambia, The		LCA	St Lucia
A,B	GHA	Ghana	A,B	VCT	St Vincent and the Grenadines
A,B	GRD	Grenada	A,B	SWZ	Swaziland
A,B,C	GTM	Guatemala	A,B	SYR	Syrian Arab Republic
A,B,C	HND	Honduras	A,B,C	THA	Thailand
A,B	HUN	Hungary	A,B	TGO	Togo
A,B	IND	India	A,B,C	TTO	Trinidad and Tobago
A,B	IDN	Indonesia	A,B,C	TUN	Tunisia
A,B,C	IRN	Iran, Islamic Rep.	A,B	UGA	Uganda
	JAM	Jamaica	A,B,C	URY	Uruguay
A,B,C	JOR	Jordan	A,B,C	VEN	Venezuela, RB
A,B,C	KEN	Kenya	A,B	ZMB	Zambia
A,B,C	LSO	Lesotho	A,B,C	ZWE	Zimbabwe
B. Advanced countries ($N = 20$)					
	Large countries				
ABC	CAN	Canada	ABC	USA	USA
AB	FRA	France	AB	ITA	Italy
ABC	JPN	Japan	AB	DEU	Germany
AB	AUS	Australia	AB	ISR	Israel
	BEL	Belgium	ABC	KOR	Korea, Rep.
AB	DNK	Denmark	ABC	NLD	The Netherlands
AB	FIN	Finland	ABC	NZL	New Zealand
A	HKG	Hong Kong, China	ABC	NOR	Norway
AB	ISL	Iceland	ABC	SWE	Sweden
ABC	IRL	Ireland	ABC	CHE	Switzerland

Table 4. Descriptive statistics and correlation matrix for advanced countries, by $\dot{FSD}1$.

	$\dot{Y}$	$\dot{L}$	I/Y	$\dot{X}$	$\dot{F}$	D(C1BK)	D(C2BK2)
Mean	0.032188	0.008006	0.238261	0.059664	0.043532	0.079001	−0.00633
Median	0.031933	0.007392	0.231416	0.059706	0.041025	0.065333	−0.01303
Maximum	0.122756	0.187111	0.388878	0.444896	0.695092	1.649406	3.286721
Minimum	−0.07562	−0.1655	0.154939	−0.140875	−0.4965	−0.79426	−2.02191
Std. dev.	0.027321	0.012104	0.047698	0.059253	0.075479	0.243741	0.297396
Observations	538	538	538	538	538	538	538
$\dot{Y}$	1	0.105402	0.303672	0.462526	0.329993	−0.11417	0.084188
$\dot{L}$	0.105402	1	0.067771	0.044158	0.084076	−0.01964	−0.07406
I/Y	0.303672	0.067771	1	0.082444	0.132601	−0.03443	−0.01989
$\dot{X}$	0.462526	0.044158	0.082444	1	0.12077	−0.09911	0.044076
$\dot{F}$	0.329993	0.084076	0.132601	0.12077	1	0.288664	0.022605
D(C1BK)	−0.11417	−0.01964	−0.03443	−0.099112	0.288664	1	0.376884
D(C2BK2)	0.084188	−0.07406	−0.01989	0.044076	0.022605	0.376884	1

Notes: $\dot{Y}$: economic growth, $\dot{L}$: labor force growth, I/Y: the investment/GDP ratio, $\dot{X}$: real export growth, $\dot{F}$: liquid liability growth, D(C1BK): 'broadening in banking sector development' component by taking the first difference, and D(C2BK2): 'deepening in banking sector development' component by taking the first difference.

