New financial intermediary development indicators for developing countries

Simplice A., Asongu

HEC-Management School-University of Liège(Belgium)

15 May 2011

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Simplice A. Asongu

E-mail: asongusimplice@yahoo.com

Tel: 0032 473613172

HEC-Management School, University of Liège.

Rue Louvrex 14, Bldg. N1, B-4000 Liège, Belgium

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Abstract

Financial development indicators are often applied to countries/regions without taking into account specific financial development realities. Financial depth in the perspective of monetary base is not equal to liquid liabilities in every development context. This paper introduces complementary indicators to the existing Financial Development and Structure Database (FDSD) and unites two streams of research. It contributes at the same time to the macroeconomic literature on measuring financial development and responds to the growing field of economic development by means of informal financial sector promotion and microfinance. The paper suggests a practicable way to disentangle the effects of the various financial sectors on economic developments.

JEL Classification: E00; E26

Keywords: Finance; Development; Formalization; Panel; Developing Countries

1. Motivation

Financial development indicators have been universally applied without taking into account regional/country specific financial development needs and realities. Usage of some indicators for instance is based on the presumption that they are generally valid (Gries et al., 2009)[1]; not withstanding empirical evidence that not all indicators may matter in financial development (Asongu, 2010a). Furthermore, the absence of a consensus on the superiority of financial development indicators; especially the widely used proxy for financial depth (Gries et al., 2009) is desirous of research attention. As far as we have perused related literature, we suppose that the absence of any study that focuses on the quality of financial development indicators with respect to contextual development concerns is enough inspiration to search for the missing link. It is therefore our objective in this paper to verify the validity of the financial depth indicator as applied to developing countries and hence decompose it to new measures that best address financial development challenges in developing countries. The underlying impetus of our study is the misleading assumption that liquid liabilities can be proxied by the monetary base (financial depth) in developing countries. This paper will therefore suggest a practicable way to disentangle the effects of the various financial sectors on economic developments. We shall develop testable hypotheses and propositions for more refined financial development indicators and empirically verify their validity in the finance-growth nexus. GDP and Monetary-base oriented ratios are developed for each sector of the financial system. Our conception of the financial system goes beyond the realm of that expressed in the International Financial Statistics' definition; it integrates the informal sector, hitherto a missing component in the existing measurement of the monetary base (M2).

Specific contributions of this paper to finance-growth literature include testing if: (1) the informal financial sector significantly contributes to economic growth; (2) disentangling

[1] Gries et al. (2003) state: "In the related literature several proxies for financial deepening have been suggested, for example, monetary aggregates such as M2 on GDP. To date there is no consensus on the on the superiority of any indicator" (page 1851).

different components of the existing measurement could influence policy decisions and; (3) introducing measures of sector importance to complement GDP ratio indicators could ameliorate understanding of the finance-growth nexus.

Our study could be interesting to policy makers and researchers because it unites two streams of research. It contributes at the same time to the macroeconomic literature on measuring financial development and responds to the growing field of economic development by means of informal financial sector promotion and microfinance. The absence of sound fundamentals in a financial indicator might bias estimations and result in unhealthy policy recommendations. The rest of the paper is structured in the following manner: section two examines related literature and resulting hypotheses; new indicators based on testable hypotheses are proposed in section three; data and methodology are presented and outlined respectively in section four; section five focuses on empirical analysis; we conclude in section six.

2. Related Literature

2.1 Monetary base as a biased indicator of liquid liabilities in developing countries

2.1.1 Definition of key-terms

a) Monetary Base

This is the amount of money in an economy. This is the measure of the money supply that typically includes most liquid currencies. Measures of money are classified as level of M, with the monetary base (M0) being the smallest and lowest M-level. While base money can be described as the most acceptable liquid form of final payment, a broad measures of money supply (M1) includes demand deposits to M0. Less liquid savings accounts such as time deposits add up to M1 to define a broader money supply (M2). Large time deposits, institutional money market funds, other larger liquid assets and short-term repurchase in turn

sum up to M2 to constitute the broadest money supply (M3). With respect to the context of our paper M2 is more appropriate due to relative undeveloped financial sector of developing countries. In the less developed world M0 could be assimilated to the informal financial sector, implying the monetary base (M0) for the most part entails informal finance. As earlier outlined, when formal and semi-formal banking sector deposits are integrated to M0 then a broad money supply definition (M2) is obtained. Liquid liabilities should therefore be the component of M2 circulating within the banking system (M2-M0).

b) Liquid liabilities

A Liquid liability is a debt or claim that has been converted into cash as it becomes due. In the context of our work, it refers to bank deposits in current and savings accounts (M2-M0). While in developed countries liquid liabilities could be assimilated to M2 (as M0 is mostly held by the banking sector), in underdeveloped countries M0 quite often does not transit through the banking sector and thus by definition is not a bank liability.

c) Financial system by International Financial Statistics (IFS)

According to the IFS, the financial system consists of deposit money banks (formal banking sector) and other financial institutions (semi-formal banking sector)[2]. This definition is ideal for developed countries (where M0 is part of the banking sector) but lacking in some substance in the underdeveloped world (where most holders of liquidity contained in M0 don't have bank accounts). Therefore according to this definition, financial depth is M2 without informal finance.

Within the framework of this paper financial depth corresponds to M2 (including the informal financial sector)

[2] See lines 24, 25 and 45 of IFS, October 2008.

2.1.2 Theoretical basis

Liquid liabilities expressed in terms of monetary base are without distinction of financial sectors and rest on the assumption that almost all currency held is linked to a financial sector deposit. Beck et al., (1999) on presenting a new database on financial development and structure pointed-out: "*Since many researchers have focused on the liability side of the balance sheet, we include a measure of absolute size based on liabilities. Liquid liabilities to GDP equal currency plus demand and interest-bearing liabilities of banks and other financial intermediaries divided by GDP. This is the broadest available indicator of financial intermediation, since it includes all three financial sectors....Liquid liability is a typical measure of financial depth and thus the overall size of the financial sector without distinguishing between financial sectors of the use of liabilities*"(page 11). It is worth emphasizing that almost no distinction is made between different financial sectors in the FDSD; and the hypothesis of all constituents of the monetary base linked to the liability side of the balance sheet is questionable for developing countries. Almost all currency held for transaction motives in developed countries are still recycled in banks[3]. However, this is subject to controversy in the underdeveloped world and therefore distinction between formal, semi-formal and informal banking sectors is imperative.