The empirical results of the two separate panel regressions for $\dot{FSD}1_{it}$ and $\dot{FSD}2_{it}$ are shown in Table 6, Panels B and C, respectively. Note that Panel A excludes the complementary FSD measures for comparison purposes. Several significant findings are as follows. First, by including either $\dot{FSD}1_{it}$ or $\dot{FSD}2_{it}$ in the model, the coefficient on $\dot{F}$ is increased from 0.065 in Panel A to 0.080 and 0.103 in Panels B and C, respectively. Second, both adjusted R^2 increase modestly after including alternative FSD measures: 0.42 to 0.45 for $\dot{FSD}1_{it}$ and from 0.42 to 0.50 for $\dot{FSD}2_{it}$. Third, the coefficients for the control variables, $\dot{L}$, I/Y, and $\dot{X}$, become smaller in size.

For the first of two $\dot{FSD}1$ component measures, D (C1BK), one observes a negative regression coefficient (−0.028) which is significant at the 1% level. At the same time, the coefficient on $\dot{F}$ becomes larger in size (0.065 *vs*. 0.80). The second component of $\dot{FSD}1$, D(C2BK2), is directly related to economic growth with a positive coefficient of 0.008, significant at the 5% level. Thus, the larger the commercial banking sector relative to the size of the central bank, the faster the country's economic growth. Surprisingly, all three $\dot{FSD}2$ measures, D(C3BK), have a significant negative coefficient: C3BK (−0.024), C5FI (−0.035), and C4CB (−0.021). The slope coefficient on $\dot{F}$ becomes substantially larger in size (0.080 *vs*. 0.103), suggesting that the impact of the narrow liquidity definition of FSD is made more precise by including additional central banks and NBFIs factors.

The expanded economic growth model improves upon Liang and Reichert's (2006) and Odedokun's (1996) models as indicated by the increase in adjusted R^2 and the size of the $\dot{F}$ slope coefficient. These findings support the conclusions of Demirguc-Kunt (2006) and Levine (2005) indicating an important role played by the non-bank financial sector. Thus, by including complementary FSD measures, the contribution of $\dot{F}$ to economic growth becomes even stronger.[3]

Emerging countries

Tables 7 reports descriptive statistics and correlations for each variable in the $FSD1_{it}$ model, while Table 8 does the same for each variable in the $FSD2_{it}$[4] model. Once again the underlying variables of FSD are highly correlated.

Table 5. Descriptive statistics and correlation matrix for advanced countries, by FṠD2.

	$\dot{Y}$	$\dot{L}$	I/Y	$\dot{X}$	$\dot{F}$	D(C3CB)	D(C5FI)	D(C4CB)
Mean	0.034403	0.008475	0.239008	0.065082	0.047267	0.076286	0.053732	0.007249
Median	0.033712	0.008658	0.227245	0.061713	0.042342	0.051296	0.057294	−0.00073
Maximum	0.11364	0.022743	0.388878	0.444896	0.695092	1.735965	1.370784	1.719017
Minimum	−0.07562	−0.00925	0.154939	−0.09742	−0.4965	−0.91544	−1.45716	−0.98272
Std. dev.	0.027261	0.005186	0.053682	0.061925	0.081103	0.283298	0.223685	0.327658
Observations	291	291	291	291	291	291	291	291
$\dot{Y}$	1	0.265825	0.294806	0.453126	0.363628	−0.01428	−0.099	−0.10978
$\dot{L}$	0.265825	1	0.103971	0.157376	0.181401	−0.06957	0.035557	0.146123
I/Y	0.294806	0.103971	1	0.119686	0.151283	−0.03015	0.09121	0.015234
$\dot{X}$	0.453126	0.157376	0.119686	1	0.14556	−0.05764	−0.09625	−0.04417
$\dot{F}$	0.363628	0.181401	0.151283	0.14556	1	0.329118	0.111346	0.085393
D(C3CB)	−0.01428	−0.06957	−0.03015	−0.05764	0.329118	1	−0.12249	−0.18746
D(C5FI)	−0.099	0.035557	0.09121	−0.09625	0.111346	−0.12249	1	−0.3204
D(C4CB)	−0.10978	0.146123	0.015234	−0.04417	0.085393	−0.18746	−0.3204	1

Notes: $\dot{Y}$: economic growth, $\dot{L}$: labor force growth, I/Y: the investment/GDP ratio, $\dot{X}$: real export growth, $\dot{F}$: liquid liability growth, D(C3BK): 'banking sector development' component by taking the first difference, D(C4CB): 'central bank development' component by taking the first difference, and D(C5FI): 'other financial institution development' component by taking the first difference.

Table 6. OLS panel data regression estimation results for advanced countries, dependent variables: $\dot{Y}$.

	Coefficients		
Variables	Panel A ($\dot{F}$) (Comparison)	Panel B (F$\dot{S}$D1)	Panel C (F$\dot{S}$D2)
C	−0.024***	−0.019**	−0.001
$\dot{L}$	0.027	0.010	0.496
I/Y	0.179***	0.176***	0.096**
$\dot{X}$	0.167***	0.139***	0.109***
$\dot{F}$	0.065***	0.080***	0.103***
F$\dot{S}$D1			
D(C1BK)		−0.028***	
D(C2BK2)		0.008**	
F$\dot{S}$D2			
D(C3BK)			−0.024***
D(C5FI)			−0.035***
D(C4CB)			−0.021***
Fixed effects	Yes	Yes	Yes
Number of AR(t) terms	1	2	1
Adj. R^2	0.421	0.452	0.496
AIC (SC)	−4.824 (−4.638)	−4.922 (−4.702)	−4.976 (−4.976)
Observations	561	498	280
Cross-section (number of countries)	19	18	10
Time (maximum range)	1967–2004	1968–2004	1967–2004

Notes: $\dot{Y}$: economic growth, $\dot{L}$: labor force growth, I/Y: the investment/GDP ratio, $\dot{X}$: real export growth, $\dot{F}$: liquid liability growth, D(C1BK): 'broadening in banking sector development' component by taking the first difference, D(C2BK2): 'deepening in banking sector development' component by taking the first difference, D(C3BK): 'banking sector development ' component by taking the first difference, D(C4CB): 'central bank development' component by taking the first difference, and D(C5FI): 'other financial institution development' component by taking the first difference. Equations: (1) Panel A: $\dot{Y} = C +$ Countries Dummies $+ \dot{L} + I/Y + \dot{X} + \dot{F} +$ error term, (2) Panel B: $\dot{Y} = C +$ Countries Dummies $+ \dot{L} + I/Y + \dot{X} + \dot{F} +$ D(C1BK) + D(C2BK2) + error term, and (3) Panel C: $\dot{Y} = C +$ Countries Dummies $+ \dot{L} + I/Y + \dot{X} + \dot{F} +$ D(C3BK) + D(C4CB) + D(C5FI) + error term. The model of Panel A is used in the paper of Liang and Reichert (2006). Expected signs are shown in parentheses.

**Significant at the 0.05 level.

***Significant at the 0.01 level.

The empirical results are presented in two panel regressions which include $\dot{FSD1}_{it}$ and $\dot{FSD2}_{it}$ shown in Table 9, Panels B and C, respectively. As before, for comparison purposes, Panel A indicates the results without any complementary FSD measures. Several general findings are as follows. First, by including either $\dot{FSD1}_{it}$ or $\dot{FSD2}_{it}$ in the model, the size of the regression coefficient on $\dot{F}$ is increased from 0.046 (Panel A) to 0.116 and 0.127 in Panels B and C, respectively. Therefore, by including two sub-components of $\dot{FSD1}_{it}$ in the model or the three sub-components of $\dot{FSD2}_{it}$, the impact of $\dot{F}$ becomes stronger. Second, the adjusted R^2 are both increased after including the various alternative FSD measures from 0.237 to 0.315 for $\dot{FSD1}_{it}$ and from 0.237 to 0.338 for $\dot{FSD2}_{it}$. Furthermore, as measures of goodness-of-fit, the AIC and SC values become smaller (more significant) by including the alternative FSD measures.