A bias in the definition of financial system deposits (aka liquid liabilities) by the International Monetary Fund (IMF) is deserving of examination. According to International Financial Statistics (hence IFS), the financial system is made up of the formal and semi-formal sectors; that is deposit money banks and other financial institutions (see lines 24, 25 and 45 of IFS, October 2008). While this definition could be quasi-true for developed countries, it fails to take account of the informal financial sector in developing and underdeveloped countries. This leaves us with some concern over the role of the informal sector in financial intermediary development and growth.

[3] Bank deposits are liquid liabilities.

2.1.3 Empirical framework

Though the monetary base (M2/GDP) which represents the money stock has been widely used as a standard measure of liquid liabilities in many studies (World Bank 1989; King and Levine, 1993), in developing countries a large part of the monetary base stock consists of currency held outside banks. As such, an improvement in the M2/GDP ratio may reflect an extensive use of currency rather than an increase in bank deposits. In an attempt to curtail this shortcoming, Demetriades and Hussein (1996) suggested the subtraction of currency outside banks from M2 in the measure of liquidity liabilities in developing countries. Abu-Bader and Abu-Qarn (2008) amongst others have recently adjusted M2 in like manner. But these adjustments fail to point-out that the "adjusted-measure "constitutes the formal and semi-formal financial sectors. More so, the informal financial sector is ruled-out as marginal in this conception of the finance-growth nexus. We shall endeavor to address these insufficiencies in this paper.

Some authors have sought to address the issue by determining a broad variable that is indicative of financial depth. They use the first principal component of M2/GDP and a combination of one or more financial indicators (Khumbhakar and Mavrotas, 2005; Ang and McKibbin, 2007). By so doing they decrease the dimensionality of the set of variables without losing much information on the one hand; and on the other hand decrease problems related to the quality of M2 as a measure of liquid liabilities. The set-back of this approach to a solution is that, more often financial depth is mixed with concepts of financial activity (private domestic credit/GDP), financial size (deposit bank assets/central bank assets plus deposit money assets), financial allocation efficiency(bank credit/bank deposits)…etc. The contribution of this paper to the existing literature is to address this problem without mixing-up these financial concepts.

Despite the partial awareness of this challenge, literature is inundated with works on financial development in developing countries that do not distinguish between components in M2 held by banks and currency held outside of the formal financial sector. We argue that probing the distinction between formal, semi-formal and informal banking sectors could be interesting in mastering the finance-growth nexus.

2.2 Why the concept of 'financial-intermediary-formalization' is crucial in economic development?

In Africa a very low percentage of households have access to formal financial services[4]. The issue is further evident with low population densities, poor transport and limited communications infrastructure; which inhibit formal financial intermediation. Even where such services are available, small and medium size businesses, and low income individuals could find it difficult meeting-up with eligibility criteria such as strict documentation requirements and/or collaterals. Beside constraints of physical access and eligibility, cost barriers in the form of high transaction fees or considerable minimum requirements for savings-balances or loan-amounts present another stumbling block.

2.2.1 Distinction between formal, semi-formal and informal financial intermediaries

Firstly, as could be grasped from table 1 formal finance refers to services that are regulated by the central bank and other supervisory authorities. Secondly, semi-formal finance is a distinction between formal and informal finance. This is part of finance that occurs in a formal financial environment but not formally recognized. An eloquent example is micro-finance. Thirdly, informal finance is one that is not arranged through formal agreements and not enforced through the legal system. The last two types of saving and lending are very

[4] Making Finance work for Africa : http://www.mfw4a.org/access-to-finance/access-to-finance.html

common in developing countries, particularly among the financially excluded or those on low incomes.

Table 1 inspired by Steel (2006) clearly expatiates the role of semi-formal and informal banks in the financial system of developing countries. Therefore, the role of Credit Unions and Micro Finance NGOs (semi-formal finance) as well as elements of the last category cannot be undermined in the finance-led-growth nexus: such is the goal of our paper.

Table 1: Segments of the financial system by degree of formality in Paper's context

Paper's context			Tiers	Definitions	Institutions	Principal Clients
Formal financial system	IMF Definition of Financial System from International Financial Statistics (IFS)	Formal Financial sector (Deposit Banks)	Formal banks	Licensed by central bank	Commercial and development banks	Large businesses, Government
Semi-formal and informal financial systems		Semi-formal financial sector (Other Financial Institutions)	Specialized non-bank financial institutions		Rural banks, Post banks, Saving and Loan Companies, Deposit taking Micro Finance banks	Large rural enterprises, Salaried Workers, Small and medium enterprises
			Other non-bank financial institutions	Legally registered but not licensed as financial institution by central bank and government	Credit Unions, Micro Finance NGOs	Microenterprises, Entrepreneurial poor
	Missing component in IFS definition	Informal financial sector	Informal banks	Not legally registered at national level(though may be linked to a registered association)	Savings collectors, Savings and credit associations, Money lenders	Self-employed poor

Source (author)

2.2.2 Imperative of decomposing financial depth into formal, semi-formal and informal components in financial intermediary development.

Hitherto, from a general macroeconomic perspective, the imperative of specifically determining the role of semi-formal and informal banks in financial intermediary

development has been marginal. We argue that stopping short of this would be gross injustice to the two later categories (see table 1) which represent quite a significant bulk of the financial sector in developing countries. The following stylized facts and hypotheses fully express the spirit of decomposing financial depth into essential constituents.

a) Stylized facts

The IMF definition of the financial system is limited to the formal and semi-formal sectors; that is deposits money banks and other financial institutions (see lines 24, 25 and 45 of International Financial Statistics, October 2008). While this could be quasi true for developed countries, this definition holds less ground in developing and underdeveloped worlds where, the informal financial sector takes a toll on the financial system and plays an important role in economic growth and development.

Contrary to mainstream literature, in developing countries money in circulation plus transaction and time deposits (M2) is not equal to liquid liabilities. This suggests that, equating financial depth to liquid liabilities would be synonymous to assuming the inexistence and/or insignificance of the informal financial sector. Money in circulation withheld by the informal sector does not always transit through the banking system[5]. Therefore such currency cannot be considered as formal bank sector deposits or liquid liabilities. More so, part of the semi-formal financial sector made-up of other non-bank financial institutions that are legally registered but not licensed as financial institutions by the central bank and government (e.g Micro Finance NGO's), also hold a substantial part of M2 which do not transit through banking sector.