The general results for the emerging countries are quite similar to the results for the advanced countries.[5] The first measure of F$\dot{S}$D1, D (C1BK), the 'banking sector broadening index' component has a negative coefficient (−0.044), significance at the 1% level. As mentioned above, the regression coefficient on $\dot{F}$ becomes larger in size. The second component, D(C2BK2) or 'banking sector deepening', carries a positive regression coefficient (0.032) which is significant at the 1% level and is consistent with the sign of the

Table 7. Descriptive statistics and correlation matrix for emerging countries, by FṠD1.

	$\dot{Y}$	$\dot{L}$	I/Y	$\dot{X}$	$\dot{F}$	D(C1BK)	D(C2BK2)
Mean	0.037897	0.023197	0.207595	0.049	0.053157	0.056642	−0.00646
Median	0.041695	0.024226	0.200453	0.052127	0.060265	0.057584	0.002814
Maximum	0.332802	0.115159	0.656996	0.717362	0.531572	1.530173	2.694142
Minimum	−0.27508	−0.0814	0.035315	−0.61221	−1.05782	−1.44388	−2.7135
Std. dev.	0.044607	0.011123	0.071491	0.115646	0.119803	0.274145	0.313425
Observations	1660	1660	1660	1660	1660	1660	1660
$\dot{Y}$	1	0.085553	0.176562	0.349863	0.325785	−0.06167	0.163374
$\dot{L}$	0.085553	1	−0.12152	−0.0131	0.035489	−0.07951	−0.04428
I/Y	0.176562	−0.12152	1	0.097907	0.118283	0.172642	−0.03538
$\dot{X}$	0.349863	−0.0131	0.097907	1	0.139217	−0.04355	0.070171
$\dot{F}$	0.325785	0.035489	0.118283	0.139217	1	0.299711	−0.01543
D(C1BK)	−0.06167	−0.07951	0.172642	−0.04355	0.299711	1	0.248314
D(C2BK2)	0.163374	−0.04428	−0.03538	0.070171	−0.01543	0.248314	1

Notes: $\dot{Y}$: economic growth, $\dot{L}$: labor force growth, I/Y: the investment/GDP ratio, $\dot{X}$: real export growth, $\dot{F}$: liquid liability growth, D(C1BK): 'broadening in banking sector development' component by taking the first difference, and D(C2BK2): 'deepening in banking sector development' component by taking the first difference.

coefficient in the advanced countries model. Thus, the higher the percentage of non-financial real-sector assets held by commercial banks relative to central banks, the higher a county's rate of economic growth. Looking at the broader measures of FSD, FṠD2, the first component, D (C3BK), 'banking sector development index', once again carries a negative regression coefficient (−0.039). The second principal component, D(C4CB), 'central banks development', and the third component, D(C5FI), 'NBFIs development', also have a negative coefficients −0.028 and −0.007, respectively. As mentioned before, the slope coefficient on $\dot{F}$ becomes larger in size than in the FṠD1 model (0.127 *vs*. 0.116).

Thus, based on the AIC(SC) selection criteria, a model based on FṠD2 appears to provide the best-fit for both advanced countries and emerging counties. Furthermore, the basic Odedokun model includes only a narrow definition of financial sector liquidity (M3), labeled $\dot{F}$. For the advanced country model, the elasticity coefficient on $\dot{F}$ is 0.065, which increases to 0.08 when FṠD1 is included in the model, and increases further to 0.103 when FṠD2 is included. A similar pattern for the coefficient on $\dot{F}$ is obtained in the emerging country model. In addition, the maximum adjusted R^2 in emerging countries is lower than that in advanced countries (0.34 *vs*. 0.50), suggesting perhaps that the financial sector plays a more crucial role in advanced countries.

Conclusions

This study employs a modified Odedokun economic growth model, using two complementary measures of FSD (FṠD1 and FṠD2). The literature suggests that the same basic functions of a financial system can be performed by different institutions, following different rules of conduct. In addition to traditional bank intermediation, growth in NBFIs (e.g. insurance company, pension funds, etc.) can potentially have a significant impact on economic growth. Hence, FṠD1 is an expanded measure of banking sector development than traditionally employed, while FṠD2 is an even broader measure which includes important NBFIs, in addition to commercial banks and central banks. Including these two measures substantially increases the model's explanatory power, supporting the position taken by Demirguc-Kunt (2006) that future studies should consider all the relevant factors affecting

Table 8. Descriptive statistics and correlation matrix for emerging countries, by FṠD2.

	$\dot{Y}$	$\dot{L}$	I/Y	$\dot{X}$	$\dot{F}$	D(C3BK)	D(C4CB)	D(C5FI)
Mean	0.038279	0.023032	0.209309	0.050748	0.054486	0.053144	0.021731	−0.04466
Median	0.041851	0.023421	0.203053	0.056009	0.060601	0.072158	0.009921	−0.03441
Maximum	0.190654	0.111807	0.656996	0.717362	0.531572	1.205261	7.951305	2.987607
Minimum	−0.14447	−0.0814	0.071851	−0.50853	−1.05782	−2.61755	−4.58229	−4.85567
Std. dev.	0.042745	0.011376	0.065599	0.116219	0.122177	0.320876	0.50349	0.390857
Observations	804	804	804	804	804	804	804	804
$\dot{Y}$	1	0.117906	0.213933	0.360146	0.320328	0.020902	−0.18195	−0.04901
$\dot{L}$	0.117906	1	−0.03397	0.03029	0.08816	0.046179	−0.00838	0.017037
I/Y	0.213933	−0.03397	1	0.065043	0.120979	0.164762	0.057529	0.042835
$\dot{X}$	0.360146	0.03029	0.065043	1	0.140602	−0.07119	−0.00015	−0.00568
$\dot{F}$	0.320328	0.08816	0.120979	0.140602	1	0.315822	0.043181	0.152574
D(C3BK)	0.020902	0.046179	0.164762	−0.07119	0.315822	1	−0.43717	−0.05966
D(C4CB)	−0.18195	−0.00838	0.057529	−0.00015	0.043181	−0.43717	1	0.232415
D(C5FI)	−0.04901	0.017037	0.042835	−0.00568	0.152574	−0.05966	0.232415	1

Notes: $\dot{Y}$: economic growth, $\dot{L}$: labor force growth, I/Y: the investment/GDP ratio, $\dot{X}$: real export growth, $\dot{F}$: liquid liability growth, D(C3BK): 'banking sector development' component by taking the first difference, D(C4CB): 'central bank development' component by taking the first difference, and D(C5FI): 'other financial institution development' component by taking the first difference.

Table 9. OLS panel data regression estimation results for emerging countries, dependent variables: $\dot{Y}$.

	Coefficients		
Variables	Panel A $\dot{F}$ (Comparison)	Panel B $\dot{FSD1}$	Panel C $\dot{FSD2}$
C	−0.013**	−0.008	−0.007
$\dot{L}$	0.619***	0.318***	0.291*
I/Y	0.127***	0.146***	0.141***
$\dot{X}$	0.130***	0.088***	0.087***
$\dot{F}$	0.046***	0.116***	0.127***
$\dot{FSD1}$			
D(C1BK)		− 0.044***	
D(C2BK2)		0.032***	
$\dot{FSD2}$			
D(C3BK)			− 0.039***
D(C4CB)			− 0.028***
D(C5FI)			− 0.007*
Fixed effects	Yes	Yes	Yes
Number of AR(t) terms	1	1	1
Adj. R^2	0.237	0.315	0.338
AIC (SC)	−3.353 (−3.159)	−3.732 (−3.501)	−3.836 (−3.587)
Observations	2053	1584	764
Cross-section (number of countries)	66	61	33
Time (maximum range)	1967–2004	1967–2004	1967–2004