[5] Less than 20% of population in some developing countries (e.g. Africa) has access to the formal banking system. See: Access to Finance in Making Finance work for Africa: http://www.mfw4a.org/access-to-finance/access-to-finance.html

Besides introducing an informal financial sector indicator for growth, disentangling the existing measure (M2) into its formal and semi-formal constituents in the context of underdeveloped countries could improve our insight on the finance-growth nexus in the growing field of financial and economic developments.

b) Testable hypotheses

Hypothesis 1: The informal financial sector (a previously missing component in the definition of monetary base: M2) significantly contributes to economic growth.

Hypothesis 2: Disentangling different components of the existing measurement (financial system) into formal (banking sector) and semi-formal (other financial institutions) financial sector indicators could improve understanding of the finance-growth nexus.

Hypothesis 3: Introducing measures of sector importance could ameliorate the capacity to understand how evolvements (improvements) of shares in different sectors of the financial system affect the finance-growth nexus. To put this in other terms, the need to evaluate how one financial sector develops at the expense of another and vice-versa could be crucial in orienting policy-making.

Above hypotheses (with exclusive respect to components of M2[6]) inspire propositions on "financial development indicators" and "measures of sector importance".

3. Propositions of new indicators

Financial development could either be indirect (financial intermediary development-through the banking sector) or direct (through financial markets). The context of this study is limited to the former type of financial development. Borrowing from Demirgüç-Kunt (1999),

[6] Beside financial depth (M2), financial activity, size and efficiency also have financial intermediary development indicators which are not in the context of this paper.

indirect indicators could further be classified into financial development aspects of depth (M2), allocation efficiency[7], activity[8] and size[9]. Amongst these measures, financial depth is the most widely used in the finance-growth literature.

3.1 Financial development indicators (M2-based)

3.1.1 Formal financial development

Proposition 1: Formal financial development could be defined as:

$$\Pr op.1 = \frac{Bank\_deposits}{GDP}$$

Bank deposits[10] here refer to demand, time and saving deposits in deposit money banks.

3.1.2 Semi-formal financial development

Proposition 2: Semi-formal financial development could be appreciated as:

$$\Pr op.2 = \frac{Financial\_deposits - Bank\_deposits}{GDP}$$

Financial deposits[11] are demand, time and saving deposits in deposit money banks and other financial institutions.

3.1.3 Informal financial development

Proposition 3: Informal financial development can be conceived as:

$$\Pr op.3 = \frac{Monetary\_Base(M2) - Financial\_deposits}{GDP}$$

3.1.4 Informal and semi-formal financial development

Proposition 4: Informal and semi-formal financial development can be defined as:

$$\Pr op.4 = \frac{Monetary\_Base(M2) - Bank\_deposits}{GDP}$$

[7] Bank credit on bank deposits.
[8] Private domestic credit on GDP.
[9] Deposit bank assets / Central bank assets plus deposit bank assets.
[10] Lines 24 and 25 of International Financial Statistics (IFS); October 2008.
[11] Lines 24, 25 and 45 of IFS, October, 2008.

3.2 Measures of sector importance

3.2.1 Financial intermediary formalization

Proposition 5: From 'informal and semi-formal' to *formal* financial development (formalization)

$$\Pr op.5 = \frac{Bank\_deposits}{Monetary\_Base(M2)}$$

In undeveloped countries M2 is not equal to liquid liabilities (liquid liabilities equal bank deposits: bd). Whereas in undeveloped countries bd/M2<1, in developed countries bd/M2 is almost equal to 1. This indicator measures the rate at which money in circulation is absorbed by the banking system. Financial formalization here is defined as the propensity of the formal banking system to absorb money in circulation.

3.2.2 Financial intermediary 'semi-formalization'

Proposition 6: From 'informal and formal' to *semi-formal* financial development (Semi-formalization)

$$\Pr op.6 = \frac{Financial\_deposits - Bank\_deposits}{Monetary\_Base(M2)}$$

This indicator measures the level at which the semi-formal financial sector evolves to the detriment of formal and informal sectors.

3.2.3 Financial intermediary 'informalization'

Proposition 7: From 'formal and semi-formal' to *informal* financial development (Informalisation)

$$\Pr op.7 = \frac{Monetary\_Base(M2) - Financial\_deposits}{Monetary\_Base(M2)}$$

This proposition shows the rate at which the informal financial sector is developing at the cost of formal and semi-formal sectors.

Propositions 5, 6 and 7 add up to unity (one) arithmetically spelling-out the underlying assumption of sector importance. That is, when their time series properties are considered in empirical analysis, the evolution of one sector is to the detriment of other sectors and vice-versa.

3.2.4 Financial intermediary 'semi-formalization and informalization'

Proposition 8: Formal to '*informal and semi-formal'* financial development: (Semi-formalisation and informalization)

$$\Pr op.8 = \frac{Monetary\_Base(M2) - Bank\_deposits}{Monetary\_Base(M2)}$$

The proposition appreciates the deterioration of the formal banking sector to the benefit of other sectors (informal and semi-formal). From common sense, proposition 5 and 8 should be perfectly antagonistic, meaning the former (formal financial development at the expense of other sectors) and the later (formal sector deterioration) should display a perfectly negative coefficient of correlation[12].

3.2.5 Interaction of propositions

Owing to the compatibility of propositions 1, 2, 3 and 4 with propositions 5, 6, 7 and 8 respectively, we are poised to hypothesis that though the propositions are independent significant determinants of growth, a combination of them would increase their effect on growth (more than their independent sums). That is, for instance the combined of effect of

[12] Correlation analysis in the appendix meets this expectation.

propositions 1 and 5(for formal finance) should be greater than the sum of independent effects of propositions 1 and 5. The following testable hypothesis results there-from.

Hypothesis 4: For formal finance, simultaneous improvement of shares in GDP (Prop.1) and Monetary Base (Prop.5) should have a higher impact on growth (than that expressed by their independent sums). By the same token, this applies to semi-formal finance (Prop.2 and Prop.6) and informal finance (Prop.3 and Prop.7).

3.2.6 Linkages between financial development measures, financial depth and liquid liabilities

Liquid liabilities are equal to the Monetary base (M2) or financial depth in developing and underdeveloped countries only when all three sectors of finance are considered.

Therefore, Liquid liabilities = M2; if and only if:

$$Liquid\_liabilities(M2) = \Pr op.1 + \Pr op.2 + \Pr op.3$$

This definition of liquidity liabilities based on propositions 1-3 differs from the usual definition (sum of propositions 1 and 2). Hence the empirical section of this paper will use the definition of liquid liabilities that comprises definitions 1-3.

4. Data and Methodology

4.1 Data

Since this paper is methodological oriented, justification of a broad database in the choice of data is not much of a constraint. African Development Indicators (ADI) of the World Bank and the Financial Development and Structure Database (FDSD) are our main data sources. We limit ourselves to developing countries with data on testable hypotheses; i.e. priority to countries which have data for both the informal financial sector (M2-financial system deposits) and the semi-formal sector (financial system deposits-bank system deposits). Our panel is

made up of Burkina Faso, Ethiopia, Kenya, Malawi, Morocco, Senegal, Tanzania, Togo and Tunisia, spanning from 1986 to 2009. Selected variables from ADI include: GDP per capita growth[13], GDP growth[14] (dependent variables), Inflation[15], Trade on GDP, Population growth and General government final consumption expenditure (control variables). Our control variables are in line with empirical literature (Levine & King, 1993; Hassan et al., 2011). Independent variables (Propositions from section 3) originate from transformations in the FDSD.

4.2 Methodology

4.2.1 Unit root tests

Since we seek to employ a model that assumes a particular functional distribution in data analysis, we begin by investigating the stationary properties of our variables at level[16] and first difference[17]. Among existing panel unit root tests we prefer the first generation(cross sectional independence) to the second generation(cross sectional dependence) because the number of periods in each cross section is superior to the number to cross sections(T>N).[18] Among existing first generational tests, we opt for Levin, Lin and Chu (LLC, 2002) and Im, Pesaran and Shin (IPS, 2003) for homogenous and heterogeneous tests respectively. Borrowing from Asongu (2011) and Khim (2004) we specify the LLC and IPS tests by Hannan-Quinn Information Criterion (HQC) and Akaike Information Criterion (AIC)[19] respectively. Maddala and Wu (1999) shape our decisions on integration properties in event

[13] GDP per capita growth proxy's welfare and is growth in the average annual income per individual.
[14] GDP growth reflects the levels of economic growth.
[15] Inflation based on annual % of consumer prices.
[16] I (0): stationary or absence of unit root at level series.
[17] I (1): stationary at first difference or first order integration.
[18] Cross section dependence tests can only be applied when the numbers of cross sections (N) exceed the number of periods (T).
[19] Panel observations are more than 120. With respect to Khim (2004), optimal lag selection for goodness of fit is best with AIC or Final Prediction Error (FPE) when observations are less than 60. However when these observations exceed 120, the HQC is best.

of a conflict of interest between LLC and IPS tests[20]. Table 2 shows stationary properties of variables in bold.

Table 2: Homogenous and heterogeneous panel unit root tests

Variables	Homogenous(LLC) tests				Heterogeneous(IPS) tests			
	Level		First difference		Level		First difference	
	c	ct	c	ct	c	ct	c	ct
LL(M2)	3.55	2.55	**-8.41*** **	**-7.53*** **	2.62	1.14	**-7.13*** **	**-6.61*** **
Prop(1)	4.41	3.74	**-3.93*** **	**-7.36*** **	4.85	5.13	**-4.76*** **	**-6.19*** **
Prop(2)	-1.55*	0.40	**-4.92*** **	**-3.46*** **	-0.20	1.07	**-5.07*** **	**-3.33*** **
Prop(3)	**-4.03*** **	**-8.11*** **	n.a	n.a	**-5.80*** **	**-6.72*** **	n.a	n.a
Prop(4)	2.26	-3.40***	**-5.92*** **	**-14.69*** **	-0.47	-1.84**	**-6.15*** **	**-10.03*** **
Prop(5)	1.49	-3.24***	**-5.89*** **	**-3.83*** **	2.48	-2.48***	**-5.92*** **	**-4.27*** **
Prop(6)	-5.23***	-0.31	**-3.90*** **	**-3.13*** **	-3.54***	-0.27	**-3.85*** **	**-3.57*** **
Prop(7)	-0.37	-5.12***	**-6.51*** **	**-5.32*** **	-0.01	-3.92***	**-5.65*** **	**-3.73*** **
Prop(8)	1.49	-3.24***	**-5.89*** **	**-3.83*** **	2.48	-2.48***	**-5.92*** **	**-4.27*** **
Prop(1*5)	3.86	2.88	**-4.34*** **	**-4.60*** **	4.72	3.36	**-5.26*** **	**-4.71*** **
Prop(2*6)	-1.47*	-1.01	**-7.39*** **	**-7.20*** **	-0.45	0.17	**-7.08*** **	**-7.12*** **
Prop(3*7)	-0.88	-2.13**	**-7.00*** **	**-5.26*** **	-0.91	-3.15***	**-5.36*** **	**-3.49*** **
Prop(4*8)	1.21	-0.51	**-6.00*** **	**-5.02*** **	1.43	-1.99**	**-4.68*** **	**-3.51*** **
Inflation	**-5.03*** **	**-4.06*** **	n.a	n.a	**-5.12*** **	**-2.61*** **	n.a	n.a
Trade	**-1.97** **	**-2.29** **	n.a	n.a	**-2.60*** **	**-3.36*** **	n.a	n.a
GDPg	**-8.77*** **	**-3.67*** **	n.a	n.a	**-11.68*** **	**-6.76*** **	n.a	n.a
GDPpcg	**-8.47*** **	**-4.24*** **	n.a	n.a	**-11.13*** **	**-7.11*** **	n.a	n.a
Popg	**-1.51***	**-2.63*** **	n.a	n.a	**-2.61*** **	**-11.82*** **	n.a	n.a
Gov't	-1.34*	1.57	**-7.31*** **	**-5.98*** **	-1.30*	0.93	**-7.95*** **	**-6.41*** **

*, **, *** denote significance at 10%, 5% and 1% respectively. 'c' and 'ct': 'constant' and 'constant and trend' ;respectively. n.a: not applicable. Stationary series are in bold and decision rule depends on both tests but priority is given the IPS in case of conflict of interest. LLC; Levin, Lin and Chu (2002). IPS: Im, Pesaran and Shin (2003). Optimal lag selection is governed by AIC and HQC for IPS and LLC tests respectively. GDPpcg: GDP per capita growth. GDPg: GDP growth. LL (M2): Liquid Liabilities on GDP. Infl: Inflation. Popg: Population growth. Gov't: Government expenditure. Prop (h): Propositions.