Notes: $\dot{Y}$: economic growth, $\dot{L}$: labor force growth, I/Y: the investment/GDP ratio, $\dot{X}$: real export growth, $\dot{F}$: liquid liability growth, D(C1BK): 'broadening in banking sector development' component by taking the first difference, D(C2BK2): 'deepening in banking sector development' component by taking the first difference, D(C3BK): 'banking sector development' component by taking the first difference, D(C4CB): 'central bank development' component by taking the first difference, and D(C5FI): 'other financial institution development' component by taking the first difference. Equations: (1) Panel A: $\dot{Y} = C +$ Countries Dummies $+ \dot{L} + I/Y + \dot{X} + \dot{F} +$ error term, (2) Panel B: $\dot{Y} =$ C + Countries Dummies $+ \dot{L} + I/Y + \dot{X} + \dot{F} +$ D(C1BK) + D(C2BK2) + error term, and (3) Panel C: $\dot{Y} = C +$ Countries Dummies $+ \dot{L} + I/Y + \dot{X} + \dot{F} +$ D(C3BK) + D(C4CB) + D(C5FI) + error term. The model of Panel A is used in the paper of Liang and Reichert (2006). Expected signs are shown in parentheses.

*Significant at the 0.10 level.

**Significant at the 0.05 level.

***Significant at the 0.01 level.

economic growth and by Levine (2005) that the importance of nontraditional financial institutions should be included in the economic growth model.

The development of NBFIs for both advanced and emerging countries produced a negative and statistically significant impact on economic growth, although the negative impact was somewhat weaker for the emerging countries. This might be due to the fact that emerging countries are at the beginning stage of NBFI development, where fraud and production inefficiencies may impose a deal-weight burden on the economy. As discussed in the literature review, these findings are consistent with those of Cheng and Degryse (2010) which find no significant role for NBFIs in promoting economic growth in China. For the advanced countries with a more extensive non-bank financial sector, the negative coefficient might indicate the lack of adequate regulation and speculative mismanagement by large financial institutions. This was clearly demonstrated in the recent financial crisis among the developed countries as new, more stringent regulations are being imposed on both the banking and non-bank sectors.

In this study, the authors expected to find a positive complimentary relationship between the growth of bank and NBFIs and economic growth. Such a finding would support a change in bank regulation regarding the separation of banking and commerce. However, the evidence suggests that growth in NBFIs has a statistically significant negative impact on economic growth. This finding suggests that these non-bank institutions, which are often loosely regulated, may introduce an excessive level of risk into the financial sector and the general economy. This negative relationship was observed for both emerging and advanced countries. Excessive risk can discourage investment and retard economic growth. This finding is consistent with the current global financial crises where many loosely regulated NBFIs, such as investment banks, hedge funds, and insurance companies, in both advanced and emerging countries have introduced an excessive level of risk into the global economy. Hence, policy-makers may need to consider more timely and effective regulation of NBFIs and insure that adequate transparency and disclosure is provided to all financial markets participants. Finally, as Levine (2005) cautions, it is important not to ignore sectors within financial systems that are potentially important. For example, Liang and Reichert (2007) documented a shift in importance from banking sector development to capital market growth as a country's level of development expands. Hence, the impact of the dramatic recent growth in the derivative markets should be explored in future studies.

Notes

1. For $\dot{FSD2}_{it}$, BKLNCB is replaced by BKLN to allow the denominator to include claims on all non-financial real-sector assets.
2. Since several countries did not report data for NBFIs until recent years, and some countries might not have well-developed non-bank financial sector, the sample size for $\dot{FSD2}$ measures is reduced.
3. One country, Belgium, is deleted from the model due to missing data (20 advanced countries based on World Bank 2005 Economic Outlook). Including $\dot{FSD2}$ measures in the model results in a significant reduction in sample size from 19 to 10 advanced countries and from 61 to 33 emerging/developing countries.
4. Since several countries did not report data for NBFIs until recent years, and some countries might not have well-developed non-bank financial sector, the sample size for $\dot{FSD2}$ measures is reduced.
5. All five components (C1BK, C2BK2, C3BK, C4CB, and C5FI) were non-stationary in their levels and required first differencing.

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