4.2.2 Model specification tests

Following Asongu (2010b) we opt for Generalized Least Squares (GLS) with Fixed Effects (FE) and do not perform the Hausman test to determine if regressions would be by Fixed Effects or Random Effects[21] . FE regressions also have the advantage of taking into account unobserved heterogeneity and does not rest on the assumption of the absence of correlation between the variables and the error term. Upon regression, we justify our choice of GLS instead of Ordinary Least Squares (OLS) with a Wald statistics for heteroscedasticity.

[20] According to Maddala and Wu (1999), the alternative hypothesis (for the absence of a common unit) of Levin, Lin and Chu (LLC) test is too strong. Following Asongu (2011) we based our decisions on results of IPS test in case of conflict of interest.

[21] A priori, the Fixed Effect regression is plausible as cross sections are member states of a given continent that are not randomly selected.

4.2.3 Model formulation

Models (1) and (2) are based on the finance-led-growth nexus and are in line with recent finance-growth literature (Hassan et al., 2011). The later checks the former and "t" ranges from 1986 to 2009 for each cross section.

$$GDPg_{it} = \gamma_0 + \gamma_1 \Pr op(h)_{it} + \gamma_2 T_{it} + \gamma_3 Infl_{it} + \gamma_4 Gov_{it} + \varepsilon_{it} \quad (1)$$

For robustness check

$$GDPpcg_{it} = \gamma_0 + \gamma_1 \Pr op(h)_{it} + \gamma_2 T_{it} + \gamma_3 Infl_{it} + \gamma_4 Gov_{it} + \gamma_5 Popg_{it} + \varepsilon_{it} \quad (2)$$

Where; *Prop, T, Infl, Gov, Popg, GDPpcg* and *GDPg* represent Propositions, Trade, Inflation, Government expenditure, Population growth, GDP per capita growth and GDP growth respectively.

Above models are replicated for each set of propositions under consideration[22]. For proposed parameters that fail to significantly explain the dependent variable, transmission mechanism models are applied to verify their effects on growth via same-sector interactions(see table 6).

4.2.4 Transmission mechanisms

$$GDPg_{it} = \gamma_0 + \gamma_1 [\Pr op(u) * \Pr op(v)]_{it} + \gamma_2 T_{it} + \gamma_3 Infl_{it} + \gamma_4 Gov_{it} + \varepsilon_{it} \quad (3)$$

[22] Where issues related to multicolinearity and overparametization cannot be foreseen (from correlation analysis), we introduce as many proposed regressors as possible. That is, propositions 1, 2 and 3 or 5, 6 and 7 when possible.

Robustness tests

$$GDPpcg_{it} = \gamma_0 + \gamma_1[\Pr op(u) * \Pr op(v)]_{it} + \gamma_2 T_{it} + \gamma_3 Infl_{it} + \gamma_4 Gov_{it} + \gamma_5 Popg_{it} + \varepsilon_{it} \quad (4)$$

Where; *Prop, T, Infl, Gov, Popg, GDPpcg* and *GDPg* represent Propositions, Trade, Inflation, Government expenditure, Population growth, GDP per capita growth and GDP growth respectively. The later equation (4) checks the former (3) with "t" ranging from 1986 to 2009. Transmission mechanisms are based on hypothesis 4, with the presumption that if Prop(u) or Prop(v) are not independent significant determinants of growth and/or welfare, their interaction could yield higher significant results than the sum of their independent effects.

5. Empirical Analysis

5.1 Correlation Analysis

We perform two types of correlation analyses. The first as presented in table 3 aims to investigate if suggested propositions are exogenous to M2. Results show but for Proposition 6, all propositions are significant determinants of M2 and therefore could be paramount in the finance-growth nexus. Formal, semi-formal and informal finances contain 97%, 27% and 76% of information in M2. The very high coefficient of correlation for formal finance reflects the existing consensus that formal finance is the main driver of the M2. But given the relative size of informal finance information in M2 (76%), its role in the economic development is deserving of examination. Proposition 4 shows that semi-formal and informal finance reflect 74% of information in M2. By the same token propositions 5 and 6 represent 33% and 4% of

M2 variations. For propositions 7 and 8, there are 39% and 33% of negative associations with M2 variations respectively.

The second in the appendix shapes our expectations on the linkages between growth and propositions on the one hand; and on the other hand, enable plausible model specifications in a bid to avoid problems linked to multicolinearity and overparametization.

Table 3: Correlation analyses between financial depth (M2) and Propositions

Props	Prop.1	Prop.2	Prop.3	Prop.4	Prop.5	Prop.6	Prop.7	Prop.8
C.Coef.	0.97***	0.27***	0.76***	0.74***	0.33***	0.04	-0.39***	-0.33***
t-stats	63.71	4.12	17.21	15.98	5.15	0.62	-6.20	-5.15

C.Coef: Correlation coefficient. Props: propositions. t-stats: student statistics. *,**,***; significance levels of 10%, 5% and 1% respectively

5.2 Empirical results

5.2.1 Results from Propositions 1 to 4

As shown in table 4, while the first main column of the table illustrates base-models from equation (1) in the finance-growth nexus, the second shows corresponding robustness checks of said models from equation (2) in the finance-welfare nexus. For instance "Model 1" is checked by "Model 1*" and so forth. At first glance, regardless of estimated coefficient-signs all propositions are independent significant determinants of growth and welfare. While liquid liabilities and the informal financial sector reflect a negative finance-le-growth nexus, the semi-formal financial sector accounts for the contrary. Semi-formal finance further weighs heavily in the determination of the estimated coefficient sign of Proposition 4(when its effect is combined with that of informal finance) .

Our controls for inflation, trade, government-expenditure and population growth are significant with expected signs and consistent with recent empirical literature (Hassan et al., 2011). Due to issues of multicolinearity and overparametization (see appendix 1) we could not regress growth variables on all the propositions simultaneously.

Table 4: Regressions with propositions 1 to 4

	Base Models: GDPg(l)				Robustness Test Models: GDPpcg(l)			
	Model 1	Model 2	Model 3	Model 4	Model 1*	Model 2*	Model 3*	Model4*
Const.	-0.53	-0.42	-1.32	-0.42	-0.16	-0.09	-0.87	-0.05
	(-0.31)	(-0.23)	(-0.78)	(-0.23)	(-0.07)	(-0.03)	(-0.37)	(-0.02)
M2(d)	**-86.9*** **	---	**-110*** **	---	**-84.5*** **	---	**-107.5*** **	---
	(-7.39)		**(-6.80)**		**(-7.32)**		**(-6.79)**	
Prop.1(d)	---	**-111.2*** **	---	**-112*** **	---	**-108.7*** **	---	**-110*** **
		(-7.33)		**(-7.23)**		**(-7.32)**		**(-7.21)**
Prop.2(d)	**115.2** **	---	---	18.21	**110.8** **	---	---	16.73
	(2.62)			(0.47)	**(2.58)**			(0.44)
Prop.3(l)	---	**-11.52* **	---	**-11.43* **	---	**-11.04* **	---	**-10.95* **
		(-1.84)		**(-1.82)**		**(-1.80)**		**(-1.78)**
Prop.4(d)	---	---	**93.38*** **		---	---	**91.89*** **	
			(3.05)				**(3.07)**	
Infl.(l)	**-0.07*** **	**-0.09*** **	**-0.09*** **	**-0.09*** **	**-0.07** **	**-0.09*** **	**-0.09*** **	**-0.09*** **
	(-2.39)	**(-3.28)**	**(-3.07)**	**(-3.30)**	**(-2.35)**	**(-3.23)**	**(-3.03)**	**(-3.25)**
Trade(l)	**0.09*** **	**0.11*** **	**0.10*** **	**0.11*** **	**0.08*** **	**0.10*** **	**0.10*** **	**0.10*** **
	(3.22)	**(3.89)**	**(3.77)**	**(3.90)**	**(2.99)**	**(3.65)**	**(3.53)**	**(3.65)**
Popg(l)	---	---	---	---	**-1.05** **	**-1.04** **	**-1.07** **	**-1.05** **
					(-2.21)	**(-2.24)**	**(-2.27)**	**(-2.25)**
Gov't(d)	**-0.50*** **	**-0.51*** **	**-0.50*** **	**-0.51*** **	**-0.49*** **	**-0.50*** **	**-0.49*** **	**-0.50*** **
	(-4.25)	**(-4.41)**	**(-4.26)**	**(-4.41)**	**(-4.24)**	**(-4.40)**	**(-4.26)**	**(-4.41)**
Hetero	**178.6*** **	**157.08*** **	**157.74*** **	**147.21*** **	**183.1*** **	**157.8*** **	**159.8*** **	**148.6*** **
Adj. R^2	0.33	0.36	0.34	0.35	0.36	0.39	0.37	0.38
Fisher	**8.04*** **	**9.08*** **	**8.32*** **	**8.41*** **	**8.52*** **	**9.54*** **	**8.84*** **	**8.88*** **

(l): level. (d): first difference. *, **, ***: denote significance levels of 10%, 5% and 1% respectively. Prop: propositions. GDPpcg: GDP per capita growth. GDPg: GDP growth. LL (M2): Liquid Liabilities on GDP. Infl: Inflation. Popg: Population growth. Gov't: Government expenditure. Hetero: Wald Chi-Square statistics for heteroscedasticity. Adj. R^2: Adjusted Coefficient of determination. Fisher: Fisher statistics. Prop.1: formal financial sector development. Prop.2: semi-formal financial sector development. Prop.3: informal financial sector development. Prop.4: semi-formal and informal financial sectors development.

5.2.2 Results from Propositions 5 to 8

Regressions on indicators of sector importance presented in table 5 below have the same structure as those of table 4 above. Our controls for inflation, trade, government-expenditure and population growth are significant with expected signs and compatible with recent empirical literature (Hassan et al., 2011). While propositions 6 and 8 are significant with the right signs (as those of propositions 2 and 4 respectively in table 4), propositions 5 and 7 respectively for formal and informal finance sector importance are insignificant with the right signs (as for propositions 1 and 3 respectively in table 4). Since propositions 5 and 7 are not independently significant in the finance-growth nexus, we are poised to further verify their validity by virtue of hypothesis 4(See Section 3.2.5).

Table 5: Regressions with propositions 5 to 8

	Initial Model: GDPg(l)				Robustness test: GDPpcg(l)			
	Model 1	Model 2	Model 3	Model 4	Model 1*	Model 2*	Model 3*	Model4*
Const.	-0.29	0.50	-0.84	0.50	-0.14	1.91	-0.46	1.91
	(-0.17)	(0.26)	(-0.49)	(0.26)	(-0.06)	(0.71)	(-0.19)	(0.71)
M2(d)	**-76.1*** **	---	**-79.6*** **	---	**-74.2*** **	---	**-77.7*** **	---
	(-7.23)		**(-7.55)**		**(-7.17)**		**(-7.52)**	
Prop.5(d)	---	-13.31	---	-8.21	---	-12.27	---	-8.88
		(-0.58)		(-0.66)		(-0.55)		(-0.73)
Prop.6(d)	**39.97** **	---	---	5.09	**38.19** **	---	---	3.38
	(2.03)			(0.22)	**(1.98)**			(0.15)
Prop.7(d)	---	-5.09	---	---	---	-3.38	---	---
		(-0.22)				(-0.15)		
Prop.8(d)	---	---	**30.4*** **	---	---	---	**30.1*** **	---
			(2.87)				**(2.90)**	
Infl.(l)	**-0.06** **	**-0.07** **	**-0.08*** **	**-0.07** **	**-0.06** **	**-0.07***	**-0.08*** **	**-0.07***
	(-2.21)	**(-2.00)**	**(-2.82)**	**(-2.00)**	**(-2.17)**	**(-1.96)**	**(-2.79)**	**(-1.96)**
Trade(l)	**0.08*** **	**0.06** **	**0.09*** **	**0.06** **	**0.08*** **	**0.05***	**0.09*** **	**0.05***
	(3.00)	**(2.01)**	**(3.47)**	**(2.01)**	**(2.82)**	**(1.72)**	**(3.24)**	**(1.72)**
Popg(l)	---	---	---	---	**-0.99** **	**-1.36** **	**-1.05** **	**-1.36** **
					(-2.07)	**(-2.50)**	**(-2.23)**	**(-2.50)**
Gov't(d)	**-0.51*** **	**-0.71*** **	**-0.49*** **	**-0.71*** **	**-0.50*** **	**-0.70*** **	**-0.49*** **	**-0.70*** **
	(-4.26)	**(-5.36)**	**(-4.22)**	**(-5.36)**	**(-4.23)**	**(-5.42)**	**(-4.21)**	**(-5.42)**
Hetero	**242.6*** **	**597.5*** **	**215.8*** **	**597.5*** **	**244.0*** **	**532.3*** **	**218.3*** **	**532.3*** **
Adj. R^2	0.32	0.11	0.33	0.11	0.35	0.16	0.37	0.16
Fisher	**7.71*** **	**2.86*** **	**8.19*** **	**2.86*** **	**8.20*** **	**3.51*** **	**8.72*** **	**3.51*** **

(l): level. (d): first difference. *, **, ***: denote significance levels of 10%, 5% and 1% respectively. Prop: propositions. GDPpcg: GDP per capita growth. GDPg: GDP growth. LL (M2): Liquid Liabilities on GDP. Infl: Inflation. Popg: Population growth. Gov't: Government expenditure. Hetero: Wald Chi-Square statistics for heteroscedasticity. Adj. R^2: Adjusted Coefficient of determination. Fisher: Fisher statistics. Prop.5: formal financial sector development. Prop.6: semi-formal financial sector development. Prop.7: informal financial sector development. Prop.8: semi-formal and informal financial sectors development.

5.2.3 Results from interaction of propositions

Table 6 below covers regressions for the validity of hypothesis 4. As in the last two tables, our controls for inflation, trade, government-expenditure and population growth are significant with expected signs and consistent with recent empirical literature (Hassan et al., 2011). The significance of interactions of propositions 1 and 5 on the one hand, and propositions 3 and 7 on the other indirectly validate propositions 5 and 7. This implies that though propositions 5 and 7 are not independent significant determinants of growth (table 5), their interactions with propositions 1 and 3 are favorable to the finance-growth nexus. Therefore with respect to our database, propositions 5 and 7 are valid if and only if there are simultaneous improvements in proportions of GDP and shares in M2 for the formal and informal financial sectors. Beyond this fact, our indirect validation of propositions 5 and 7 comply with the premise of hypothesis 4. For instance the interaction of propositions 1 and 5

affect growth and welfare much higher than their independent effects combined. This also applies to semi-formal and informal sectors.

Table 6: Regressions with interactions of propositions

	Initial Model: GDPg(l)				Robustness test: GDPpcg(l)			
	Model 1	Model 2	Model 3	Model 4	Model 1*	Model 2*	Model 3*	Model4*
Const.	-0.55	-0.94	-1.06	-1.05	-0.45	-0.30	-0.73	-0.37
	(-0.32)	(-0.58)	(-0.61)	(-0.64)	(-0.19)	(-0.13)	(-0.30)	(-0.16)
LL(d)	**-79*** **	---	**-87.4*** **	---	**-77.1*** **	---	**-85.5*** **	---
	(-7.36)		**(-6.55)**		**(-7.31)**		**(-6.54)**	
[Prop.1*Prop.5](d)	---	**-137.9*** **	---	**-141.5*** **	---	**-134.4*** **	---	**-138.1*** **
		(-8.05)		**(-8.15)**		**(-8.02)**		**(-8.12)**
[Prop.2*Prop.6](d)	**485.9** **	---	---	-230.86	**471.7** **	---	---	-230.05
	(2.32)			(-1.19)	**(2.30)**			(-1.22)
[Prop.3*Prop.7](d)	---	**-267.9*** **	---	**-267.9*** **	---	**-257.7*** **	---	**-257.6*** **
		(-4.92)		**(-4.93)**		**(-4.83)**		**(-4.84)**
[Prop.4*Prop8](d)	---	---	**94.50***	---	---	---	**93.84***	---
			(1.87)				**(1.90)**	
Infl.(l)	**-0.06** **	**-0.09*** **	**-0.08*** **	**-0.09*** **	**-0.06** **	**-0.08*** **	**-0.08*** **	**-0.09*** **
	(-2.23)	**(-2.95)**	**(-2.67)**	**(-3.02)**	**(-2.19)**	**(-2.91)**	**(-2.64)**	**(-2.99)**
Trade(l)	**0.09*** **	**0.10*** **	**0.10*** **	**0.10*** **	**0.08*** **	**0.09*** **	**0.09*** **	**0.09*** **
	(3.18)	**(3.71)**	**(3.44)**	**(3.77)**	**(2.99)**	**(3.44)**	**(3.23)**	**(3.50)**
Popg(l)	---	---	---	---	**-0.97** **	**-1.13** **	**-1.04** **	**-1.14** **
					(-2.04)	**(-2.49)**	**(-2.17)**	**(-2.52)**
Gov't(d)	**-0.51*** **	**-0.51*** **	**-0.50*** **	**-0.50*** **	**-0.50*** **	**-0.51*** **	**-0.49*** **	**-0.50*** **
	(-4.28)	**(-4.57)**	**(-4.21)**	**(-4.48)**	**(-4.25)**	**(-4.59)**	**(-4.20)**	**(-4.51)**
Hetero	**238.6*** **	**78.02*** **	**211.8*** **	**79.3*** **	**239.4*** **	**80.67*** **	**214.2*** **	**82.15*** **
Adj. R^2	**0.32**	**0.38**	**0.31**	**0.38**	**0.35**	**0.41**	**0.35**	**0.41**
Fisher	**7.86*** **	**9.94*** **	**7.63*** **	**9.36*** **	**8.36*** **	**10.37*** **	**8.16*** **	**9.80*** **

(l): level. (d): first difference. *, **, ***: denote significance levels of 10%, 5% and 1% respectively. Prop: propositions. GDPpcg: GDP per capita growth. GDPg: GDP growth. LL (M2): Liquid Liabilities on GDP. Infl: Inflation. Popg: Population growth. Gov't: Government expenditure. Hetero: Wald Chi-Square statistics for heteroscedasticity. Adj. R^2: Adjusted Coefficient of determination. Fisher: Fisher statistics. [Prop.1*Prop.5]: formal financial sector development. [Prop.2*Prop.6]: semi-formal financial sector development. [Prop.3*Prop.7]: informal financial sector development. [Prop.4*Prop.8]: semi-formal and informal financial sectors development.

For tables 4, 5 and 6, the Fisher and Wald statistics for respectively the significance of overall model and justification of the use of GLS are significant for all regressions. Explanatory powers of estimated parameters expressed by the adjusted coefficient of determination (Adj.R^2) are also impressive.

5.2.4 Retrospect to hypotheses

***Hypothesis 1**: "The informal financial sector (a previously missing component in the definition of monetary base: M2) significantly contributes to economic growth".*

We have verified the empirical validity of propositions 3 and 7 resulting from this hypothesis. While Proposition 3 is an independent significant determinant in the finance-

growth nexus, simultaneous improvements of propositions 3 and 7 indirectly validate Proposition 7 by virtue of hypothesis 4.

Hypothesis 2*: "Disentangling different components of the existing measurement (financial system) into formal (banking sector) and semi-formal (other financial institutions) financial sector indicators could improve understanding of the finance-growth nexus".*

We have equally verified this hypothesis. While in tables 4, 5 and 6, coefficients of M2 have been significantly negative, those corresponding to formal and semi-formal finance have been negative and positive respectively. This suggests formal finance is the more important determinant of M2[23]. However disentangling the semi-formal finance sector yields a different significant sign (positive) in the finance-growth nexus. This implies had M2 been used as the sole financial indicator, its negative sign (geared by formal finance) would have over-shadowed the positive sign of semi-formal finance contained there-in. Consequently disentanglement has improved our understanding of the finance-growth nexus.

Hypothesis 3*: "Introducing measures of sector importance could ameliorate the capacity to understand how evolvements (improvements) of shares in different sectors of the financial system affect the finance-growth nexus".*

But for the semi-formal financial sector in which a great part of information in Proposition 2 in reflected in Proposition 6(approximately 90%), only 51% and 23% of information in propositions 1 and 3 are present in propositions 5 and 7 respectively(see correlation analysis in appendix). This suggests that sector importance finance indicators are not the same as GDP ratio indicators (: they are complements to GDP ratio measures). Thus, though the finance-led-growth effects of similar sectors in the two categories of indicator (GDP or M2 ratios) have the same sign and significance, our data structure by virtue of

[23] Its sign (that of formal finance) affects the sign of the M2 coefficient more significantly.

correlation analysis shows same sector M2 ratios and sector GDP ratios are not the same(: do not contain the same information). Vertically comparing coefficients from regressions in tables 4, 5 and 6, it could be deduced that the finance growth-nexus is more affected by proportion-of-GDP financial-sector ratios than shares-of-M2 ratios(: further evidence that the two sets of indicators contain information with different variations).

Hypothesis 4*: "For formal finance, simultaneous improvement in shares of GDP (Prop.1) and Monetary Base (Prop.5) should have a higher impact on Growth (than their combined independent effects). By the same token, this applies to semi-formal finance (Prop.2 and Prop.6) and informal finance (Prop.3 and Prop.7)".*

We have shown that, though sector GDP ratios or sector M2 ratios are independent significant determinants of growth, simultaneous improvements in sector shares of GDP and M2 will yield a greater effect on growth than their combined independent effects. Thus policy oriented towards simultaneously increase of shares in both categories of ratios should yield higher growth-effects.

6. Conclusion

Financial development indicators are often applied to countries/regions without taking into account specific financial development realities. Financial depth in the perspective of monetary base is not equal to liquid liabilities in every development context. This paper has introduced complementary indicators to the existing Financial Development and Structure Database (FDSD).

We have empirical tested four hypotheses and withheld the following: (1) the informal financial sector (a previously missing component in the definition of the monetary) base) significantly contributes to economic growth; (2) disentangling different components of the

existing measurement (financial system) into formal (banking sector) and semi-formal (other financial institutions) financial sector indicators improves understanding of the finance-growth nexus; (3) introducing measures of sector importance could ameliorate the capacity to understand how evolvements (improvements) of shares in different sectors of the financial system affect the finance-growth nexus; (4) though sector GDP ratios or sector M2 ratios are independent significant determinants of growth, simultaneous improvements in sector shares of GDP and M2 will yield a greater effect on growth than their combined independent effects.

The work unites two streams of research. It contributes at the same time to the macroeconomic literature on measuring financial development and responds to the growing field of economic development by means of informal financial sector promotion and microfinance. The paper suggests a practicable way to disentangle the effects of the various financial sectors on economic developments.

Appendices

Appendix 1 : Correlation analysis

LL	Prop1	Prop2	Prop3	Prop4	Prop5	Prop6	Prop7	Prop8	Infl.	Trade	GDPg	GDPpc	Popg	Gov	
1.00	0.97	0.27	0.76	0.74	0.33	0.04	-0.39	-0.33	-0.21	0.29	-0.04	0.08	-0.57	0.04	LL
	1.00	0.12	0.44	0.42	0.51	-0.08	-0.47	-0.51	-0.23	0.38	-0.02	0.11	-0.63	0.05	Prop1
		1.00	0.13	0.53	-0.40	0.90	-0.34	0.40	0.16	-0.02	-0.08	-0.09	0.04	0.03	Prop2
			1.00	0.90	-0.12	-0.12	0.23	0.12	-0.27	-0.00	-0.16	-0.10	-0.23	0.03	Prop3
				1.00	-0.32	0.41	-0.01	0.32	-0.16	-0.01	-0.17	-0.13	-0.17	0.04	Prop4
					1.00	-0.47	-0.65	-1.00	-0.20	0.54	0.00	0.09	-0.45	-0.02	Prop5
						1.00	-0.35	0.47	0.30	-0.05	-0.04	-0.08	0.16	0.00	Prop6
							1.00	0.65	-0.04	-0.53	0.03	-0.02	0.33	0.02	Prop7
								1.00	0.20	-0.54	-0.00	-0.09	0.45	0.02	Prop8
									1.00	0.01	0.00	-0.02	0.16	0.01	Infl.
										1.00	-0.06	0.02	-0.43	-0.01	Trade
											1.00	0.98	-0.04	-0.10	GDPg
												1.00	-0.23	-0.08	GDPpc
													1.00	-0.05	Popg
														1.00	Gov

Infl. :Inflation. Popg :Population growth. Gov : Government expenditure. GDPg:GDP growth; GDPpcg: GDP per capita growth; LL: Liquid Liabilities on GDP; Prop.1:Proposition 1; Prop.2: Proposition 2; Prop.3:Proposition 3; Prop.4:Proposition 4; Prop.5:Proposition 5 ; Prop.6 : Proposition 6 ; Prop.7 :Proposition 7 ; Prop.8 ; Proposition 8

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